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# The Foundation of Chinese Systems Thinking

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## Abstract

*Whoever wants to know the fruits should never lose eye of the tree bearing them. In other words, the development of systems thinking cannot be understood without taking their cultural context into consideration. This also holds for the development of both Western and Chinese systems thinking. As the Chinese culture fundamentally differs from the Western one, ideas of the nature, variety and history of system thinking in China and the West can thus not be the same. Even Xuesen Qian (1911–2009), father of the 'metasynthesis' system approach,[1] and Jifa Gu, originator of the 'wuli-shili-renli (WSR)' system approach,[2] seem to be unaware of the cultural ground of their intellectual products.*

[1] Xuesen Qian (also known as Tsien Hsue-shen), who worked on the Manhattan Project, is more known as the father of China's space program. The systematology he advocated 'is neither holism nor reductionism, but the dialectical unity of holism and reductionism'. His metasynthesis method 'combines qualitative research with quantitative research, scientific theory and empirical knowledge, natural sciences with social sciences, and macro-research with micro-research. These characteristics enable this method to solve complex problems in open complex giant systems'. Before Ludwig von Bertalanffy, Xuesen Qian, who was in favour with Mao Zedong, also said, 'The traditional division of science and technology departments has not only limited our scientific vision and research scope, but also caused the separation of related disciplines, artificially dividing our knowledge into disconnected parts' (for more details see Yu Jingyuan (2011, 2016). See also URL: https://www.science.org/do/10.1126/resource.2438783/full/calsse_booklet_2019_10_04.pdf. The innovative ideas of Qian were preceded by those of Bogdanov (1980), *Essays in Tektology* (Intersystems, 1980, online); and Şenalp 2021.

[2] Jifa Gu is a leading Chinese operations researcher and systems engineer. *Rénlǐ* (人理) is an important concept in his WSR system approach. It has been developed from Confucianism and emphasizes the necessity of dealing with human relations in systems practice (see Midgley *et al.* 2000; Zhichang Zhu 2021; Li Shenzhi 1999). Good intellectual histories of China are Yu Yingshi (2016) and Ge Zhaoguang (2014, 2018).

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*In this article, the author attempts to explain the cultural-philosophical foundation of Chinese systems thinking, because China seems to fully understand the significance of systems science. The conclusion will be that (a) the Chinese, experts in playing Go, have been systems thinkers from the very outset and (b) Western systems thinkers could learn something of great importance from them. The conclusion will be that (a) the Chinese have been systems thinkers from the very outset and (b) Western systems thinkers of all kinds could learn a lot from them.*

***Keywords:*** *Chinese Systems Thinking, Dào, Lǐ.*

## Dào (道)

In contrast to the ancient Greek, who inhabited a mountainous peninsula with many inlets and were therefore bound to be seafarers who goes out for trade, the ancient Chinese were peasants living in a fertile region in the middle reaches of the Yellow River, far away from the sea. For their existence, the ancient Chinese were heavily dependent not only on each other but first and foremost on their knowledge of nature (particularly the seasons). In such a society, the calculating merchant/trader was distrusted, individualism had little chance to develop, and attunement to nature and social harmony were a *conditio sine qua non*. Everything and everybody were regarded as hanging together with the *Umwelt* and the *Mitwelt*. Harmony, balance was considered to be of primary importance. Balance, implying two entities forming a unity, was considered to be of primary importance. Today also, every Chinese is imbued with the idea of the 'unity of heaven and man' (*tiān rén hé yī*) (Li Shenzhi 1999; Yu Yingshi 2016; Ge Zhaoguang 2014, 2018).

This is probably the main reason why the concept of *Dào* is the most fundamental of all Chinese ideas. Jin Yuelin (1895–1984), the famous author of *Lùn Dào* (on *dào*, 1940), preferred not to translate the word. So did his student Hao Wang (1921–1995), the famous commentator on Kurt Gödel. In the *Great Appendix* to the *Yìjīng*, a work generally denigrated by Western scientists but of crucial importance for understanding China, it is written and emphasized: 一陰一陽之謂道 (*Yīn* and *Yáng*: that is called de *Dào*). In a nutshell, this is system thinking.[3] The word 'system' stems from the Greek word σύστημα (constitution, organized whole, a whole that consists of parts). The words *Yīn* and *Yáng* stand for complementary parts.

