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Original Article

Agency enabled by the *Psyche*: Explorations using the Transdisciplinary
Philosophy-of-Science Paradigm for Research on Individuals

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Abstract

A science of the individual encounters the unparalleled challenges of exploring the unique phenomena of the psyche and their workings. This article applies the Transdisciplinary Philosophy-of-Science Paradigm for Research on Individuals (TPS-Paradigm) to specify these challenges. Considering three metatheoretical properties—1) location in relation to the individual's body, 2) temporal extension and 3) physicality versus “non-physicality”—that can be conceived for various kinds of phenomena explored in individuals (e.g., behaviours, experiencings, semiotic representations), the TPS-Paradigm scrutinises these phenomena's perceptibility by individuals. From this metatheoretical perspective, the article traces developmental pathways in which psychical phenomena enable individuals to increasingly become actors—as single individuals, communities and species. The explorations first follow microgenetic and ontogenetic pathways in the development of perceptual and psychical representations of the physical phenomena encountered in life. Then the article explores how individually developed psychical properties, which are perceptible only by the individual him- or herself, can be communicated to other individuals and how individuals can develop psychical representations that are socially shared, thus enabling social coordination and the transmission of knowledge to subsequent generations. Many species have evolved abilities for co-constructing psychical representations reactively and based on occasions (e.g., observational learning). The evolution of abilities for co-constructing psychical representations also actively and based on intentions (e.g., instructed learning) entailed the development of semiotic representations through the creation of behavioural and material signs (e.g., language), allowing humans to communicate systematically about psychical abilities despite their imperceptibility by other individuals. This has opened up new pathways through which inventions can be propagated and continuously refined, thus producing cultural evolution. These processes enable humans to develop ever more complex psychical abilities and to become actors in the evolution of life.

Keywords:

principle of emergence;
mind-body problem / brain-mind problem;
individual and socially shared mental representations;
language and other semiotic systems of culture;
human evolution.

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Nothing is more fascinating than the phenomena that we experience in every waking moment of our lives—each individual for him- or herself. These phenomena sometimes appear to be like windows through which we can peer into the world. At the same time, they also appear to constitute a world of their own within us, one that is interwoven with the world that we conceive of as being external to us and in which we exist as part of its universe. The unique phenomena of the psyche and their workings, intangible and ephemeral, have occupied philosophers, scientists and many others over the last millennia and even further back in the natural history of humankind. Psychical phenomena influenced human developmental pathways in unprecedented ways, producing the abilities that first enabled scientific explorations (e.g., Baldwin 1906; Fahrenberg 2008a, 2008b, 2013; Freud 1915; Hegel 1807; Hirschberger 1980a, 1980b; Kant 1798; Peirce 1931-1935; Schrödinger 1958; Tomasello 2014; Walach 2013; Wundt 1863, 1894; Vygotsky 1978).

Explorations of these unique phenomena encounter profound challenges unknown to other explorations. For how can individuals explore and understand an object of investigation from which they themselves are inseparable (Durkheim 1919)? How can humans explore the human mind when they are equipped with nothing but such a mind (Stent 1969; Uher 2015a)? Scientists cannot step outside of themselves and of their being as human individuals. But scientists can explicate the basic assumptions that they have made about their particular objects of research and about the fundamental notions by which knowledge about them can be gained (Aristotle 350 BCE; Fahrenberg 2013; Collingwood 1940; Walach 2013). This enables critical reflection—individually and in exchange with other scientists. The ways in which individuals develop and exchange ideas, experiences and knowledge are explored in this research.

The Transdisciplinary Philosophy-of-Science Paradigm for Research on Individuals

This research aims to explore the workings of the psyche by applying the *Transdisciplinary Philosophy-of-Science Paradigm for Research on Individuals* (briefly referred to as *TPS-Paradigm*). This novel research paradigm explicitly considers the challenges and limitations that are inherent to explorations of individuals and their minds and it aims to meet and minimise these challenges and limitations by adopting transdisciplinary and philosophy-of-science perspectives (Uher 2013, 2015a, b, c,). Hence, the intention of this research is not to comprehensively review previous lines of research but rather to complement the existing knowledge with new insights that can be gained from the transdisciplinary and philosophy-of-science perspectives that are still not well considered.

