

Social relations: Building on Ludwig von Bertalanffy

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Abstract

Ludwig von Bertalanffy did not leave us a legacy of a social systems theory. Nonetheless, reconstructing his general approach to systems provides us with several ideas on how to build a theory of social systems. The concept of social relations easily connects to Bertalanffy's concept of relations of organization. His way of thinking underlines that social relations, as any relations of organization, are unobservables that long for theoretical means of understanding. His conception of the world would assign social relations a special place in a hierarchy of processes internal to a social system—they represent the whole of the system that nonetheless emerges from the interaction of the actors as parts thereof. Last but not least, his world view would orient us towards an organization of social systems in which the dialectic of social relations and actors balances unity and diversity as an Ought. These three main ideas of Bertalanffy offer system theoretical pillars that can inspire current social theory.

KEYWORDS

antagonisms, commons, social theory, structure and agency, unity through diversity

1 | INTRODUCTION

New attention is being given to Ludwig von Bertalanffy's scientific work, in particular, to the general system theory (GST). Of special interest with regard to that paper is the growing engagement being shown by the social sciences and humanities. GST is understood here as the label that defines the framework and research programme of Ludwig von Bertalanffy, whose ambition was to establish a general theory of systems—a collective endeavour with contemporary colleagues and those who would follow. GST was clearly devised as a role model for transdisciplinarity, which as such has consequences for social and human sciences as well. The growing attention by these disciplines is remarkable because GST is not mainstream.

The focus of the present paper is twofold. On the one hand, it highlights certain forgotten GST insights that are relevant for the social sciences or that have not yet made their way into the common body of academic knowledge (even if—or precisely because—they parallel insights of other approaches). On the other hand, the paper illustrates what elaborations of social science positions can be achieved based on GST and their usefulness in solving both academic and real-world problems. This contribution concentrates on delineating three crucial issues and is not a comprehensive review of social theory with respect to GST.

Any scientific undertaking can be characterized according to how it meets the following three levels of preconditions: the level concerning the tools, the level concerning the scope, and the level concerning the aims

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of the undertaking. On the most basic level, tools are provided by (a) methodology, which is the most fundamental precondition. Methodology is a framework of knowledge already gained, consisting of systematic procedures, involving instruments, to produce new knowledge that provides an understanding of how real-world causations function. Such an understanding includes already (b) theory on a next level. Theory is necessary to ideationally reproduce the objects that make up the scope of investigation, segments of the so-called real world. Theory does so based on generalizations that themselves are not observable but testable models. Those models inform the practice on the top-most level on which (c) technology is applied. Technology is any procedure or means that functionalizes the causations modelled, designs the real world, and transforms it from one state to another to solve real-world problems, which is the ultimate aim.

A general theory of systems as devised by Bertalanffy cuts across all three levels. According to them, the following tenets can be identified that are pertinent to his ambitions. These tenets signify the paradigmatic character of his approach and deserve elaboration: (a) regarding methodology—a new way of thinking as a novel tool available to scientific frameworks that does justice to complexity and rejects reductionist or holistic monism as well as the arbitrariness of dualism; (b) regarding theory—a new conception of the world that comprises evolutionary phases and emergent levels of organization, which introduces a different scope to scientific models; and (c) regarding technology—a new *weltanschauung* (world view) that elevates “unity through diversity” to the supreme principle of the organization of any system, thus introducing a different aim of scientific design.

These GST tenets have implications for social sciences, that is, for framing, modelling, and designing social relations. These are discussed below one by one. All three sections present some of Bertalanffy's thoughts, provide an interpretation that helps illuminate their importance for social sciences, and make reference to some compatible elaborations based on Bertalanffy.

2 | INTEGRATION

Let's start with Point 1—the new way of thinking—and recall Bertalanffy's historical achievement. He succeeded in reconciling the contending strands in biology, namely, of Mechanicism, that is, the reduction of biological phenomena to laws of physics, and Vitalism, that is, the belief in mystic forces governing the realm of biota. In doing so, Bertalanffy made use of a thought framework that anticipated the “complementarism” that was claimed by system theorists Robert L. Flood and Michael C.

