

Fritjof Capra
The Biology of Love

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For the last 30 years I have developed a synthesis of a new conception of life, which is now emerging at the forefront of science. I call it "the systems view of life," which is also the title of the textbook I wrote with my colleague Pier Luigi Luisi. It is a synthesis that integrates four dimensions of life: the biological, the cognitive, the social, and the ecological dimension.

In this work, I have occasionally come across natural scientists, like Humberto Maturana, who talked about love. I have always shied away from using this word in my scientific work, but recently I have begun to see a connection between the human experience of love and the systems view of life. This was triggered by a German biologist and philosopher, Andreas Weber, who was a student of Francisco Varela and is therefore thoroughly familiar with the systems view of life.

Andreas, whom I met recently, is also a very romantic writer in the tradition of the German Romantics. His book is titled *Matter and Desire* with the intriguing subtitle *An Erotic Ecology*. For us here, the title is also intriguing because of Michael's book *The Death of Desire*.

In fact, if, as Michael reminded us, *Eros*, according to Plato is desire in all its aspects, the link between Weber's two book titles, "Matter and Desire" and "An Erotic Ecology," makes total sense. Michael's discussion of the Terms *Eros*, *Agape* and *Philia* made it clear to me that the concept of love in the systems view of life, which I shall present to you, is related to the full dimension of *Eros*, since it arises within a view of life that does not separate mind from body, reason from emotion, nor human life from spirituality (or "man" from "God" in patriarchal language).

So, what I want to do is first, to give you a very brief summary of my synthesis of the systems view of life, and then relate it to what Andreas writes about love, life, and desire.

The systems view of life

In the systems view of life, the central characteristic of biological life is metabolism, defined as "the ceaseless flow of energy and matter through a network of chemical reactions, which enables a living organism to continually generate, repair, and perpetuate itself."

The understanding of metabolism includes two basic aspects. One is the continuous flow of energy and matter. All living systems need energy and food to sustain themselves; and all living systems produce waste. That's part of metabolism. But life has evolved in such a way that organisms form communities, the ecosystems, in which the waste of one species is food for the next, so that matter cycles continually through the ecosystem.

The second aspect of metabolism is the network of chemical reactions that processes the food, and forms the biochemical basis of all biological structures, functions, and behavior. The emphasis here is on "network." One of the most important insights of the systemic understanding of life is the recognition that networks are the basic pattern of organization of all living systems. Ecosystems are understood in terms of food webs (i.e., networks of organisms); organism are networks of cells, and cells are networks of molecules. And then there are social systems, which are networks of communications. The network is a pattern that is common to all life. Wherever we see life, we see networks.

Now, the defining characteristic of these living networks is that they are *self-generating*. In a cell, for example, all biological structures are continually produced, repaired, and regenerated by the cellular network. Similarly, at the level of a multicellular organism, the bodily cells are continually regenerated and recycled by the organism's metabolic network. Living networks continually create, or recreate themselves by transforming or replacing their components. In this way they undergo continual structural changes while preserving their web-like patterns of organization. This coexistence of stability and change is indeed one of the key characteristics of life. To repeat, what remains stable is the system's pattern of organization, the network; what continually changes is the organism's structure.

Now, when we combine this insight with the one that no living organism can exist in isolation, that all organisms, to sustain themselves, need this continual flow of energy and matter, this ongoing interaction with the environment, we realize that a living organism is engaged in continual interactions with its environment, each of which triggers structural changes in the system. This is why these interactions are known as "structural coupling." These living systems are autonomous, however. The environment only triggers the structural changes; it does not specify or direct them. A living system responds to a disturbance in its own, self-organizing way.

In the systems view of life, the process of this self-organizing response to disturbances is identified with cognition, the process of knowing. Cognition is the activity involved in the self-generation and self-perpetuation of living networks. In other words, cognition is the very process of life. The organizing activity of living systems, at all levels of life, is mental activity. The interactions of a living organism — plant, animal, or human — with its environment are cognitive interactions. Thus life and cognition are inseparably connected. The process of cognition — or, if you wish, of mind — is immanent in matter at all levels of life.

Now I have to come back to the flow aspect of metabolism. The dynamics of this flow of energy and matter through living networks have been studied in great detail and have led to a very important discovery. Living systems generally remain in a stable state, even though energy and matter flows through them and their structures are continually changing. But every now and then such an open system will encounter a point of instability where there is either a breakdown or, more frequently a spontaneous emergence of new forms of order.

This spontaneous emergence of order at critical points of instability, which is often referred to simply as “emergence,” is one of the hallmarks of life. It has been recognized as the dynamic origin of development, learning, and evolution. In other words, creativity — the generation of new forms — is a key property of all living systems.