[3] In the years that preceded the 'Great Proletarian Cultural Revolution', countering his adversaries, who persisted in saying that 'two combine into one' (合二而一), Mao Zedong maintained that 'one divides into two' (一分为二). Sharpening the opposites, however, he conveniently (and fatefully) forgot that, according to the *Yìjīng*, *Yīn* and *Yáng* are not contradictory but contrary towards each other, a crucial and very important but often overlooked distinction. '*Yīn* contains *Yáng*' (阴含阳), '*Yáng* is part of *Yīn*' (阳分阴) and '*Yīn* and *Yáng* give birth to each other' (阴阳相生).

According to the Chinese, black and white, positive and negative, north and south, east and west, interior and exterior, entrance and exit, input and output, life and death, above and under, high and low, even and uneven, hard and soft, hot and cold, short and long, wet and dry, open and closed, foul and fragrant, empty and full, small and big, day and night, dawn and dusk, light and darkness, demand and supply, debit and credit, space and time, one and many, universal and particular, same and other, necessity and contingency, male and female, part and whole, or individual and community are not antagonistic towards, but complementary to each other, the one going well with, and being intimately involved by the other. Though clearly distinguishable, ship and harbor, train and station, airplane and airport, electrical connector and power point, right hand and left hand, on and off presuppose and, are dependent on, each other. One hand cannot clap. It takes two to tango, or to kiss. *Yīn* and *Yáng* are not hostile against, but implicative of and closely related to, each other; they are mutually not contradictory but contrary. This bi-conditionality is prevalent in nature and should thus be our guide to living in general and to scientific research in particular.

Westerners, who from an early age learned to think binary, have great difficulty with the Chinese biconditional way of thought.[4] Emphasizing the importance of the individual[5] (see Gusdorf 1948; Morris 1972; Lukes 1973; Dumont 1983; Taylor 1989; Gurevich 1995; Ariès and Duby 1999; Siedentop 2014; Rosemont 2015; Freud 1923; Strawson 1959; Ayer 1963; Chatterjee 1970; Morris 1972; Lukes 1973; Frank 1986; Rudolph 1991; Kim 1994; Gurevich 1995; Guttenplan 1994; Triandis 1995; Renaut *et al.* 1997; Ashmore and Jussim 1997; Garrett 1998; Ariès and Duby 1999; Valsiner and van der Veer 2000; Udehn 2001; Wallace 2003; Mathers 2009; Houtman *et al.* 2011; Callero 2013; Barlow 2013; Descombes 2013; Infantino 2014; Zahle and Collin 2014; Siedentop 2014; Gasser and Stefan 2015; Rosemont 2015; White 2017; McIntyre-Mills 2017; Mach 2018; Wallace 2019; Larsen and Buss 2020; Davis 2021; Berns 2022), they prefer to assign to each thing a clearly circumscribed place and to grant each person certain rights according to his/her legal obliga-

[4] Aristotle made the distinction between contradictory and contrary opposition (see Chenyang Li 1993; and the special issue of *Logica Universalis* 2(1) (2008) on the Square of Opposition. URL: http://www.square-of-opposition.org; and https://plato.stanford.edu/entries/square.

[5] See URL: https://en.wikipedia.org/wiki/Self, https://en.wikipedia.org/wiki/Ego_psychology; https://en.wikipedia.org/wiki/Psychology_of_self, http://personality-project.org; https://plato.stanford.edu/entries/identity-personal; https://plato.stanford.edu/entries/self-knowledge; https://plato.stanford.edu/entries/self-consciousness; https://philpapers.org/browse/self-consciousness; https://plato.stanford.edu/entries/methodological-individualism; https://www.apa.org/pubs/journals/psp; https://journals.sagepub.com/home/cap; and https://spa.americananthro.org/ethos. 'Individualism' is a key concept in liberalism, a heterogeneous political-social movement in which individual liberty takes a central position. According to the adherents of Hinduism, ego and reality are identical (*tat tvam asi*). According to the Buddhists, there is no ego at all (*anātman*).