Jackson (Flood & Jackson, 1991) for a critical application of their System of System Methodologies. This was characterized by Wendy Gregory (1996) as “discordant pluralism,” because this framework turned out to be “not a relativistic chaos of unrelated factors, but a dialectical model” (Jay, 1984, p. 15, cited in Gregory, 1996, p. 54). “Complementarism” means that “different perspectives and systems methodologies should be used in a complementary way to highlight and address different aspects of organizations, their issues and problems” (Jackson, 2003, p. 285). It does not, however, mean that anything goes. “Discordant pluralism” means to accept “a need for debate about what are ‘good’ arguments and what are not, and for discussion about how we can choose between different positions that are conflicting” (Gregory, 1996, p. 54). The question of different perspectives is framed “in a way that recognizes the legitimacies of each position” involved. It “is a third perspective through which the legitimacies of each value system can be brought together in a critically systemic discourse” and such a constellation “may legitimately eliminate elements of otherness that have been identified as illegitimate” (Gregory, 1996, p. 55).

This is exactly how Bertalanffy dealt with the controversy in and about biology of his time. Namely, he scrutinized the opposing positions and integrated the justifiable demand of Mechanicism, namely, its commitment to a scientific approach, with the justifiable demand of Vitalism, namely, its antireductionism. At the same time, he discarded their improper demands, namely, the mechanistic demand for reductionism and the vitalist demand for mysticism.

How did Bertalanffy achieve that? He postulated that the organization of substances makes the difference between life and nonlife and not the substances as such, if any.

Bertalanffy theorized “organizing relations” that unite substances into systems (Bertalanffy, 1932, p. 81—my translation). The properties and behaviour of a system cannot be explained by a “summation” of the properties and behaviour of the parts when investigated independently from the system. In a system, the behaviour of the parts depends on how they are related and cannot be predicted in advance. Although a sum can be put together gradually, a system is given with its parts and their relations at one blow. Bertalanffy called those relations the “systems law” (Bertalanffy, 1932, p. 98—my translations). Thus, the fundamental characteristic of life is its “organic wholeness” and requires a new research method—which he termed an “organismic biology”—and a new way of explanation—which is a “systems theory of life” (Bertalanffy, 1932, p. 80—my translations), a term Bertalanffy had already introduced earlier

(Bertalanffy, 1930/1931). In doing so, he claimed the establishment of “theoretical biology,” something that was missing at that time and would fulfil the necessary completion of life sciences (Bertalanffy, 1932, p. 25—my translation). He also referred to arguments of the British biologists Joseph Henry Woodger, John Burdon Sanderson Haldane, and Joseph Needham (Bertalanffy, 1932, pp. 93, 50, VI–VII).

Importantly, by introducing the system concept, he already paved the way for a general theory of systems beyond organismic systems of the biotic realm. According to his general approach, organizational relations—systemic relations—differ from case to case. The system concept presupposes the concept of organizational relations. Without conceiving them, no system can be conceived. Accordingly, these relations integrate the elements of a system, and they do so in a specific way, which makes the systems comparable with, and distinguishable from, each other at the same time: You can look for organizational relations in any system, and in each system, the organizational relations will look different.

Bertalanffy's key quotation in English (though focusing on the question of organisms as kinds of systems) stems from a publication nearly 20 years later and reads as follows (Bertalanffy, 1950, pp. 134–135):

As opposed to the analytical, summative and machine theoretical viewpoints, organismic conceptions have evolved in all branches of modern biology which assert the necessity of investigating not only parts but also relations of organisation resulting from a dynamic interaction and manifesting themselves by the difference in behaviour of parts in isolation and in the whole organism.

The key point here is that Bertalanffy's turn towards relations of organization is a theoretical issue. “Science is not a mere accumulation and catalogue of facts. It is a conceptual order we bring into facts” (Bertalanffy, 1953b, p. 238). Bertalanffy emphasized the difference between description and explanation, between “perception” and a system of concepts. Only the latter puts science in a position to deal with “laws” and makes theory indispensable for science (Bertalanffy, 1932, pp. 22–25—my translations). The relations of organization in a system—though endowed with the properties of having been caused by a dynamic interaction of the elements of the system and of exerting causative power on the behaviour of each element in which the relations manifest themselves—are not observable, in contrast to the dynamic interaction or the behaviour of the elements. These relations need to be construed theoretically, and they are necessary in

promoting understanding and explaining the empirical data of interaction and behaviour—data that would be senseless without interpretation in the light of organizational relations. One cannot conclude from empirical data on theoretical knowledge in a deductive way. Once certain organizational relations have been hypothesized; however, the construct can be corroborated by facts.

And this is exactly the situation we find in sociological and overall social science research investigating social systems. In social systems, the theoretical construct that specifies organization and order—completely in line with Bertalanffy even if theorized independently—is known as social relations.

