



# Whatever Happened to The Tao of Physics?

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*Hear Fritjof at our Mystics & Scientists conference*

*An historian of ideas traces the development of Fritjof Capra's thinking from the publication of his early bestseller on the parallels between Eastern mysticism and modern physics to his detailed articulation of a new holistic world view which takes advantage of important recent developments in the sciences but remains committed to a deep spiritual vision.*

## The counter-cultural revolution

There is no doubt that *The Tao of Physics* captured the mood of its time. 'Bliss was it in that dawn to be alive, but to be young was very heaven'; Wordsworth's recollection of his experiences in Paris at the time of the French Revolution were mirrored in the sixties and the seventies when the dawning of a New Age of Aquarius was thought to be imminent.



As he tells us in the Preface to his book, Fritjof Capra was caught up in the spiritual ecstasies of that time. He tells the reader how, as he sat beside the ocean one day, he was overwhelmed by a 'beautiful experience' of nature as 'a gigantic cosmic dance', one which he came to see as, not only expressing some of the mystical ideas which at that time were permeating the West, but which were also consistent with ideas currently emerging from modern physics.

The book which emerged in 1975 was an elaboration of this insight. In it he set out to explore the idea that 'the concepts of modern physics often show surprising parallels to the ideas expressed in the religious philosophies of the Far East'. This was not just an interesting jeu d'esprit, but in Capra's view it was an insight into a profound change in worldview that was taking place at that time, one which science had hardly yet begun to comprehend, but which challenged contemporary assumptions and pointed towards a radically alternative social and economic order.

The original book cover informed the reader that the work was a 'stunning exploration' of these parallels, combining the seemingly opposing domains of science and mysticism. But as he himself was the first to explain, this sort of project was not new. He pointed to several leading physicists such as Bohr, Heisenberg and Oppenheimer who had already given voice to it; Heisenberg for example had spoken of 'the relationship between philosophical ideas in the tradition of the Far East and the philosophical substance of quantum theory'. And there had been other similar speculations in the thinking of such figures as C.G. Jung and Joseph Needham.

From Capra's personal and professional point of view, however, the book was a risky enterprise, and there have

inevitably been dissenting voices. There have been plenty of critics ready to dismiss Capra's thesis as on the one hand little more than a set of vague comparisons between mutually contradictory methodologies, and on the other as involving serious misunderstandings of both sides of the comparison. His persistence with the use of bootstrap theory, for example, has been questioned, and some have taken issue with his commitment to an organicist philosophy as contrary to universally accepted assumptions of the natural sciences. In spite of these reservations the book was generally received with enthusiasm and acclaim, and was seen world-wide as an important contribution to serious issues of the time. Several other authors followed in a similar vein, for example Gary Zukav and Michael Talbot. And if you search 'The Tao of' in any on-line book-seller you will discover that the phrase 'The Tao of...' has become a formula for a whole publications genre. Examples include; *The Tao of Fully Feeling*, of *Dating*, *Running*, *Twitter*, *the Dude*, *Microservices*, and many more, including of course *The Tao of Pooh* which has become almost a rival in popularity to its progenitor. I confess to having added to this list, and offer thanks and apologies to F.C. on behalf of us all.

Capra might well have gone on to a lucrative career as a New Age guru, or perhaps as an orientalist scholar, but he chose instead to take up the challenge of elaborating his vision of a new world view and world order, while at the same time continuing to teach, research and publish in his field of high energy physics. Though he was clear that 'science does not need mysticism and mysticism does not need science', he felt drawn towards the idea that the relationship between the two was intellectually and spiritually potent, and that the new physics contained important but as yet unarticulated philosophical and cultural implications. In the final chapter of his book he concluded that we needed not only a new world view but also a radically different social and economic structure, and much of his thought, writing and public speaking during the decades following the publication of *The Tao of Physics* was devoted to drawing out the revolutionary ideas needed to achieve this transformation.

Looking back to the period following the book's publication, his ambitious project must be seen in the context of a palpable reaction in the nineteen-eighties and beyond against the hopes and idealisms of the earlier age. The times they were indeed a-changing, but not in the direction that was hoped for by the advocates of the Aquarian Age. The Age of Universal Peace and Love has given way to the Age of the Universal Turing Machine, and aspirations have shifted from the art of living to the art of getting and spending. This reaction also saw the rise of postmodernism and the rejection of grand

utopian narratives. It experienced too the painful rise of neo-liberal economics which eclipsed the ideals of community and sharing. And the assumptions of reductionism, materialism and mechanism became ever more firmly fixed at the heart of the academy.