tions. Something is either black or white. In the Western view, grey things (everyday reality!) do not exist. One rides either on the right or left side of the road; riding in the middle of the road (both on the right and left side of it) would not be possible. Day or night, there is no place for twilight. The door is either open or closed, but a door ajar is something they cannot conceive of. They do not realize that switching on the light, one uses both the positive and negative poles of the electric wire. Nor are they aware of it that spring and fall are different parts of one and the same cycle. Westerners adhere to the principle of bivalence stating that every declarative sentence is either true or false. They neglect the obvious fact that everyday language is not restricted to declarative sentences. A declarative sentence does not ask a question, give an order, or express an emotion. The principle of bivalence is also called the law of the excluded middle (*Tertium non datur*) stating that there is no other possibility for declarative statements than being either true or not-true. In terms of set theory, sets A and B are either disjoint (*e.g.* {1, 2, 3} and {4, 5, 6}) or not disjoint (*e.g.* {1, 2, 3} and {3, 4, 5}). In the latter case, A is partly or wholly a subset of B, or the other way around. For example, set {1, 2, 3} overlaps, or is partly a subset of, the set {3, 4, 5}, and set {3, 4, 5} is wholly a subset of the set {2, 3, 4, 5}.

The Chinese, taking their cue from nature, think differently. Grey is to a certain degree white and to a certain degree black, but white is in no way a subset of black, or vice versa. Black and white should be epistemologically distinguished but not be separated. They are not alternatives. They are not excluding but complementing each other, like male and female, winter and summer, high tide and low tide. 'If *Yīn* and *Yáng* are obliterated, there would be no means of seeing change' and change is, according to the Yìjīng, the undeniable hallmark of everything. 'Πάντα ῥεῖ' (everything streams), Heraclitus said.

The importance of bi-conditionality should not be underestimated. It does equal justice to both sides and expresses no preference. It is thus less forceful and more objective, in accordance with reality. A disjointed speech or piece of writing, having parts that are not connected with each other, is hard to follow, but a coherent one is easy to understand. Obviously, not only the parts but also their interconnectedness is important for comprehending, which is an act of intelligent behaviour. A team that performs disjointedly is not a team worthy of its name. Mountains are different from, but not hostile against, or irreconcilably opposite to, valleys. Once a common ground is found, even declared enemies can shake hands and make it up to each other. Compromising (said to be the essence of Chineseness) is the art of reaching mutual agreement, a subject that should interest game theorists. Having impregnated his pencil with ink (two seemingly totally different things), the calligrapher draws a particular line. Following the Way and attuning to the *Dào*, he creates order out of chaos.

In China, calligraphy (the art of giving form, of in-forming) is considered the queen of arts. It would be interesting to compare Chinese, Japanese, Kore-

an, Mongolian, Tibetan, Indian, Persian, Arabic and Western calligraphy, and to investigate what calligraphy, writing (poetry), painting, architecture, sculpture, dance (ballet) and music have in common. The Chinese regard poetry as invisible painting and painting as visible poetry, the former focusing on process, the latter (like architecture and sculpture) highlighting pattern (configuration). A process is the concatenation of configurations unfolding in time. Dance and music are performing arts, the former is a purposefully selected sequence of human movements, the ordering in space; the latter is sound organized in time. Pattern formation or system building in space and time is the very essence of Chinese art.

Roads can be found everywhere, but it is impossible to find only one of their sides. The complementarity view belongs to the ontology of relations rather than to the ontology of things. The so-called Internet of Things, which is an extension of Internet connectivity, seems to lean towards the latter, while neglecting the former. The crux of relational or correlative thinking (as distinct from causal thinking) is its focus on in-betweenness. Chinese culture and art are characterized by it. The Chinese believe that reality originates in nothingness (*wú*), that there is no movement without stillness, and that being, in whatever form, rises from non-being. In their view, it is not something but not-something (nothing) that generates and connects everything, and it is chaos on which order is based. The spokes of a wheel concentrate on, and come together in, its center, and yet it is the motionlessness of the hub that makes the turning of the wheel possible. Unity is the essence of diversity. It is 'the great Interdependence of all differences' (*Yìjīng*). Everything and everybody begins and ends in it. No differentiation without integration and no integration without differentiation.[6]