Social relations, however, might be conceived in different ways. In order to properly apply the systems perspective, social relations must not be conflated with social interaction or human behaviour and have to be conceptualized as being different. At the same time, social relations need to be reconnected with interaction and behaviour. Accordingly, the application of systems thinking should work as attempt to integrate agency with structure and to reconcile ideas that overemphasize the first aspect with those that overemphasize the second aspect. Both need to cut back their one-sided claims. Systems thinking need not be engaged with one side exclusively, as frequent objections to that approach wrongly contend. It can do justice to both sides—and taking Bertalanffy's stance seriously, it needs to do justice to both sides. Structure shall not be reduced to, or projected onto, agency, nor shall agency and structure be unrelated differences. “Social relations are, so to speak, that which is essential for behaviour, that is, what is common because it is necessary, and may be labelled ‘lawful’ in this sense. Social relations appear in concrete behaviour” (Hofkirchner, 2015, p. 99).

Such an approach has, in fact, been pursued by system theorists such as members of Ervin Laszlo's General Evolution Research Group, Robert Artigiani (1991), by representatives of Critical Realism, in particular, Margaret S. Archer (Archer, 1995, 2003, 2007, 2010, 2012) and her project group on Social Morphogenesis at the Centre for Social Ontology, and workers departing from U.S. sociologist Walter F. Buckley (1967), including the economist Tony Lawson (2013) and the relational sociologist Pierpaolo Donati (Donati, 2011; Donati & Archer, 2015). The circle includes academics that can be subsumed under the label Emergentist Systemism (Wan, 2011) such as Mario Bunge (2003, 2012) or Wolfgang Hofkirchner (2013b, 2014a, 2015, 2016, 2017). Many sociologists also fit in here; even if they do not explicitly share a systems approach, they have nevertheless contributed with important insights to such a framework (e.g., Alexander, 1995; Giddens, 1984; Mouzelis, 1995; Reckwitz, 1997).

Thus, lesson number one that we can learn from GST for framing social systems is that theorizing social relations needs to build a bridge between subjective approaches, which take the agency of the social actors as their unique point of departure, and objective approaches, which tend to hypostatize structural factors. Bertalanffy's integrative thinking shows the path to answering the fundamental question of sociology—how to relate agency and structure.

3 | EMERGENCE

The epistemological tenet of Bertalanffy's GST is to make use of theoretical insight to produce new knowledge: The priority of theory is to be turned into, and applied as, methodology.

As to Point 2, Bertalanffy's theoretical focus on organization clearly makes systems distinct from each other and brings forth evolutionary levels. This posits a new picture of the world. Bertalanffy grounded systems as ordered hierarchies that find their origin in evolution.

Bertalanffy's key quotation in section 1 (Bertalanffy, 1950, pp. 134–135) enables deriving the following ontological assumptions:

Systems are layered. Bertalanffy clearly distinguishes a level of the parts, comprising those parts as entities together with their behaviour and interaction, from a level on which he situates the organizational relations (Hofkirchner & Schafranek, 2011). I suggest calling the level of the parts the microlevel of the system in question and calling the level of the whole the macrolevel of that system. That enables including both levels in the system. This helps avoid difficulties when it comes to doubts about how the whole (which is composed of its parts) would be able to influence its parts. According to Lawson (2013), the whole acts through, but not on, its parts. The latter assumption is a category mistake. Rather, it is the organizational relations that causally affect the elements of the system. It is the higher system level—the macrolevel—that is causative for the lower system level—the microlevel. And, of course, the microlevel is in turn causative for the macrolevel. One can make reference to the four Aristotelian causes and understand downward causation as *causa formalis* and upward causation as *causa materialis* in a synchronic manner, whereas the interaction of the system as a whole with the environment and other systems and cosystems is on a horizontal plane where *causa finalis* and *causa efficiens* work in a diachronic manner (Hofkirchner, 2013b, p. 136). Overall, this represents the figure of self-organization that signifies the basic dynamism of a completed (and emerging) complex system. There is a bottom-up process in which

the interactions of elements (or proto-elements in the case of emerging systems) cause the emergence of relations of organization that become solidified on a higher level. Equally, there is a top-down process in which these solidified organizational relations exert a causal power on the activities of the elements. Thus, after the forming of a system, that very system maintains itself such that—through downward causation—its organizing relations make its elements produce the system itself anew. And the elements—through upward causation letting organizational relations emerge—maintain themselves by making the system organize relations for the production of the elements.