And finally, I need to mention an important aspect of evolution. When we study the long history of evolution, we come to realize that nature sustains life by creating and nurturing communities. As soon as the first cells appeared on Earth, they formed tightly interlinked communities, known as bacterial colonies; and for billions of years, nature has maintained such communities at all levels of life. So, life flourishes in communities, in networks of relationships.

Human experience of the characteristics of life

So, these are the main concepts of the systems view of life: the description of living systems in terms of networks and flows; the continual self-generation and regeneration of these living networks; the ongoing interactions of living organisms with their environment, while they maintain their autonomy; cognition as the dynamics of self-

organization, as the very process of life; the spontaneous emergence of order — in other words, life’s inherent creativity; and the flourishing of life in communities, in networks of relationships.

These phenomena are characteristic of all forms of life, from the simplest bacteria and other microorganisms, to plants, animals, and human beings. We can experience them at the human level, and when the fundamental characteristics of life are experienced by a conscious self they acquire new meaning.

For example, we experience the autonomy of our living organism as free will; the emergence of new ideas, or new artistic forms, as human creativity; the processes of relationships with others as animosity, affection, or love; and behavior for the common good as ethical behavior. To attribute these human values and emotions to other forms of life would be anthropomorphism, but we must realize that they are based on biological patterns and processes common to all life.

Love as a longing for attachment

Well, I have now prepared the ground to discuss some of Andreas Weber’s key ideas. His starting point is the observation that life flourishes in communities, in networks of relationships. In fact, an individual self can be seen as a node in a network of relationships. Who I am depends on my personal and professional relationships to others, on my relationships to ideas and cultural traditions, as well as on the genetic relationships to my ancestors. Andreas writes:

“We long to connect with another — be it world, skin, food, or air — in order to become ourselves” (p. xiv).

He identifies this longing for connecting with another with the biological basis of love:

“In all living systems, the drive, desire, and longing for attachment *and* autonomy is foundational: essential in order to perceive, to continue, and to unfold” (p. xiii).

Now, I would argue with the use of “desire” and “longing” to describe this drive for attachment in simple organisms. In my view, living organisms (at least before the emergence of emotions in evolution) don’t “long to connect” — they just connect. Only at higher levels of consciousness, which involve the ability to create mental images and to imagine the future, can there be desire. However, to ground the human experience of

love in this biological reality seems a valid idea to me.

The human experience of love is grounded in biology as human consciousness is grounded in life, and, in the terms of Michael's analysis, as *Agape* is grounded in *Eros*.

Erotic ecology

The next step for Andreas is to note that ecology is, essentially, a science of relationships. "This book," he writes, "describes ecological reality as a relational system. And conversely, it comprehends love as an ecological process" (xiv). The fundamental experience of these ecological relationships, for him, is the experience of being touched, which is an erotic experience; thus his term "an erotic ecology." Let me quote a few more passages:

"Being in the world is primarily an erotic encounter, an encounter of meaning through contact, an encounter of being oneself through the significance of others" (xiii)

"From birth, and probably even before it, we experience the fundamental erotics of being touched by the world" (xiv)

This is, of course, very Freudian. According to Freud, the desire of being touched is our strongest desire. He saw the entire body as a sensual organ. Touch, in Freud's view, is the very essence of *Eros*. In Freud's view (and, Michael, please correct me if I'm wrong) trauma is the disruption of touch, and because touch is essential to life, the disruption of touch becomes a disruption of life, and hence an existential problem.

As we discussed in our previous meetings, most psychiatrists search for the "causes" of trauma, which can then be counteracted (e.g. chemically). Freud, by contrast, saw neurosis as a creative response to certain life situations; and Laing had the same understanding of psychosis.

Another interesting idea is that, according to Laing, "psychotherapy, essentially, is an authentic meeting between human beings." In my view, this was the essence of his approach. In his authentic encounters with patients, Laing touched them deeply. They felt "touched," or "moved," and through this metaphorical touching he helped them to overcome their traumas, to "metabolize" them, as it were.

Now back to Andreas. I also found it interesting how he relates erotic touch to the concept of structural coupling (the interactions of a living system with its environment, which trigger structural changes in the system). He writes:

“We discern the fundamental principles of erotic touch: two sides always enter into relationship such that both come away changed” (p. 22).

“The world is not an aggregation of things, but rather a symphony of relationships between many participants that are altered by the interaction: a necessarily erotic occurrence” (p. 29).

Love as aliveness

The biological and ecological phenomena Andreas associates with love — the network of relationships, the individual as a node in such a network, and the structural changes triggered by each interaction — are all fundamental characteristics of life; and so he comes to the conclusion that, ultimately, the experience of love is an experience of intense aliveness:

“I have the impression that love is nothing more or less than pure aliveness in flesh and blood... To love means to be fully alive” (p. 3).