The article first introduces the nature and aim of the TPS-Paradigm and specifies some philosophical presuppositions that the paradigm makes about individuals as objects of research. It then elaborates metatheoretical properties that the TPS-paradigm conceives for the phenomena explored in individuals, putting the main focus on the phenomena of the psyche. On the basis of these elaborations, the article explores the unique possibilities that psychical¹ phenomena open up for individuals to become actors in their lives but also the challenges that these phenomena's peculiarities impose on individuals in everyday life, especially for their possibilities to exchange with others. The various solutions that many species and, in particular, humans have evolved to overcome these challenges are explored along the microgenetic, ontogenetic and (possible) phylogenetic pathways in the development of individuals and the workings of their minds.

Know thyself: The intricate challenges of scientists exploring individuals

The TPS-Paradigm explicitly considers the fact that all science is made by human individuals and elaborates the particular implications that this fact entails. Specifically, all scientific endeavours depend on and reflect the particular perceptual and conceptual abilities of the human species—and their particular limitations. These human abilities determine the sole access that scientists can gain to the reality of the universe in which humans have

¹ For the term psychical in differentiation to psychological, see part 13.4 below.

evolved as a species. Therefore, the TPS-Paradigm conceives of anything that is perceptible by the human senses (or that can be made perceptible, e.g., through technical means) and/or that can be conceived of by the human mind as a *phenomenon*. This notion differs from various historical research traditions in which phenomena are conceived of as mere sensory perceptions that are differentiated from non-sensual concepts (sometimes called noumena); for example, in the philosophies of Plato or Kant (Hirschberger 1980a, 1980b). The TPS-Paradigm explicitly refrains from making such distinctions for reasons explored below.

Human individuals are known to be prone to many kinds of biases, illusions, errors and fallacies in perception and reasoning (e.g., Wolpert 1992). Of particular importance for scientists of all disciplines are the fallacies that are derived from the human tendencies to seek regularities and structures and to oversimplify complexity, which is referred to as the *law of least effort* (Royce 1891). Of particular importance for scientists exploring humans is the *fallacy of misplaced concreteness* (Whitehead 1929) that is derived from the common tendency to uncritically assume that words correspond to concrete entities. But this may be possible only for words denoting physical events that can be directly perceived. It is not possible for words denoting abstract ideas that can only be conceived by human minds and that Bentham (1748-1832) referred to as “fictions” (Ogden 1932). But humans tend to assume that linguistic abstractions, “fictitious” words according to Bentham, can reflect real concrete entities.

Scientists exploring human individuals encounter further intricacies because they themselves are always individuals—and thus not independent from their objects of research. The scientists’ own positions in their social world (unintentionally) influence the ways in which they explore individuals. In addition to the risks for introducing *anthropo-centric biases* to their research that all scientists face, scientists exploring individuals are prone to introducing all kinds of *ethno-centric biases*, such as biases that are derived from their own language (Deutscher 2010), sociocultural and national background (Adam & Hanna 2012; Faucheux 1976; Russel 1927; Teo & Febraro 2003), religion and worldview (Weber 1930, 1946), education and scientific tradition (Geertz 1988; Kuhn 1976), historical time (Fischer 1970; Gergen 1973), age and gender (Pellegrini 2011). Finally, the scientists’ own personal standpoints as individuals derived from their own personal experiences that they have made in their own lives entail additional risks for introducing all kinds of *ego-centric biases* to their research (Fahrenberg 2013; Ramón y Cajal 1897/1999; Weber 1949).

Fallacies and biases influence not only the specific theories and models that scientists develop. More profoundly, they influence the very means by which scientists generate knowledge (Uher 2015a, b, c).

The philosophy-of-science perspective: Scrutinising the own basic assumptions

Knowledge about the making of science is the most general level of scientific knowledge and is referred to as *philosophy-of-science*. In philosophy-of-science, scientists make explicit and critically reflect on the philosophical presuppositions that they have made about the properties of the phenomena to be explored and about the fundamental notions by which knowledge about them can be gained (Aristotle 350 BCE; Fahrenberg 2013; Collingwood 1940; Toomela 2012; Walach 2013).

Philosophical presuppositions are basic rational structures that scientists conceive for a given scientific system and that are required for that system to function. Importantly, these rational structures can originate only from outside the given scientific system that is built on these structures; therefore, they cannot be rationally justified or validated within the system for which they are formulated (cf. incompleteness theorem; Gödel 1931) and are also called *absolute presuppositions* (Collingwood 1940). For example, many scientists presuppose that, in nature, there are basic structures that follow rational or logical laws and that can thus be described in logically consistent ways and be explored by means of rational or logical analyses. This presupposition appears to be self-evident, but actually it is not. Rather, scientists can also conceive alternative absolute presuppositions from which competing and

contradicting scientific systems can be constructed (Fahrenberg 2013; Kellert 1993; Walach 2013).