The Gospel of John opens with the famous declarative sentence. 'Εν ἀρχῇ ἦν ὁ λόγος, καὶ ὁ λόγος ἦν πρὸς τὸν θεόν, καὶ θεὸς ἦν ὁ λόγος' (in the beginning was the Word, and the Word was with God, and the Word was God). The Chinese do not think so. In their view, *nothingness*, *silence* was the very beginning, the absolute silence, broken by the word. As written in the *Dàodéjīng* (Ch. 1), '無名天地之始, 有名萬物之母' (without-name is the beginning of heaven and earth [the universe], with-name is the mother of ten thousand [all] things). Or in Chapter 40, '天下萬物生於有; 有生於無' (all things under heaven spring from being; being emerges from non-being). For example, pots are made of clay, but their usability resides in the not-being of clay. *Wú* (non-being), the unnamable is the source; *yǒu* (being), the namable is the manifestation. Existence is preceded by non-existence. This is the fundamental difference between the Christian and Chinese way of thought!

[6] In mathematical analysis, the connection between differentiation and integration is fundamental. However, mathematics is based on Boolean, *i.e.* binary logic.

China's philosophy of nothingness is different from what some modern physicists conceive of as the void. In the Chinese view, reality cannot be grasped; it cannot be caught by any formula whatsoever; it cannot be named (put into words). Trying to do so is like grasping dry, loose sand: it escapes between the fingers. Imagine a straight line connecting point A (on the left side) and point B (on the right side). Somewhere on the line (right at the middle!), it is impossible to say whether one leans more to any of the sides, whether one gravitates more towards A or towards B, but it is after (not at) this special, absolutely neutral point that A and B *start* being and *become* what they really are: endpoints, *i.e.* points that can be called/named A or B. In the opposite direction, ceasing to be endpoints and thus gradually losing their identity status, A and B end up in *wú*, where no identity exists. Moving further on the line, A and B, having lost their identity, gradually change or transform into B and A respectively. When the line between A and B is a hanging one, like a necklace, the very lowest point is where the line does not go up and is absolutely neutral to either A or B.

Whereas Western scientists are imprisoned by binary thinking and only consider two possibilities ('yes' or 'no', 'on' or 'off', 'true' or 'false', 'black' or 'white'), their Chinese colleagues think correlatively and complementarily, not exclusively but inclusively, thus more harmoniously and more realistically. They make room for a third possibility (*tertium datur*!). While Western scientists are interested in the application and practical use of natural, negative, whole, rational, irrational, real, complex and even hyper-complex numbers, their Chinese counterparts have the ingrained habit of paying attention to the root of all roots, to zero, to the numberless and nameless, to the ineffable, to the Absolute, that is to say, to *wú*. Nothing is, by definition, not anything (in Hinduism: *neti, neti*). '*Wú'* is a word referring to the character 無, which is a graphic symbol representing nothingness, *i.e.* standing for something that is invisible, unsayable and inconceivable. Nothingness is referred to by the word *wú*, but cannot be conceptualized, or thought about. Talking about nothingness is thus essentially impossible. *The Chinese think relationally and see things pattern-wise and process-wise at the same time*, *that is to say*, *matrix-wise.*[7] Rather than considering things to be pieces that should fit together, they think of fragments constituting completeness, of parts that belong to a whole.

The Enlightenment, which marked the transition from the dark Christianity-dominated Middle Ages to Modernity, has been much eulogized in the West, but the light may still have to come – from the East? If that happens, the old saying *Ex Oriente Lux* will prove to be right.[8] After modernism came postmod-

[7] This comes close to what modern natural scientists call 'field' (see Amoroso *et al.* 2015).

[8] For a more in-depth treatment of the concept of *Dào* see Tang Junyi 1973; and Zhang Liwen 1994.

ernism, the mode of discourse in which epistemic certainty is rejected and reality is problematized (see Cahoone 2003).

## Lǐ (理)

The word *lǐ* has many meanings, but its reference to pattern or structure seems to be common to all of them. This is not surprising, because the original meaning of *lǐ* is the natural veins of a piece of unworked jade according to which a professional carves the gemstone. The word *lǐ* refers to the jade's intrinsic striations.[9]

The word 'structure' refers to a number of relations taken together. The concept of relation, being fundamental to mathematics, is extremely difficult to define. According to Bertrand Russell (1872–1970), it seems to be impossible to make any statement of what a relation is without using the notion of relation in doing so. Binary relations are particularly important. Concerning the relations between two entities, they can have different properties. Typical of the Western way of systems thinking is the conceiving of entities as being absolutely separated. A thing or person (A) may be somehow related to another thing or person (B), but is not thought of as being the same as, or identical with, B in any way whatsoever. A man (individual) is a man and a woman (another individual) is a woman; 'on' is not 'off', *Tertium non datur*, full stop.