It is interesting that the feeling of intense aliveness has also been associated with spiritual experience. To begin with, the original meaning of spirit is “breath.” Spirit is the breath of life. The Benedictine monk, psychologist, and author David Steindl-Rast characterizes spiritual experience as moments of heightened aliveness. Our spiritual moments, according to Brother David, are those moments when we feel most intensely alive. The aliveness felt during such a “peak experience,” as Abraham Maslow called it, involves not only the body but also the mind.

Buddhists refer to this heightened mental alertness as “mindfulness,” and they emphasize that mindfulness is deeply rooted in the body. Spirituality, then, is always embodied. Spiritual experience is an experience of aliveness of mind and body as a unity. Moreover, this experience of unity transcends not only the separation of mind and body, but also the separation of self and world. The central awareness in these spiritual moments is a profound sense of oneness with all, a sense of belonging to the universe a whole. And of course, as we all know, love too involves the dissolution of

ego boundaries.

So, here we have spirituality characterized by an intense sense of aliveness and by a sense of fundamental connectedness — exactly as in Andreas Weber’s understanding of love. What is missing in Brother David’s description of spiritual experience is the sense of longing and the erotic touch. But if you read the writings of mystics, like Saint Teresa of Avila, or look at paintings and sculptures of saints in ecstasy, there is plenty of longing and erotic intensity.

Desire as a life wish

Living organisms maintain themselves in a delicate coexistence of stability and change. Whenever they reach a point of instability, there can be a spontaneous emergence of novelty, or a breakdown of the system. According to Andreas,

“A life-form can fail at any time, and therefore it *wants* to survive... [Desire is] the wish for continued existence... The life wish is not a program, but an urge that emerges out of matter and also structures it. A being — even the simplest cell — *is* this longing” (pp. 43-44).

Again, I am not comfortable with this formulation from the scientific point of view, even though I like it as poetry. As a scientist, I would simply say that in evolution, those organisms that organize themselves to assure their continued existence, are the ones that survive. I don’t see the need to project longing or desire onto them.

Now, desire and death is, of course, a huge topic in psychoanalysis. I look forward to hearing more about that during our discussion.

Metabolism and death

The way all living systems sustain their continued existence is through metabolism. As I have mentioned, metabolism is the ceaseless flow of energy and matter through a network of chemical reactions, which enables a living organism to continually generate, repair, and perpetuate itself. Metabolism involves the continual creation and transformation of components. In the case of a multicellular organism, it involves the continual regeneration and recycling of cells. This constant recycling of cells is part of the organism’s self-renewal, which is an essential property of life. But what is self-

renewal at the level of the organism, is the cycle of life and death at the level of the recycled cells. In other words, the death of an individual cell is not the opposite of life, but is an essential aspect of life at a higher systems level.

Andreas writes a lot about this important connection between metabolism, the essence of life, and death. Here is what he writes about metabolism:

“In contrast to an object or machine, a body regularly splits off a part of itself in order to survive and incorporates a piece of the foreign world into itself. This is precisely why it is wrong to compare a life-form with a machine: a machine does not metabolize” (p. 57).

“Cells can only survive by casting off their substance and building themselves anew in every moment out of the flesh of other beings” (p. 67)

“The functioning of the circle of life on Earth depends solely on the fact that we all share in the great body of matter and pass through one another reciprocally” (p. 57).

Now, I have also written a lot about metabolism, but never in such a poetic way, and this time I completely agree with what he says. And here he is Andreas on life and death:

“Aliveness must be able to fail, if it is truly alive. Only because of death does life become creative” (p. 50).

“While in the prime of life, every cell is dying a continual death” (p. 56).

“Death is the way in which the living make an offering so that more life emerges” (p. 197).

And finally, here is an interesting observation about the failure of most cultures to understand this essential link between life and death:

“The central misery of all cultures (not just ours) is the denial brought about by our permanent fear of death.... People of all eras have striven for immortality by various means: the worship of omnipresent ancestors in rocks and trees, the eternal life that awaits all true believers, the technological deliverance that will allow the world to be conquered. There has always been a heroic path to immortality. Following this path has always required strict rules that required one to give up the very thing that was supposed to be preserved: one’s own aliveness” (p. 153).

I will leave it at that, and I greatly look forward to our discussion.

Notes on Michael's talk (2017)

Unrequited love corresponds to the emphasis on craving in Buddhism.

People in psychotherapy are unable to change (no structural coupling); cf. Schleiermacher, Husserl, Weber,

Eros is a basic kind of love, deeply rooted in biology. Agape and philia are types of love that require consciousness, i.e. identification with the other, empathy, etc. (elaborate!).