On the basis of the particular absolute presuppositions being made, scientists develop metatheoretical and methodological frameworks that are coherent within the given scientific system yet not necessarily with the metatheories and methodologies used in other scientific systems that build on alternative absolute presuppositions. For example, psychologists have developed very different absolute presuppositions about human nature (the “images of man”; Fahrenberg 2004; Shotter 1975), such as the ideas that humans are driven by subconscious inner urges and conflicts (Freud 1915), are passively responding to external conditions (Skinner 1971; Watson 1913) or actively striving for cognisance (Kelly 1955) and personal growth and fulfilment (Maslow 1943; Rogers 1959). These different presuppositions laid the foundations for the development of various psychological research paradigms that each comprise coherent set of statements, theories and methods but that still tend to be contradictory or even irreconcilable with one another because they are based on different absolute presuppositions (Fahrenberg 2013; Walach 2013).

Making explicit the absolute presuppositions on which a given scientific system is built therefore is an essential prerequisite for analysing from a meta-perspective the theories, approaches and methods that are applied within a given system, thus for critically reflecting on the metatheories and methodologies that are used in a given field. *Metatheories* refer to the implicit and explicit beliefs, theoretical ideas and basic assumptions that scientists make about their objects of research and to the questions that they ask about these objects. The scientists’ metatheories determine the ways in which they reduce real phenomena to scientific phenomena and thus, what they consider to be facts in their field and how the thus-defined facts can be theoretically analysed and interpreted (Althusser & Balibar 1970; K ppe 2012; Toomela 2011; Wagoner 2009; Weber 1949). *Methodologies* refer to the ways (i.e., approaches) in which scientists tackle the questions that they ask about their objects of research and to the techniques and research practices (i.e., methods) that they therefore use. Methodologies are closely interrelated and intertwined with the metatheories that scientists have derived from the particular philosophical presuppositions on which a given scientific system is built (Sprung & Sprung 1984; Uher 2013).

The TPS-Paradigm is called a *philosophy-of-science paradigm* not because it contains a philosophy-of-science; this is true for any scientific system. Instead, its name derives from its aim to make explicit as comprehensively as possible the absolute presuppositions, metatheories and methodologies on which it rests to enable scientists to critically reflect, discuss and further develop established theories, models and research practices and to derive ideas for novel lines of research. This is seldom done in the sciences exploring individuals (Fahrenberg 2013; Omi 2012; Schwarz 2014; Toomela 2011; Uher 2013, 2015a, b; Walach 2013; Weber 1949; Westen 1996).

Transdisciplinarity: Integrating and applying knowledge across disciplines

The TPS-Paradigm is *transdisciplinary* because, in contrast to other research paradigms, it explores concepts, approaches and methods that were developed in *different* established paradigms and different research disciplines studying individuals. By systematically elaborating the philosophical presuppositions, metatheories and methodologies on which different concepts, approaches and methods are built, the TPS-Paradigm identified commonalities and differences between them. This allowed for the coherent integration of concepts, approaches and methods from different disciplines into interrelated philosophical, metatheoretical and methodological frameworks that can be applied across disciplines. These frameworks also enabled the further and new development of concepts, approaches and methods that meaningfully complement and expand the existing ones. The TPS-Paradigm is targeted at supporting scientists to critically reflect, discuss and further develop previously established theories, models and research practices and to derive ideas for novel lines of research in the future (Uher 2011a, 2013, 2015a).

A comprehensive application of the TPS-Paradigm was demonstrated in “personality” psychology. By elaborating the particular metatheories and methodologies that scientists use

to establish comprehensive “personality” taxonomies, the TPS-Paradigm revealed profound mismatches between the scientists’ implicit and explicit metatheories and the methodologies applied. It was shown that comprehensive taxonomic models of individual-specificity in central phenomena explored in individuals, such as behaviours and experiencings, have not yet been developed. The application of the TPS-Paradigm also enabled the development of novel theoretical and methodological approaches that can fill the gaps identified and that can meaningfully complement and expand previous lines of research (Uher 2015b, c).

The transdisciplinary philosophy-of-science perspective taken on individuals as living organisms

Central to the TPS-Paradigm are the absolute presuppositions that are being made about individuals as living organisms and the metatheories and methodologies that are therefrom derived. In line with its transdisciplinary scope, the TPS-Paradigm builds on a broad array of theoretical concepts and methodologies from diverse research disciplines from across the life sciences and beyond. Of particular importance are theoretical ideas about individuals as *living organisms*.