The Chinese think there is a third possibility. To them, entities that are absolutely separated do not exist, for there is 'Great Interdependence' (*Yìjīng*), 'The ten thousand things are all one' (Zhuangzi), 'The ultimate is the one' (Wang Bi), 'One is all and all is one' (Zhiyan), 'There is nothing isolated' (Zhu Xi) and 'In the whole, all is one and one is all' (Feng Youlan). The Chinese way of systems thinking is not reductionist but holistic. When the *Great Appendix* to the *Yìjīng* states that *Dào* means both *Yīn* and *Yáng*, it speaks of a universal structure, of an all-embracing system, of an eternal pattern. The one consists of the many and the many constitute the one. Monists and pluralists have thus more in common than they usually think they have. Parts and whole are inextricably interconnected. This can only be the case, when *Yīn* and *Yáng* are not conceived of as absolutely separated, that is to say, when they are not considered contradictory and irreconcilable but contrary and complementary, *Yīn* containing *Yáng*, *Yáng* being a part of *Yīn*, and *Yīn* and *Yáng* giving birth to each other. *Yīn* and *Yáng* together form *Dào* (also referred to as the One), the circle being the symbol of it. They may differ to a certain extent, or gradually, but they never exclude each other. *It is not a matter of 'either-or'* (Du *et al.*

[9] For more information see URL: https://www.gemsociety.org/article/jadeite-jewelry-and-gem stone-information. For pattern *formation* see Benedict 1935; Sekimura *et al*. 2003; Ball 2009; Gulliksson 2015. See also URL: https://iapr.org/; http://www.scholarpedia.org/article/Category: Pattern_Formation. For pattern *recognition*, see URL: https://iapr.org. According to the Chinese, in literature (*wénxué*) worthy of this designation, *lǐ* (or *wén*) is manifested (see Liu Hsieh 1983).

2007: 9) *but of 'both-and'*. Indoctrinated in dialectical materialism (a philosophy of science, history, and nature developed in Europe and based on the writings of Karl Marx and Friedrich Engels [see Conze 1932; Mao Zedong 1937, 1957; Lefebvre 1940; Wetter 1952; Jordan 1967]), Xuesen Qian and Jifa Gu do not seem to be aware of this great idea, which can be traced all the way back to the *Yìjīng* (see note 3). The same holds for Professor Fenrong Liu, co-director (with emeritus Professor Johan van Benthem) of the Tsinghua University – University of Amsterdam Joint Research Centre for Logic[10], as well as for Jana Rošker, an author of *Traditional Chinese Philosophy and the Paradigm of Structure* (Lǐ 理) (2012) and contributor to the famous *Stanford Encyclopedia of Philosophy*.

While the whole appears through the parts, the parts are identified in the whole. Form emerges from interplay, unity from duality, the one from the many. '*E pluribus Unum*' as well as '*Plures in Uno*'. The whole is not something already there. Being a continuous process, it gradually reveals itself. The trail or the path originates from going it, from uniting what seems to be separated, from joining left and right together, from combining the parts to a whole. The brook or the river starts flowing as soon as the water finds its way. The waves are momentarily distinguishable from and yet belong to, and are one with, the ocean (see Bortoft 2012; Verschuuren 2017; for mereology, the theory of parthood relations, see Burkhardt *et al.* 2017; Cotnoir and Varzi 2021).[11] *Dào* and *lǐ* are interchangeable. Therefore, the character for *lǐ* in the beautiful saying of the *Yìjīng*, 理一分殊 (the pattern is one, the parts are many [see Lee 2012]) could be replaced by the character for *dào*. According to Zhu Xi (1130–1200), a leading philosopher during the Song dynasty, *dào* and *lǐ* are 'the highest categories, nature's roots and society's most fundamental principles'.[12]

Chinese steeped in the *Yìjīng*-worldview conceive of a process as being more than a time series of happenings. They view processes systemically. To them, the diachronic and longitudinal is compatible with the synchronic and transversal. The warp (*zòng*) and the weft (*héng*) form the fabric of life, indeed the fabric of the cosmos the continuous changing of which we must learn to fully understand (*tōngbiàn*).