This is termed self-organization: The system (the self) refers to itself in that it lets its organizational relations refer to its elements (many selves). These, in turn, refer via the organizational relations to the system. Note that Bertalanffy's publication *Kritische Theorie der Formbildung* (Bertalanffy, 1928a) anticipated “self-organization as an inherent and materially immanent principle of life,” though he did not use that term at that time, as David Pouvreau and Manfred Drack concluded (Pouvreau & Drack, 2007, p. 302). Also, Klaus Müller (1996, p. 87) states that Bertalanffy interpreted the phenomena in question as self-organization processes. The ideas that in organisms “the single processes are ordered for the maintenance of the whole” (Bertalanffy, 1928a—translation after Pouvreau & Drack, 2007, p. 305) and that this “maintenance of the organized system” is achieved “in a dynamical pseudo-equilibrium through the change of components” (Bertalanffy, 1932—translation after Pouvreau & Drack, 2007, p. 309) anticipate Hermann Haken's ideas around the slaving principle for the organic world. This is because Bertalanffy's ideas contend that the rate of change is the higher the lower the level is (Hofkirchner, 2013a, p. 121). Haken's slaving principle states that the parameters that change more slowly are those that enslave the remaining parameters (e.g., Haken, 1978). At the same time, Bertalanffy's standpoint of a hierarchical system theory is richer than Humberto Maturana and Francisco Varela's idea of autopoiesis (Maturana & Varela, 1980). That idea refers solely to flat networks. Maturana and Varela reduce a system to a mere network of elements that produces new elements that maintain the network (Hofkirchner, 2013a, p. 121). For Bertalanffy, the organic dynamics cannot be dissolved into single causal chains of independent processes. This is because the independence is only relative and secondary. Primarily, the single processes depend on the whole or, more precisely, depend on the relationships that represent the system laws (Bertalanffy, 1932, p. 99). It is no surprise that Bertalanffy's notion of the dynamical pseudo-equilibrium, the German “Fließgleichgewicht,”

which he translated into “steady state” as distinct from “homeostasis,” is coupled to the notion of open systems—open in the physical sense that they can maintain themselves “in a continuous exchange of matter with environment” (Bertalanffy, 2015, p. 156). Thus, his understanding is fully compatible with Ilya Prigogine's concept of dissipative structures (Prigogine, 1955). Bertalanffy's *Biophysik des Fließgleichgewichts* published in 1953 shows that he was already familiar with Prigogine's work from 1946 (Bertalanffy, 1953a).

Furthermore, Bertalanffy knew C. Lloyd Morgan's concept of “emergent evolution” (Bertalanffy, 1932, p. 94). He sympathized with its content, though he acknowledged the term only later. In 1940, he presented in the publication *Vom Molekül zur Organismenwelt* the world as “hierarchical order of superposed system formations.” This ranged from the primordial parts of matter up to communities of one or different species (Bertalanffy, 1940, p. 5—my translation). In 1950, he already extended the field to social systems: “Reality, in the modern conception, appears as a tremendous hierarchical order of organized entities, leading, in a superposition of many levels, from physical and chemical to biological and social systems” (Bertalanffy, 1950, p. 164). Later, he addressed the connection between the synchronic and diachronic aspects and admitted that “the notion of emergence is essentially correct: each higher level presents new features that surpass those of the lower levels” (Bertalanffy, 1959, p. 67).

Thus, Bertalanffy paved the way for a clarification of the nature of systems. If we interpret Aristotle's notion of a system as a whole that surpasses its parts, and if self-organization and emergence feature the dynamism of systems, then only systems that are self-organizing, emergent systems are true systems (in the sense of Aristotle). Any other entity that is incapable of organizing itself or of showing emergence does not deserve to be called a system. Hofkirchner (2013a, p. 105) provides a definition of “evolutionary systems” in that vein, modifying Bunge's system definition.

Emergence is a feature of social systems as well, of their becoming and of their being. Social systems belong to another stratum and, like physical and biotic systems, they are endowed with relative autonomy and specific laws. Although evolution has led to ever more sophisticated kinds of self-organization, it is self-organization that social systems ultimately share with other systems.