Living organisms can be conceived of as *systems* that are composed of sets of interrelated entities forming a complex whole (von Bertalanffy 1973). Living systems are complex at every level of their hierarchical structure. Entities at one level are compounded into *new* entities at the next higher level such that series of systems reside within a greater array of even more complex systems (e.g., nuclei, cells, organs, individuals, groups, communities, societies, species; Caprara 1996).

“Systems at each hierarchical level have two properties. They act as wholes (as though they were a homogeneous entity), and their characteristics cannot be deduced (even in theory) from the most complete knowledge of the components, taken separately or in other combinations. In other words, when such a system is assembled from its components, new characteristics of the whole emerge that could not have been predicted from a knowledge of the constituents. Such emergence of new properties occurs also throughout the inanimate world, but only organisms show such dramatic emergence of new characteristics at every hierarchical level of the system“ (Mayr 1988, p. 15).

The *whole* is not just more than the sum of its parts; it is essentially *different* from the sum of its parts—it has different properties, structures and functionings; this is referred to as the *principle of emergence* (Koffka 1935; Köhler 1969; cf. also Durkheim 1919; Simmel 1908). Hence, the identification of lower-level constituting elements of living organisms in and of itself cannot provide explanations of how the identified elements function together as a whole (e.g., Diriwächter & Valsiner 2008; Hartmann 1964; Pauli 1927; Koffka 1935; Köhler 1969; Toomela 2012; Vygotsky & Luria 1930; Wundt 1863). Moreover, as in living systems, series of systems are nested within each other, the entities that can be conceived at any one level can be conceived of as multi-contextual. Different properties and functionalities can emerge from the same set of elements in different contexts (Uher, Addressi & Visalberghi 2013a; Uher 2015b; Walach 2013). Thus, the principle of emergence also entails that assumptions of isomorphisms between elements on different levels (in all directions) can be very misleading (Mayr 1988; Wolpert 1992). Isomorphisms are particularly low, if not completely absent, if phenomena of different kind—and thus with different metatheoretical properties—are concerned (see below).

As living organisms, individuals can be conceived of as *self-preserving* and *self-organising* from within their boundary (Luisi 2003; Varela, Maturana & Uribe 1974; Zeleny 1977). Living organisms also exchange with their external surrounding and can therefore be conceived of as open systems (i.e., *dissipative systems*; Prigogine 1996). Dissipative systems develop non-linear system dynamics. In their developmental pathways, bifurcations may occur at which point the directions of the future development of a given system become unpredictable. In the development of living systems, dialectical processes occur in which

interactions between elements can result in changes of the elements in and of themselves. These peculiarities of living organisms result in processes in their microgenetic, ontogenetic and phylogenetic development that are irreversible and historically unique (Baldwin 1896; Caprara 1996; Li 2003; Prigogine 1996, Valsiner 2014).

Three metatheoretical properties that determine the perceptibility of phenomena by individuals

Central to the TPS-Paradigm are the absolute presuppositions that it makes about the phenomena explored in individuals, in particular about the differentiation of different kinds of phenomena from one another and the conception of their particular properties. The paradigm considers three metatheoretical properties that can be conceived for the various phenomena being studied. These metatheoretical properties are considered because the particular constellation of the forms that can be conceived for each given kind of phenomenon with regard to these properties determines the phenomena's perceptibility by individuals. Perceptibility by individuals has elementary consequences for the ways in which information from a given kind of phenomenon can be converted into information encoded in other kinds of phenomena (Uher 2015a, c). The central roles that such conversions play in individuals' everyday lives, such as for transmitting meanings, are explored in this research.

The absolute presuppositions that the TPS-Paradigm makes about the three metatheoretical properties and the distinctions between various kinds of phenomena need not be consensually shared by all scientists exploring individuals. Other scientist may make other absolute presuppositions and use other rationales to conceive of and to differentiate between phenomena and their properties. Those scientists who do not agree with the particular presuppositions made in the TPS-Paradigm, must develop metatheoretical considerations other than the ones that are explored in this research, thus precluding direct comparisons. The explorations presented in this research are aimed at revealing possible differences in the absolute presuppositions that are made in the field and, in particular, to enable comparisons and controversial discussions between different research traditions and scientific disciplines that are based on the *same* absolute presuppositions as made in the TPS-Paradigm.

Importantly, the TPS-Paradigm generally considers the dimensions of everyday life experiences (i.e., spatial dimensions comparable to the human body, temporal dimensions of the international time standard) rather than to the dimensions of atoms or the outer space as considered in specific fields of research (e.g., chemistry, quantum physics, astronomy). The three metatheoretical properties, however, are conceived on levels of abstraction that are commonly not considered in either everyday life or science.