In spite of this radical cultural shift, Capra held his nerve, and boldly continued to elaborate in a series of writings, as well as in various enterprises and initiatives, his central thesis. This quest for a new paradigm, as he came to call it, was clearly a project of daunting magnitude. While drawing on many diverse sources, for which he always gave generous acknowledgment, he boldly undertook the task of applying his basic vision to a whole range of intellectual, social and cultural fields.

## The new scientific revolution

In *The Turning Point*, his first major work after *The Tao of Physics*, he adopted a rather different tone and approach from the earlier work. The broad comparisons between traditional Eastern philosophical and mystical teachings on the one hand and recent developments in physics on the other, became less prominent, and in the new work he set out to show how the traditional reductionist, mechanistic paradigm, originating in the work of Descartes and Newton, had outrun its usefulness. That paradigm had certainly exerted a momentous influence, not only on the development of the natural and the human sciences in subsequent centuries but had impacted on the whole range of cultural life, even up to the present time, but by mid-twentieth century was being seriously challenged. The details of his argument can only be indicated briefly here, but it stretched across many fields including biology, medicine, psychology, economics and ecology.

The central theme in Capra's paradigm-transforming enterprise rested, not only on the broad holistic implications of twentieth century fundamental physics but also on developments in systems theory. General systems theory, as developed in the years following World War 2, and primarily evident in living entities, looked at structures in terms of the mutual interdependence of component elements such that the whole structure cannot be reduced to the sum of its parts, and in a way which, in situations of constant dynamic inner and outer change, order and balance are maintained. Capra placed special emphasis on *structures* and *interactions* between elements within a system rather than on the *material stuff* of which particular systems are made, and in this way it was possible to gain a new understanding of whole complex entities ranging from individual molecules and organisms to highly complex phenomena such as social and political systems, and hence for structures containing human, organic and non-living elements. He was able to draw further support for this approach from various sources including the concept of Gaia developed by James Lovelock and Lynn Margulis, and the idea of symbiosis – co-operation between organisms - given new prominence by Margulis; these were both important influences on Capra in his construction of a model of life as involving systemic interdependence.

The application of systems theory was clearly an important step for Capra in building a clear methodological foundation for his thinking, one which linked his argument back to *The Tao of Physics*, but also opened up new resources and possibilities for onward development. These new possibilities arose out of a number of interlinked developments in the sciences. From Capra's point of view these developments can be seen in retrospect as evolving out of and progressing beyond general systems thinking, and by which over the following decades Capra was able to integrate into his new-paradigm thinking a variety of subject matters.

First and foremost these developments included complexity theory. This not only opened up new potentials for the investigation of dynamic, evolving, open systems, but also provided new non-linear mathematical tools for carrying out such investigations. Linked to this was the development of

chaos theory along with fractal geometry. The significance here for Capra lay in the startling discovery that simple deterministic equations can lead to unpredictable complexity and hence to the idea of an open universe where predictability has inherent limitations, and where true novelty and creativity in nature become conceivable.

An important influence on Capra's thinking in this area came from Humberto Maturana and Francisco Varela's concept of autopoiesis. This concept takes the idea of dynamic systems a stage further by seeing living systems, from the cellular level upwards, as self-sustaining, self-organising and self-regenerating. This clearly represented a radical shift away from the concept of living systems as constructed and operating on quasi-mechanical principles. As Capra points out, Kant had already noted that organisms, by contrast with machines, are self-organising and self-reproducing entities, but it now became possible to see this distinction applied in detail to a whole range of phenomena from bacteria to minds.

This advance also led to the conception of life as an emergent phenomenon, namely as generating features which combine lower level properties but are not predictable therefrom, and in a wider perspective as evolving to new and unpredictable levels. Combining A.N. Whitehead's process philosophy with burgeoning interest in the concept of emergence, Capra was led to a view of nature, not only as dynamic and ever-changing – something he also drew from his earlier investigations into Eastern thought - but as involved in a 'constant generation of novelty'. Ideas about emerging levels of complexity and order, as evident in organic evolution for example, enabled him to take a further significant step away from the old reductionist, mechanistic paradigm and to see nature in terms of systemic self-creation, to see creativity as inherent in all living systems.