The Western mindset is different. Usually, the words 'system' and 'process' are loosely interchanged. Systems, however, differ from processes, and a system diagram (the visual model of a system, its components and their interrelationships or interactions) is not the same as a flowchart (which only repre-

[10] URL: http://tsinghualogic.net/JRC.

[11] See URL: https://plato.stanford.edu/entries/mereology; https://philpapers.org/s/mereology.

[12] For a more in-depth treatment of the concept of *Lǐ*, see Zhang Liwen 1994; and Chen Jiaying 2011. See also URL: https://doi.org/10.1017/S036250280000047x; https://unizarfilosofia.wordpress.com/2010/10/31/la-notion-de-li-dans-la-pensee-chinoise; http://www.scholarpedia.org/article/Pattern_formation and https://iapr.org.

sents a workflow or process). A system view of an organization differs from a process view. Systems lend themselves to synthesis, processes to analysis. Lilian Gilbreth (1878–1972) knew the difference between synthesis and analysis, between systemic and systematic thinking (Newman and Elliott 2018). Systems emerge and the properties of an emergent system are irreducible to the properties of the parts forming or constituting the system.[13] For example, the properties of an organism cannot be reduced to the properties of the cells making up the organism and – contrary to what modern neuroscientists want us to believe – the properties of the human mind are irreducible to the properties of the physical parts without which no brain could function. In the West, a process is nothing but a chain of consecutive happenings. The systemic and systematic description of these happenings is the concern of historians – a task they miserably fail to accomplish.

I do not know of any Western historian who approaches his/her *explanandum* (episode or era to be explained) in a truly systemic way, *i.e.*, a historian who takes the problem of time seriously into account. The things, events, human beings and actions he/she deals with are constantly changing, while taking place somewhere in changing, but no historian has thus far been able to explain environmental change[14] and to answer the vexed question as to whether change is discrete or continuous. Even 'the present' is a problematic concept, for the present, being the end of the past, is not part of the past and, being the beginning of the future, is not part of the future.[15] Despite the media hype about developments in complexity and network science, artificial intelligence, machine learning and data mining technology, the study of complex and dynamic systems is still in its infancy.

The fundamental difference between the Western and Chinese way of (systems) thinking can be illustrated by the symbols † and ☯. In contrast to the Christian cross, the *Yīn-Yáng* diagram cannot be divided into two symmetrical halves. The diagram is a chiral configuration, the two parts of which are isomorphic without mirroring each other. In contradistinction to the similar left and right half of the cross, *Yīn* and *Yáng* are asymmetrical to each other, like the left and the right shoe or glove. *Yīn* and *Yáng* are mutually complementary. The two belong together, involve each other and constitute or form an entity.

[13] URL: https://iep.utm.edu/emergence; https://plato.stanford.edu/entries/properties-emergent; https://www.d-iep.org/diep, http://www.scholarpedia.org/article/Contextual_emergence; https://philpapers.org/s/emergence. For the related concept of self-organization see URL: http://www.scholarpedia.org/article/Self-organization; https://philpapers.org/s/self-organization.

[14] According to Marshall Sahlins (1930–2021), the late nestor of American cultural anthropologists, history is nothing but geography in time, while geography is only history in space. This insight has still to sink in with many area or era students.

[15] The role played by space and time in human experience is a hot issue in the social sciences (see Ingold 1997). See also URL: https://doi.org/10.1016/S0962-6298(96)00097-2.

Like male and the female; they cannot do without each other and their wonderful unity results in the emergence of new life. *Yīn* and *Yáng* together generate the universal change. This is the natural order, the *way* (*dào*) to be followed. Going against the flow is disturbing the order of things and therefore, must be condemned morally and legally. Though *Yīn* and *Yáng* can be distinguished, they will never be separated. They depend on each other and borrow their existence from each other. They differ from each other and yet are the same, and vice versa. The parts constitute a whole, which consists of parts. This basic idea permeates the fascinating culture of the Chinese, their arts, their medicine, their cuisine, their whole lifestyle. Sweet and sour are blended together, forming a delicious dish. Whereas the Christian cross symbolizes the victory of Jezus over death (a sheer impossibility, for we are all dying as soon as we are born), the Yīn-Yáng diagram suggests – more realistically, I think – an eternal cycle, with neither beginning nor end.