1) The phenomena's location in relation to the individual's body

The TPS-Paradigm considers the phenomena's spatial location in relation to the individual's body in terms of their *externality/internality*. Phenomena can be located internal or external² to the individual's body; some kinds of phenomena can also be both (e.g., body heat). The spatial location of phenomena has important consequences for individuals as it determines their opportunities to directly perceive these phenomena in themselves and in other individuals.

The TPS-Paradigm defines as *extroquestion* (from the Latin *extro* meaning beyond, outside and *quaestio* meaning seeking, investigation, enquiry) the exploration of phenomena that individuals can directly perceive as being located external to their bodies, which allows multiple individuals to perceive one and the same event. Joint perception is important because it facilitates intersubjective perception and social exchange as explored below. Importantly, extroquestion is defined on the basis of the phenomena under study and of the individuals who are perceiving these phenomena and providing information from their pertinent perceptions and conceptions (Uher 2015a). Extroquestively accessible are all

² The differentiation is made between internal versus external, rather than between *endogenous* versus *exogenous* because the latter implies a reference to potential causes and thus to explanations, which are not needed to metatheoretically define the various kinds of phenomena.

phenomena that are external to individuals' bodies, thus physical ones (e.g., individuals' physiognomy, written language, monuments). Through the use of invasive methods (e.g., endoscopy, surgery), physical phenomena that are internal to individuals' bodies (e.g., morphology of inner organs) can also become perceptible by multiple individuals.

Other internal phenomena, by contrast, cannot be perceived by other individuals at all; they can be accessed only by the single individual. These are the unique properties of the phenomena of the psyche (e.g., experiencing). The TPS-Paradigm defines as *introquestion* (from the Latin *intro* meaning in, within) the exploration of phenomena that can be directly perceived only by the individual him- or herself and that are, in principle, not directly perceptible by any other individual under all possible conditions—thus, psychical phenomena (see below; Uher 2015a).

Extrospection and *introspection*, by contrast, are commonly defined and differentiated from one another on the basis of the *perspective* that individuals can take on themselves versus on other individuals or on things. However, both perspectives are always interwoven as individuals can always extrospect and introspect at the same time (cf. Kant 1781; Wundt 1896).

2) The phenomena's temporal extension

The TPS-Paradigm considers the phenomena's temporal extension because individuals can directly perceive only those phenomena that are *present in a given moment*. Some phenomena are temporally more extended and persist over some period of time (e.g., individuals' body morphology). This facilitates the phenomena's direct perception by individuals in their everyday lives. Other phenomena are much less temporally extended and change more quickly (e.g., blood sugar, hair style). Still other phenomena, in turn, are strictly momentary and highly fluctuating (e.g., behaviours, thoughts); their occurrence is strictly bound to the present moment in time—the here and now. Momentary phenomena can be directly perceived only in the very moments in which they occur (e.g., kicking a ball) or when they have caused changes in other phenomena that can still be directly perceived (e.g., the ball lying in the goal area).

3) The phenomena's physicality versus “non-physicality”

The TPS-Paradigm considers the phenomena's *physicality* because material physical phenomena feature *spatial units* that are rather constant and identically repeatable to a considerable extent (e.g., electrons, atoms, molecules). Such spatial units help in creating an intersubjective consensus between individuals on how to categorise and compare the phenomena and events encountered in life. Spatial units occur in the material phenomena of individuals' bodies (e.g., cells, organs, body parts) and in the material physical phenomena of their external surrounding (e.g., other individuals, plants, animals, printed texts, buildings). Material physical phenomena can also be used to determine rather constant and repeatable units in immaterial physical phenomena, which feature no spatial units in and of themselves, such as behavioural and many physiological phenomena (e.g., body movements, body heat). Importantly, in the TPS-Paradigm, the terms physical and physicality refer to the science of physics and not to corporality, which cannot be conceived for immaterial physical phenomena.