Moreover he came to realise that this potent cocktail of ideas applies not only to nature but also to the human level, for example in the cultural fields of politics, law and ethics as well as to that of the individual, all of which he began to see as both emergent and self-organising. In the broadest terms, Capra's quest for a new paradigm led from principles relating to the web of biological life towards the human and social world of meaning and mind. It even led to the emergence of intrinsic purpose, a concept usually excluded from mechanistic style thinking except in theological contexts, though Capra was careful to avoid any idea of an extrinsic cosmic goal or purpose.

Emergence, however, is a rather elusive concept, not easy to define or explain, particularly in view of the related notion of unpredictability and the possible conflict with the law of entropy. Capra addressed this issue, and questions about the creation of novelty, by drawing on the idea of dissipative structures developed by Ilya Prigogine. On this view new and emergent events arise at critical moments of fluctuation and instability within a system, far from equilibrium, at the 'edge of chaos'. The problem of entropy is dealt with in terms of dissipative structures which are 'islands of order in a sea of disorder, increasing their order at the expense of the environment.

## Life, mind and spirituality

The original focus for Capra of these speculations was the key question What is life? But as I have suggested this inevitably led him beyond life in general and towards human life, culture and mind. Much of his own creative energies have been devoted to the application of his work in the fields of science to the human world, to its problems and discontents. At one level this has involved a confrontation with the elusive issue of the nature of mind and consciousness. Influenced by ideas originally outlined by Gregory Bateson, his approach was to avoid the ontological question of the so-called 'hard problem' – how can matter produce or link to non-material mind? - as well as the related dilemmas of Cartesian body-mind dualism, and to speculate about the applicability of systems, complexity and autopoiesis theories to the cognitive realm as well as to all other levels of life. This meant, as I indicated, treating mind, not as a thing but as a process, not

as a visitation from another world but as a process of life. And it entailed a view of consciousness as an emergent property of life, arising from but not reducible to the purely biological. And in the shape of 'higher-order consciousness' it pointed towards the human capacity to map and control its internal and external environment.

At another level, Capra's commitment to the issues of human social and political life go back to early days and reflect the idealism of the counter-culture period. This involved a commitment to Green politics, which led in turn to the project of integrating this commitment into his broader philosophical enterprise. In a series of books and public talks Capra argued that since the systems approach to life necessarily involved an integrated, holistic approach to the living world, and indeed its non-living environment as well, it was essential that we should cease to treat the world as a set of dead objects, as an instrument for our utilitarian satisfaction but rather as a quasi-sacred living whole of which we humans are an integral part. Human life should therefore in some way be consonant with nature's own structures which have evolved to sustain the web of life.

The outcome of these developments was a series of proposals for addressing, inter alia, questions relating to planetary sustainability. He argued that the unlimited expansion of human exploitative activity on our planet can only lead to irreversible ecological catastrophe. Deep systems changes are necessary at all levels of society if we are to 'change the game'. Perturbations in the global environment, he points out, can lead either to global disaster or to the creation of a new sustainable life within the web of nature. In Capra's words by way of summary: 'My objective has been to develop a conceptual framework that integrates the biological, cognitive and social dimension of life, a framework that enables us to adopt a systematic approach to some of the critical issues of our time'.

Spirituality remained an important motivating factor for Capra. Eastern elements, especially Buddhist and Chinese Taoist, clearly continue to hold an important place in his thinking, but his dialogues with Father Steindl-Rast indicate an ecumenical outlook. His most recent major work, *The Systems View of Life: A Unifying Vision*, authored jointly with biochemist Pier Luigi Luisi, is presented as a university level textbook, but this does not deter the authors from dealing with spiritual topics. Indeed it boasts a chapter entitled 'Science and Spirituality' in which they make it clear that they are not talking about religion in the narrow sense, but are seeking to show that a purely secular concept of spirituality is not only compatible with modern science and systems thinking, but ought to play a role, along with ecological thinking, in education at all levels. At both of these levels – spirituality and education – the authors insist again on the fundamental vision of the interdependence of all beings, a point at which mysticism, morality, politics and science converge.

In writing this summary of Capra's work since the publication of *The Tao of Physics* I have been aware that while much of the widespread idealism of that period has become dissipated there are many aspects of its project which have been sustained and advanced. As I see it, we have developed a much greater appreciation of the symbiotic nature of our relations with each other and with the natural world, of the importance of conservation, of recycling and sustainability, of global warming and global health, of the opening of minds to world's cultural and spiritual heritage in which we can all share, and to basic issues of human diversity including gender and ethnicity. In these and in many other respects Capra's contributions have been bold, deeply thoughtful, and inspiring.

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