Capra Course

Summary of Lecture 1:
Systems Thinking

(with references to the corresponding sections in the textbook *The Systems View of Life* by Capra and Luisi)

In the first lecture, I introduce the main theme of the course, beginning with an assessment of the state of the world today. I emphasize that the major problems of our time — energy, the environment, climate change, economic inequality, violence and war — are all interconnected and interdependent. They are systemic problems that require corresponding systemic solutions. *(Section 17.1)*

One of the main messages of this course is that there *are* solutions to the major problems of our time; some even simple. But they all require a radical shift in our perceptions, our thinking, our values. *(Introduction)*

Unfortunately, this realization has not yet dawned on our political and corporate leaders who are unable to "connect the dots" and who refuse to recognize how their piecemeal solutions affect future generations. What we need is systemic solutions and sustainable solutions. *(Section 18)*

Today, it is becoming increasingly apparent that a full understanding of these issues requires nothing less than a radically new conception of life. Indeed, such a new conception of life is now emerging. It encompasses many concepts and ideas that are now being developed by outstanding researchers and their teams around the world. **I**n this course I present a synthesis of their works, a conceptual framework that integrates four dimensions of life — the biological dimension, obviously, but also the cognitive dimension, the social dimension, and the ecological dimension. And I also discuss various implications of this unifying vision — philosophical, spiritual, political, economic implications, and so on.

So, this is the main theme of the course: the new systemic understanding of life and its many applications. I have called my synthesis "the systems view of life" because the new conception of life requires a new kind of thinking — thinking in terms of relationships, patterns, connectedness, context. In science, this kind of thinking is known as "systems thinking," or "systemic thinking." It emerged in the 1920s and 1930s from a series of interdisciplinary dialogues involving biologists, psychologists, and

ecologists. In all these fields, scientists realized that a living system — an organism, a social system, or an ecosystem — is an integrated whole whose properties cannot be reduced to those of smaller parts. *(Section 4.1)*

By the end of the 1930s the key characteristics of systems thinking had been established. The 1940s saw the formulation of actual systems theories. I call these the "classical systems theories." *(Section 5)* They include general systems theory and cybernetics. In the 1970s and 1980s, systems thinking was raised to a new level with the development of complexity theory, technically known as "nonlinear dynamics." This is a new, computer-based mathematics that allowed scientists for the first time to handle the enormous complexity of living systems. Chaos theory and fractal geometry are important branches of complexity theory. *(Section 6)*

The crucial characteristic of complexity theory is that it involves a nonlinear mathematics. When you solve a nonlinear equation with these techniques, the result is not a formula but a geometric pattern. The strange attractors of chaos theory and the fractals of fractal geometry are examples of such patterns. They are geometric shapes, visual descriptions of the system's underlying complex dynamics. So, complexity theory is really a mathematics of relationships, a mathematics of patterns; and this is why it is so important for the understanding of living systems.

From the 1970s and 1980s on, there has been a strong interest in nonlinear systems, and this has created a whole series of new and powerful theories that have dramatically increased our understanding of many key characteristics of life.

My synthesis of these theories, which integrates life's biological, cognitive, social, and ecological dimensions is the subject of this course. I believe that such an integrated view is urgently needed today to deal with our global ecological crisis and to protect the flourishing of life on Earth. As I mentioned before, the main problems of our time are systemic problems, and they require systemic solutions; and the systems view of life is really crucial for finding these solutions.

It will be critical for present and future generations of students, and for business, political, and community leaders to really understand the basics of this new systemic conception of life; and this also holds for a broad range of professions — from economics and management to politics, health, design, law — because they all have to do with life.