The phenomena of the psyche, in and of themselves, feature properties that are of an entirely different kind than the properties of physical phenomena and that are therefore conceived of as “*non-physical*” in the TPS-Paradigm. The term is put in quotation marks because it does not indicate a simple contrast to physical. Rather, the term is meant to denote properties that are often associated with the terms psychical and mental and also with intangible and immaterial. But as behavioural and some physiological phenomena can also be conceived of as being immaterial, the term “non-physical” is used. The term denotes that psychical phenomena, in and of themselves, are immaterial and that spatial units that are identically repeatable, at least to some degree, cannot be found. But in contrast to immaterial physical phenomena, there are no systematic relations between psychical phenomena and the (material and immaterial) physical phenomena that accompany them

(e.g., chemical and electric phenomena in the brain; Fahrenberg 1979, 1992, 2008a, 2008b; Kant 1798; Wundt 1894)

The epistemological principle of complementarity and the psyche-physicality problem

The differentiation of physical and “non-physical” properties as made in the TPS-Paradigm refers to one of the most fundamental research problems in philosophy and psychology—the so-called body-mind problem or brain-mind problem (e.g., Fahrenberg 1979, 1992), which is referred to as the *psyche-physicality problem* in the TPS-Paradigm, in line with its particular terminology. The absolute presuppositions that the TPS-Paradigm makes about this problem are based directly on the *principle of complementarity* introduced by Bohr (1937) in quantum physics as a solution for the wave-particle dilemma in research on the nature of light. This epistemological principle considers the fact that, in living and non-living nature, pairs of properties can often be found that are mutually exclusive and maximally incompatible with one another but that are both related to the same object of research and both necessary for its sufficient description. Consequently, the different metatheoretical properties that can be conceived for the phenomena explored in individuals and the peculiarities that they entail for the phenomena’s direct perceptibility by individuals (e.g., researchers) must be adequately considered both in metatheoretical explorations (see below) and in the research methodologies used for investigations (for applications in philosophy and psychology, see e.g., Fahrenberg 1979, 1992, 2013; Hoche 2008; Kant 1798; Uher 2015a, b, c; Walach 2013; Wundt 1894)

The TPS-Paradigm conceives only of physical and “non-physical” properties as being complementary to each other in the Bohrian sense. But the different forms that phenomena can take in each of the two other metatheoretical properties (i.e., internal/external and momentary/not momentary) are not conceived of as complementary because each of these two properties can be conceived of as reflecting a gradual dimension representing the same kind of property (i.e., location in relation to the individual’s body, temporal extension). The three metatheoretical properties in and of themselves are not complementary to each other either. By contrast, each given kind of phenomenon is *always* characterised by a particular *constellation of forms of all three properties*, allowing for the metatheoretical differentiation of different kinds of phenomena.

The various kinds of phenomena differentiated in the TPS-Paradigm

On the basis of the three metatheoretical properties and the particular constellation of their forms that can be conceived for a given phenomenon, the TPS-Paradigm differentiates various kinds of phenomena explored in individuals.

Two major groups are conceived, basic kinds and composite kinds of phenomena. The phenomena of morphology, physiology, behaviour and the psyche are conceived of as *basic kinds of phenomena* because they cannot be removed from the body of the individual being considered without destroying its integrity (Uher 2015a). By contrast, the phenomena of semiotic representations, artificially modified outer appearance and contexts (“environment”) are conceived of as *composite kinds of phenomena* because they each comprise several different kinds of phenomena, among them at least one basic kind of phenomenon, which is thus inseparable (in the sense stated) from the body of the individual considered. Composite kinds of phenomena may also comprise external physical phenomena that may be bound to or independent from the individual being considered. Hence, composite kinds of phenomena comprise phenomena with heterogeneous metatheoretical properties, which entails that their structures and interrelations are highly complex. The basic kinds of phenomena, by contrast, as they comprise only one kind of phenomenon as differentiated in the TPS-Paradigm, have comparably homogeneous metatheoretical properties and their structures are therefore less complex (see below).

The following sections explore these various kinds of phenomena, their particular constellations of metatheoretical properties and the implications that these constellations entail for the phenomena’s perceptibility by individuals in their everyday lives. Some phenomena are discussed only briefly (e.g., morphology, physiology). The main focus is on

explorations of psychical phenomena and of those kinds of phenomena that comprise psychical phenomena or that have important functional interrelations with psychical phenomena in individuals' everyday lives.