In social systems, actors' agencies reproduce the structure of the social system. Conversely, the agencies can also co-act to transform the structure in order to change the system qualitatively. Twenty years ago, Hofkirchner (1998, pp. 29–30) suggested an ontological view of self-organization in social systems. That text can

read as a concretization of social self-organization in line with Bertalanffy, although Bertalanffy himself was not mentioned:

There are two levels. At the micro-level the elements of the system, namely agents, are located. They carry out actions, and by the interplay of the fluctuating individual actions they produce fairly stable relations among them which, in the form of rules, that is values, ethics and morals, and in the form of regularities which concern allocative and authoritative resources, gain a relative independence from the interactions. Structures like that emerge thus on a macro-level, where they exist in their own right insofar as they, in turn, influence the agents. On the one hand, they constrain the individual agency by setting conditions that limit the scope of possibilities to act and, on the other, just by doing so provide it with the potential for realizing options it would not otherwise have. In so far as the structures do not cause directly, and therefore cannot determine completely whether or not these options will be realized, for the actions are mediated by the individual agents, dominance cannot control the outcome, either. The structures are inscribed in the individual agents by an endless process of socialization and enculturation, but the engramms which are produced in the individuals serve as cognitive tools for the anticipation and construction of ever new actions which may or may not obey the rules and accept the values and recognize the ethics and follow the morals, and which may or may not fit the regularities and renew the allocative and authoritative resources and thus may or may not reproduce the structures. Either way, interaction reflects upon the conditions of its own emergence and may consciously be directed at the structures in order to maintain or alter them. In this sense only, that is, because in their recursive actions the agents refer to the structures, these structures play the dominant role in this relation of bottom-up and top-down causation. Nevertheless none of the relations in this causal cycle leads to plain results. Each influence has consequences which due to the inherent indeterminacy cannot be foreseen. By this, and only by this, qualitative change is possible.

After Bertalanffy, the object of social sciences cannot be a social substance—a substance differing from other substances. In this respect, Bertalanffy anticipated Bruno Latour's criticism of the substantialist view in sociology. He did, however, give a system theoretical answer to that view, an answer more in the direction of the so-called new materialism than in the direction of Latour's actants and networks. The object of social sciences is not a particular substance but rather social systems, which means the social relations that organize matter in a different way than in realms of prehuman, biotic, and physical matter. Social relations define the context. Social relations can be viewed as being the structure emerging from the process in which social (human) actors interact, and in turn, these relations manifest themselves in agency, in how the actors behave. Specifying the downward causation as constraints and enablers goes back to sociologist Anthony Giddens (1984). It has, however, diffused throughout the systems terminology to cover the specification of the role of organizational relations in systems in general. It is worth mentioning that Archer reproached Giddens for conflating agency and structure, though. A picture that is, in that respect, fully compatible with Bertalanffian systems thinking, like her morphogenetic perspective or Hofkirchner's evolutionary systems perspective can be summed up as follows: Social relations

are the enablers and constraints of the actions and interaction of the actors. They determine, in a way, the behaviour of the actors. In this way, behaviour can be understood by referring to its underlying social relations. But no behaviour can be explained by resorting to the actors or agency alone. Enablements and constraints are relational, they are structural in nature, not agential. They are the Third that relates actors, and individual agency realises only possibilities that are undergirded by social relations. (Hofkirchner, 2015, p. 99)

In short, the object of social-scientific inquiry comprises (a) the actors that co-act to such an extent that the social system is reproduced or transformed, (b) the social relations that emerge from and, through the provision of constraints and enablers, dominate their interaction, and (3) the interplay between actors and social relations, in which the actors remain in the space determined by social relations or transgress it and in which the social relations turn up as intended or turn out to be unintended consequences. This is in line with a general definition of systems that includes (a) elements, (b) organizing relations, and (c) their interplay, which is self-organization.

Note here that such a social systems definition is in stark contrast to systems concepts of Luhmannian origin that fail to accept actors—social agents that are humans—as elements of social systems. Not only is the dialectic of agency and structure hampered if humans are not part of the story, but the emergence of social systems as collective entities through cooperation is also belittled if the study does not go beyond the study of communication (Hofkirchner, 2013a).

Lesson number two that we can learn from GST is the following: In the case of social systems, the key object for modelling is the emergence and dominance of social relations. It is social relations that manufacture the integration, the cohesion, and thus the quality and the development of social systems. Those relations, however, depend on the agency of actors that reproduce or transform them.

4 | SYNERGY

The ontological tenet of Bertalanffy's GST is to produce ever more sophisticated models that can be usefully applied in practice. This is because, on the basis of theoretical insights, they present realistic accounts of the dynamics of self-organization in general. From these models, one can ascend to accounts in particular by introducing step-by-step concrete conditions such that technologies can be devised and developed that successfully functionalize the dynamics at hand for human(e) goals.