The West thinks to be able to explain something by looking at the parts; China thinks to be able to make something clear by taking a look at the whole, by asking attention for its space -, time -, community - and history setting. Being caught in division and fragmentation (the curse of liberalism!), and clinging to reductionism, the West fails to be realistic. Biologists dramatically illustrate this. Contemporary Darwinism reduces organisms to genes. However, the real entity, the whole organism is sacrificed. Genetic reductionism does not take into account the emergence and development of the whole organism. Organisms have disappeared as real entities from biology, which is a fundamental scientific error. Brian Goodwin (1931–2009) was the first to point out this error in his book *How the Leopard Changed Its Spots: The Evolution of Complexity* (1994; see also Ruse and Travis 2009; Scott 2007; Kauffman 2019).

Being able to make epistemological distinctions does not mean that the reality, of which we are a part and – mystery of all mysteries – from which we are apart, is ontologically divided. Scrutinizing a leaf of a tree, we risk not seeing the tree, and examining a tree, we are in danger of not seeing the wood.

*The West tends to zoom in and to exclude, and China tends to zoom out and to include.* As, according to the Chinese, in and out (like right and left, above and below, or black and white) are not contradictory and mutually excluding but contrary and mutually inclusive, however, the Western and Chinese approaches to (complex) systems may one day meet each other, making the world a better place to live. Oscar Wilde once said, ‘Classicism is the subordination of the parts to the whole; decadence is the subordination of the whole to the parts’. In his great book *From Dawn to Decadence: 500 Years of Western Cultural Life* Jacques Barzun (2000) makes abundantly clear that we are living in a completely decadent world.

## Conclusion

Western system thinking emerged from reductionism, a way of thought closely related to individualism (and to liberalism). Chinese system thinking emerged from holism, the central message of the first Chinese Classic, the *Yìjīng*. Holism is closely related to collectivism (and socialism). Reductionism and holism should and could be combined, for whereas parts are by definition parts of a whole, there can be no whole without parts. Whoever wants to compare Western and Chinese system approaches should be aware of the fundamental difference between the Western and Chinese culture. He/she should sort out the fruits according to the trees from which they come.

Systems science is currently a hotchpotch of confusing ideas, theories and methods. There are various reasons for this deplorable situation:

1) Insufficient awareness that systems are sets (collections of things), while sets are not necessarily systems (collections of *connected* things).

2) Insufficient awareness that epistemic/cognitive issues are closely related to, but definitely different from, metaphysical/ontological subjects which in turn are to be clearly distinguished but certainly not separated from the topics linguists and philosophers of language are concerned with.

3) Insufficient awareness of the gap between natural and cultural sciences; going from the study of physical systems to the study of biological systems is making a giant step, but going from the study of biological systems to the study of systems involving the immeasurable and unfathomable human mind is making a step that is even bigger. Insufficient awareness that there are two kinds of order: natural, endogenous or spontaneous orders on the one side and man-made, designed or engineered orders on the other side. These orders can be combined and when combined, are inextricable (*e.g.,* a company, a city, and a country).

4) Insufficient awareness that systems science is but one of the *formal* sciences, which constitute a system sorely neglected by systems scientists but are worth to be investigated as part of the ever-growing system of sciences consisting of many branches and their sub-branches.

5) Insufficient awareness that the *formal* sciences (mathematics, logic, statistics, computer science, systems science) have something in common (namely the critical research of structures or forms)[16] and must be distinguished from the

[16] Logic, from which metascience (also known as philosophy of science) branched off, constituted originally a trio (with epistemology and metaphysics). It is divided into several fast developing subdisciplines and becomes increasingly formalized. On should not confuse it with argumentation theory (also known as informal logic). Like mathematics, statistics, computer science and systems science (fields of research which are fast spreading out over many sub-fields), logic is subjected to historical and philosophical investigation. For metascience, see, *inter alia*, the *Minnesota Studies in the Philosophy of Science* (1956ff), the *Boston Studies in the Philosophy of Science* (1963ff), the *Journal for General Philosophy of Science* (1970ff) and the book series *Handbook of the Philosophy of Science* (2006ff). In addition, see URL: https://philsci.org;

*not*-formal sciences (physical, biological, human and social sciences). Thus, systems scientists should be well informed about the latest developments in other formal sciences, without tacitly claiming to be an expert in any of the fields concerned. Writing about systems is one thing, but writing about systems as intimately related to connected processes (dynamically changing systems) is quite another thing altogether.