The individuals' body: Morphology and physiology

Morphology refers to the structures and constituting parts of individuals' bodies in the TPS-Paradigm. Morphological phenomena can be located both internal to the individuals considered (e.g., morphological brain structure, skeletal build) and external to them (e.g., physiognomy); some phenomena can be both (e.g., hair). Morphological phenomena are temporally extended; they can and do change over time, in particular during ontogeny, but they change only slowly and are thus more persistent. Morphological phenomena are material physical; one and the same event can therefore be directly perceived by multiple individuals. Many external phenomena of individuals' morphology (e.g., physique) can be directly perceived with the naked eye or bare hands by individuals in ordinary everyday life settings. This is not possible for external micro-level phenomena (e.g., cell surfaces of the outer skin) and all internal phenomena of morphology (e.g., intestinal structures, except in accidents). But, in present-day humans, they can be made perceptible by using invasive methods (e.g., surgery) and technical means (e.g., microscopes, endoscopes). In addition, morphological phenomena, because they are material physical, feature spatial units that are identically repeatable to considerable degree (e.g., molecules, cells, organs, body parts). Together with their extroquestive accessibility, this facilitates reaching intersubjective consensus between individuals on how to categorise phenomena and events. This also allows for direct comparisons within and between individuals and with designated spatial standards of measurement (e.g., metering rule), thus enabling scientific quantifications (Uher 2013, 2015a, 2016).

Physiology refers to the functioning of the morphological structures of individuals' bodies in the TPS-Paradigm. Physiological phenomena are primarily located internal to the individual (e.g., neurotransmitter systems), but some can also become external (e.g., heat). Most physiological phenomena are not bound to the immediate moment, but their temporal extension varies from phenomena that occur only briefly (e.g., motor unit action potentials) to phenomena that are more persistent (e.g., blood circulation, body temperature). Some physiological phenomena can be conceived of as material (e.g., chemical signals). Others are immaterial though bound to the individual's bodily matter, which facilitates the identification of spatial units on which categorisations can be based (e.g., breaths, heart beats). The physical properties of physiological phenomena also enable direct comparisons within and between individuals and with designated physical standards (e.g., barometer to measure blood pressure), thus enabling scientific quantifications (Uher 2013, 2015a, 2016). Given this constellation of metatheoretical properties, individuals can directly perceive in other individuals only a few physiological phenomena in everyday live situations (e.g., sweat). For most physiological phenomena, individuals must employ invasive methods (e.g., blood sampling) and use technical means (e.g., stethoscope). But within themselves, individuals are able to sense and perceive some of their own physiological phenomena, as explored below.

Behaviours: Individuals' primary way to connect with external phenomena

The TPS-Paradigm metatheoretically defines behaviours as "external changes or activities of living organisms that are functionally mediated³ by other external physical phenomena (Millikan, 1993) in the present moment" (Uher 2013, 2015a; Uher et al. 2013a, 2013b). External changes and activities can be mere by-products of the organisms' chemistry (e.g., heat) and physics (e.g., breath sounds) or they may fulfil functions of the organisms' physiological regulations (e.g., loss of heat serving thermoregulation). Therefore,

³ In the TPS-Paradigm, the term *mediation* refers to the Latin *mediare*, to be in the middle, not to the meaning of mediation as used in statistics (where it is differentiated from moderation).

not any functional externalisation or external change can be conceived of as a behaviour; they are behaviours only if their *functions have reference to other external physical phenomena* or to relations to them (Millikan 1993). This metatheoretical definition implies that, to identify the function of a particular behavioural event, the external contexts in which it occurs must be considered (e.g., raising an arm to reach a fruit in the tree or to threaten an opponent; see the behavioural situation, below).

This metatheoretical definition of behaviour differs in important ways from previous concepts in psychology. Specifically, the TPS-Paradigm conceives neither of physiological responses nor of mental activities as behaviours; this differs fundamentally from behaviouristic concepts (e.g., Skinner 1957). Instead, it explicitly considers that physiological and mental phenomena have different metatheoretical properties and it therefore conceives of them as constituting different kinds of phenomena. For the same reason, the TPS-Paradigm refrains from making a priori assumptions about the potential causation of behavioural phenomena in other kinds of phenomena as is implied, for example, by the concepts of behavioural “responses” or “goal-directed” actions. On the basis of the absolute presuppositions made about individuals as living organisms, it explicitly considers that events of a given kind of phenomenon can be dynamically interrelated to and co-determined by events of *all* other kinds of phenomena in various (subsidiary) systems both internal and external to the particular individual considered. In line with another important absolute presupposition made in the TPS-Paradigm—the Bohrian principle of complementarity—each given kind of phenomenon is first defined in its own right concerning its own particular constellation of forms with regard to the three metatheoretical properties considered. This is an essential prerequisite for the selection and development of methodologies that enable appropriate investigations and for the analysis of possible causal interrelations between events of different kinds of phenomena (Uher 2015a, b, c).