Point 3 is about the praxiological tenet, the inherent normativity of the general theory of systems, which forms a new, scientifically grounded *weltanschauung*. As communication expert Mark Davidson pointed out, Bertalanffy's GST view is inherently value-laden because it emphasizes becoming aware of the mutual dependencies of systems, elements, subsystem and suprasystem, and the hierarchical relations of the architecture. This includes emergent processes of the development and the evolution of what we call world. Ultimately, we become aware of the collective consequences of our individual actions (Davidson, 1983, 2005, p. 30).

Despite the widely agreed assumption that Ought cannot be derived from Is without additional premises that contain values, a closer look at that issue might do better justice to the intricate relationship between them. Is can be seen as a necessary but not sufficient condition for Ought, and Ought can, in turn, be seen as a contingent emergent on a given Is. "In that way Is can be integrated with Ought. They are not rendered completely identical nor completely different. [...] Values, guidelines for actions, morals are seen as emerging in a historical context; they originate from, and depend on, history"

(Hofkirchner, 2016, p. 282). This is the position of an emergentist ethics. It seems that GST implies such a position. Bertalanffy looked for an Is that suits its supervenience by Oughts that are grounded on the Is.

Bertalanffy liked to recall *pantha rei*, the well-known idea of Heraclitus, philosopher of Greek Antiquity. Looking at life, for Bertalanffy, there are three currents in encapsulation. The first current is the flow that characterizes the maintenance of an organism.

The living organism is a hierarchical order of open systems. What imposes as an enduring structure at a certain level, in fact, is maintained by continuous exchange of components of the next lower level. Thus, the multicellular organism maintains itself in and by the exchange of cells, the cell in the exchange of cell structures, these in the exchange of composing chemical compounds, etc. As a general rule, turnover rates are the faster the smaller the components envisaged. (Bertalanffy, 2015, p. 160)

This flow is embedded in a second current. The single organism is an abstraction: It is fixed in the current of generations of which it is an offspring and to which it contributes offspring. And, finally, there is an even more embracing current that forms a third step. That is the total history of phylogenies, a unique stream of geological dimension. Each higher current represents wholeness, is lawful, and determines the lower ones to a certain extent (Bertalanffy, 1940, pp. 67, 99).

When it comes to social systems and the history of humanity, of cultures, and of civilizations, Bertalanffy's outlook can be applied too.

At present there is a tendency to consider a society, an economy, or a nation, as a whole which is super-ordinated to its parts. [...] Civilisations appear, if not as superorganisms, as was maintained by Spengler, at least as superindividual units or systems, as expressed in Toynbee's conception of history. (Bertalanffy, 1950, p. 135)

Bertalanffy sympathized all his life with ideas of Spengler (1922) and Toynbee (1964) because they tried to use organismic conceptions as metaphors for describing trajectories of social systems (Bertalanffy, 2015, pp. 202–203). Though Bertalanffy recognized the limits and failures of those ideas, he continued to maintain that the concept of wholeness regarding human history was valid. It is a tragedy owed to the political developments

of the first half of the last century that his view of wholeness was overemphasized because it was easy to interpret them as a scientific foundation of the so-called “Führerprinzip” (the authoritarian leadership principle of the Nazi movement reorganizing society). The perspective of unity through diversity (not uniformity) as something that needs conscious choice came to the fore only after World War II (Pouvreau, 2009). What Bertalanffy insinuated is, of course, a system theoretical foundation of regularities of social self-organization. This did not involve a naturalistic derivation of iron laws that cannot be changed or spiritualistic imagination. In 1940, he wrote (Bertalanffy, 1940, p. 99—my translation): “The term ‘wholeness’ is nowadays, in fact, abused.” Bertalanffy is known to have been a critical observer of the path of civilization. For him, humanity was still in the process of becoming and might be on the wrong course. Though he was inclined to assign positive features to what the development of humanity could mount up, he had to concede that the path actual history had taken showed negative directions. He was therefore aware of the different manifestations of the directedness of the development in biota and in humanity and stated that “unlike the phylogeny that is determined by organic regularities only, it's up to man himself whether he directs the development that is determined by his peculiarity towards progress or towards self-annihilation” (Bertalanffy, 1951, p. 214—my translation). Bertalanffy said that we cannot abolish the strong laws of history but that we have the choice to recognize them and to plan to control them. Otherwise, we would be overwhelmed by them (Bertalanffy, 1951, p. 224).

A social systems approach in the wake of GST “allows a perspective that is factual and normative in one. [...] That is, what serves the objective functioning of the social system, appears to the actors as laden with morality” (Hofkirchner, 2017, pp. 282–283).