It is very important that systems scientists have a standard and generally accepted model of whatever thing they happen to investigate. In the present jungle called systems science, we find scientists focusing on different kinds of systems: physical, chemical, biological, environmental, demographic, political, legal, military, economic, financial, educational, scientific or technological systems. Paying exclusive attention to one group of systems, they develop their own jargon, theories and techniques, forgetting to abstract from the subject at hand. They investigate individual trees but do not see the forest in which the trees grow. Each systems scientist stays in his/her bubble, compartment or faculty; nobody rises above the rest, nobody stands 'au-dessus de la mêlée'.

The vast and fast-developing field of systems science should be understood as including but not being limited to systems theory, system dynamics, systems engineering, knowledge management studies, organization studies, operations/operational research, cybernetics, control theory, complex systems studies and network science[17] but their cultural context should never be forgotten for each thing gets full meaning only in a particular setting, against its cultural-philosophical background, as parts are always parts of a whole. In the words of Murray Gell-Mann (1929–2019), co-founder of the highly prestigious Santa Fe Institute, scientists should take 'a crude look at the whole' (Miller 2016).[18]

I hope to have led horses of different breed to the river, but drinking water is surely something they have to do themselves. In my view, the water coming from the *Yìjīng* is the purest of the purest. Western 'systems seekers' such as Michael Jackson, Gerald Midgley, Derek Cabrera, Dave Snowden, Yaneer Bar-Yam, John Miller, Brian Arthur, Eric Beinhocker, Joshua Epstein, Doyne Farmer, Melanie Mitchell, Stefani Crabtree, Marten Scheffer, Stephen Thurner,

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https://philsci.eu; https://iep.utm.edu/category/s-l-m/science; and https://plato.stanford.edu/contents.html (fill in: philosophy of science). For argumentation theory, which deals with the effectiveness or plausibility (rather than the validity) of an argument, see Marta Spranzi 2011; van Eemeren *et al*. 2014; MacDonald 2017; Herrick 2019; Kornfield 2021; and the journals *Argumentation and Advocacy* (1964ff), *Informal Logic* (1978ff), *Argumentation* (1987ff), *Cogency* (2009ff), *Argument & Computation* (2010ff) and *Argumentation in Context* (2012ff). See also the book series *Argumentation Library* (1999ff) and *Argumentation in Context* (2009ff). URL: https://cf.hum.uva.nl/issa; http://ilias-argumentation.com; and https://iep.utm.edu/argument.

[17] All these disciplines overlap or, relate to, each other and there is an extensive and growing literature on them.

[18] See URL: https://www.santafe.edu.

Geoffrey West, David Krakauer, Albert-László Barabási, Gary Metcalf, Ray Ison, Gianfranco Minati, Ricardo Hausmann, Wolfgang Hofkirchner, David Byrne and Carlos Gershenson could learn a lot from this amazing, almost forgotten ancient book. It opened my eyes how to distinguish between reductionist and holistic thinking (On-Cho Ng 2008; Smith 2012; Redmond and Tze-ki Hon 2014; Dajun 2019; Sung Kok Leong 2021; Wai–ming Ng 2021).[19]

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[19] See URL: https://plato.stanford.edu/entries/chinese-change; https://doi.org/10.1080/02549948.2020.1831263; http://www.hermetica.info/YixueBib.htm. If I were in the position to instruct, I would immediately order the translation and professional annotation of two monumental works: (a) Lin Zhongjun2008; and (b) the unsurpassed *Zhōnghuá Yíxué Dàcídiǎn* (great Chinese dictionary on *Yìjīng* study) (2008), compiled, under the leadership of Professor Cai Shangsi, by dozens of Chinese *Yìjīng*-experts supported and supervised by a team of advisors (among them Professor Chung-ying Cheng). Research into the *Yìjīng* should not be conducted by a loose group of philologists but by a tight team of experienced, dedicated and internationally recruited scientists willing to collaborate interdisciplinarily and able to read classical and modern Chinese.

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