Because the advent of global challenges—which represent complex problems—the survival of humanity has become dependent on successfully coping with complexity. Davidson interviewed Bertalanffy's widow, unearthed materials, and received new information from personal communications. He then compiled these for his 1983 book *Uncommon Sense*. Bertalanffy appealed to respect the biosphere as a whole and to reorganize the world into a system of (mutually) symbiotic societies. As a patriot of our planet Earth, he claimed a universal declaration of interdependence and an ethos that should not focus on the good for the individual alone but on the level of humanity as a global system (Davidson, 1983, 2005, p. 31).

The development of science and technology plays an important role in Bertalanffy's work and is relevant to the crises we face today.

The basic complaint against our age is the dehumanization of man in our mechanized, industrial, and commercial society, a robotization which makes the individual into an ever smaller wheel in Lewis Mumford's "megamachine," and control of his behaviour possible by innumerable persuaders, hidden and not-so-hidden. [...] The opposite trend, often claiming the predicate "humanistic psychology," finds its realization in encounter groups, mind-expanding drugs, nude marathons, the human potential movement, and the like. [...] Both these "movements"—antithetical as they are in all other respects—concur in one important aspect, namely, in the "zoomorphic" conception of human nature and the devaluation of the individual. [...] In both antitheses, what is specifically "human"—reason, culture, tradition—tends to be discarded. (Bertalanffy, 1972, pp. 189–190)

Bertalanffy refers back to Heraclitus' saying that humankind thinks in opposites. According to Bertalanffy, this fractured thinking can be balanced out through continuous but never-ending efforts. He shows examples that "also the constructs of physics are such opposites, and for this very reason prove inadequate in view of reality." They may "become meaningless," become "superseded," be "both legitimate and complementary aspects," "break [...] down," be "wrongly hypostatized" (Bertalanffy, 2015, pp. 247–248). Bertalanffy took Nicholas of Cusa's ideas *ex omnibus partibus relucet totum* ("from all parts the whole is reflected") and *coincidentia oppositorum* as a point of departure when conceptualizing the whole as something that transcends the accumulation of every part.

Discursive thinking always represents only one aspect of ultimate reality, called God in Cusa's terminology; it can never exhaust its infinite manifoldness. Hence ultimate reality is a unity of opposites; any statement holds from a certain viewpoint only, has only relative validity, and must be supplemented by antithetic statements from opposite points of view. (Bertalanffy, 2015, p. 248)

In a text about the wars of religion, Cusa had propagated a solution that "everybody will understand that there is only One Religion in the diversity of confessions" (Bertalanffy, 1928b, p. 73—my translation) because it is merely the formalities of the rituals that differ from church to church but not the worshipping of one god.

Thus, we can elaborate GST and enrich it with three more insights that, finally, fortify its new *weltanschauung*. First, we can ask what is the Is, in principle, that makes an Ought in nature and society? This points to the question why complex, self-organizing systems exist at all. The answer to this question opens new horizons. The answer is that systems are formed and then maintained if proto-elements, and as long as elements, benefit from the system. Self-organizing systems emerge through organizational relations when cooperation of agents allows for synergy effects; the provision and production of synergy are the *raison d'être* of any system (Corning, 1983, 2003): If the organizational relations are no longer able to provide and help the elements produce synergy, then the system will break down. As an example, the living systems we can observe today as the outcome of natural evolution succeeded in being most enduring by virtue of their ability to adapt to synergy requirements.

Second, we can ask what does synergy in social systems mean? Social systems crystallize in social relations that allow the proliferation of the common good for participant actors. Any social system is a social system by virtue of organizational relations of production and provision of the common good. That is to say, the commons are the social manifestation of systemic synergy (Hofkirchner, 2017). Hindrances of the commons supply are frictions that represent systemic dysfunctions due to the suboptimal organization of the synergetic effects. The less friction is present in the interaction of actors as a consequence of relations promoting the common good, the more enduring are social systems. Any meaningful design of social systems is oriented towards the alleviation of frictions. "That commons are generated and furnished by any social system is an objective fact. That communing is doing good, is a moral norm for actors" (Hofkirchner, 2017, pp. 282–283).

Third, we can ask what are the global challenges about? Global challenges embody a crisis in the worldwide availability of the common good. They show that a reorganization is needed that is about the common good.

Acknowledging Bertalanffy's predilection for the *coincidentia oppositorum*, social relations can be categorized as follows with respect to how they deal with global challenges (Hofkirchner, 2014b):

- (1) Antagonistic relations that make positions on the common good conflict with each other in a contradictory, mutually exclusive manner. The common good is appropriated by actors at the cost of the expropriation of other actors. Those relations threaten humanity with extermination because antagonistic actors tend towards eliminating the other party. *Tertium non datur* from formal logic is

an apt description of that situation. Negation of differences or imposition of one difference leads to uniformity.

- (2) Agonistic relations that make different positions regarding the commons indifferent to, and therefore enable coexisting with, each other in a compossible manner. They seem indispensable for social life because they promise peaceful competition and help defuse antagonisms (Mouffe, 2013). There is, however, no guarantee for that. Not only can antagonistic relations be transformed into agonistic ones, but agonisms can also change into antagonisms. Accordingly, they do not suffice for collective action on a planetary scale. The juxtaposition of the differences leads to fragmented plurality—*quod libet*.
- (3) Synergistic relations that enable mutually supportive positions that complement each other for the common good and for any other human(e) goal, humanity-wide. The composition tunes the differences and yields unity through diversity. The *coincidentia oppositorum* (Nicholas of Cusa includes both contrary and contradictory oppositions) occurs on another level, which is beyond any opposition (Bertalanffy, 1928b, pp. 26–27)—on the level of the Third as I have termed it in the past.

Given these categories, science can take position in the sense of Bertalanffy and recommend what needs to be done if humanity is to survive: Antagonistic relations must be reduced to a minimum, and agonistic relations must be put in the service of truly synergistic relations to enact another step in human evolution. Such a transition is necessary because the social relations of any partition of humanity are increasingly based on the principle of othering of partitions that are considered outside of them. This fails to do justice to legitimate self-interests of the rest of the partitions. Frictions from which the global challenges emanate render the continuation of civilization unsustainable. They are caused by the lack of relations that would be valid for all partitions from a bird's eye view, that is, from a metalevel perspective, from the position of a Third. The establishment of such relations would mean the abolition of those frictions by a new suprasystem in which all existing systems take part and shape according to the new relations on a higher level. This follows the application of the subsidiary principle (as envisaged by Cusa) as a basis for the preservation of diversity and autonomous agency.

Lesson number three is about the design of social systems: Unity through diversity, a principle found in nature (i.e., in natural systems self-organizing), can also be adapted to hold for society (i.e., social systems and social self-organization) based on the following concretization:

It is both possible and desirable to transform the social relations from antagonistic and agonistic forms into synergistic forms that in themselves will be appropriate to handle the commons on a planetary level, to guide global governance, and to enable a thriving and surviving human civilization.

5 | CONCLUSION

Scrutinizing the tools, scope, and aims of Ludwig von Bertalanffy's envisaged GST reveals its revolutionary character; the consequences for social sciences are discussed, and refinements and extensions are suggested.

First, regarding methodology, the new way of thinking in integration helps frame relations of organization in any systemic context. It can therefore theorize social relations in social systems to better understand empirically observable social interactions. The integrative imperative of the methodology orients towards a solution that represents qualitatively novel knowledge because it leaves behind the one-sided exaggerations of subject/action-fixation and structuralism and does justice to legitimate claims of both sides.

Second, regarding theory, the new real-world picture of emergent systems that builds upon this new way of thinking helps model self-organization in any systemic context. The role of microlevel and macrolevel is clarified, and social self-organization can, thus, be construed as dialectic of agency and structure. The ontic whole of society is modelled as a systemic entity characterized by dynamism. That dynamism is, internally, an interplay of the formative power of social relations and the material substrate of actors; externally, vis-à-vis its environment, it drives the social system towards anticipated ends or unknown attractors.

Third, regarding technology, the new synergistic *weltanschauung* that builds upon the new conception of the world helps design applications for the transformation towards a better world. Accordingly, systems generate ends because these mediate synergy effects, which is beneficial for the elements and, in turn, beneficial for the systems too. GST takes a critical stance when it comes to society. It is the commons that can be identified. This represents the social synergy that any social system cultivates and needs to cultivate if it hopes to be maintained. Moreover, social antagonisms are identified as conflicts over the commons; actors need not reproduce those conflicts forever and need not bring about the extermination of humankind. Rather, they can choose to transform such conflicts into social relations of unity through diversity, into relations that make individuals and society—and any partitions of world society and the whole of world

society—boost each other such that societal development becomes sustainable on our planet.

Bertalanffy's hope was that GST would advance the unity of science in order to yield solutions to the global challenges. Revisiting GST can contribute to that objective and help fulfil Bertalanffy's hope.

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