Hence, in the TPS-Paradigm, all behavioural phenomena are conceived of as located external to individuals’ bodies. Moreover, behavioural phenomena are bound to the immediate moment; their events are ephemeral and highly fluctuating. Behavioural phenomena are also bound to or emanate from the individuals’ bodies; but, in and of themselves, they are immaterial physical phenomena (e.g., movements, acoustic waves). Behaviours are continuous and dynamic processes in which spatial units suggesting clear demarcations of single events are largely absent. But demarcations can be made based on the material physical properties of the individual’s body to which they are bound, which also entails the identical repeatability of events to some extent (e.g., events of scratching can be demarcated through finger flexions).

The external and physical properties of behaviours enable multiple individuals to directly perceive one and the same event, which facilitates finding intersubjective consensus on how to demarcate and categorise events—but within the constraints of the behaviours’ lack of spatial units; for example, what is one event of a scratch ($n = 1$) given that finger flexions can differ in both extension and speed and that individuals can use one or multiple fingers or even both hands? The constraints of the behaviours’ limited temporal extension further complicate individuals’ possibilities to jointly perceive one and the same behavioural event because individuals can perceive behavioural events only *while* they happen (e.g., a hug, a smile) or while they are still ongoing (e.g., bouncing, running). The momentariness of behavioural events also complicates direct comparisons with designated spatial standards for enabling scientific quantifications of events (e.g., the loudness of a sound can be perceived only while it occurs). As behavioural phenomena are external and physical, these constraints can be reduced to some extent by technically converting information from these phenomena into information in other kinds of physical phenomena (e.g., audio records; see Uher 2015a, c)—at least, this is possible for present-day humans. The momentariness of behaviours also complicates comparisons of events displayed by the same individual (except for concurrent events) and comparisons of events displayed by different individuals. Because behaviours are momentary and occur seldom spatially and temporally exactly in parallel with one another, individuals can compare ongoing events only with past events, which necessarily have already ceased to be and of which individuals can retain only

memories. But memories are different kinds of phenomena than behaviours—they are phenomena of the psyche.

The *psyche*: The individual's inner world

In the TPS-Paradigm, the *psyche* denotes the entirety of the immediate experiential reality both conscious and non-conscious of living organisms—the individual's inner activity and inner world (*Innenwelt*, von Uexküll 1909).

The TPS-Paradigm builds on concepts of the psyche that are rooted primarily in German-language philosophy and psychology from the 19th and 20th century—from the research areas and times in which the science of the psyche—psychology—was established as a scientific discipline. To use, integrate and elaborate these concepts, the paradigm introduces some terminological differentiations that are commonly not made in the pertinent English-language literature. Contrary to common practice, the paradigm translates the German term *psychisch* into *psychical*⁴ rather than *psychological* (German *psychologisch*) because “events, processes, and structures that are properly called psychical do not become *psychological* until they have been operated upon in some way by the science of psychology” (Adams & Zener in Lewin 1935, p. vii; emphases added). A further differentiation made between experiencing and experiences are explained below.

Importantly, the TPS-Paradigm considers all kinds of psychical phenomena (e.g., those commonly referred to as thinking, feeling, wanting, etc.) rather than focussing on only particular ones (e.g., only thinking) because all these phenomena share the same constellation of the three metatheoretical properties considered in the TPS-Paradigm and thus, cannot be differentiated on the basis of these properties. Moreover, individuals' immediate experiential reality always comprises all kinds of psychical phenomena (Wundt 1896). For these reasons, the phenomena of the psyche are primarily referred to as psychical rather than as mental because the term mental is often used to refer to cognitive phenomena only, thus excluding emotional, volitional and other kinds of psychical phenomena. Considering all kinds of psychical phenomena is important for holistic explorations of individuals that are in the focus of this research.

Psychical phenomena belong to the phenomena of life. As such, they are bound to a unit—the individual (Pauli 1927). Thus, they are also bound to and directed toward the individual's life (Stern 1924, p. 203). *Erleben* (experiencing) presupposes *Leben*—life. This is reflected in the term *psyche* originating from the ancient Greek word *ψυχή* for life, breath. As psychical phenomena are bound to the individual organism, each psychical event is dynamically interrelated to and co-determined by all concurrent events and by past events within the same organism (Lewin 1935). As a consequence, no single event can be conceived independently from all other events and interrelationships between psychical phenomena are highly complex (Pauli 1927; Rothschild 1963). In addition, like all phenomena of life, psychical phenomena vary intra-individually and inter-individually. Psychological laws therefore cannot be deterministic but only probabilistic (Brunswik 1952, 1955; Uher 2013)—unlike many natural science laws describing phenomena of non-living matter (Pauli 1927; Schrödinger 1944).

As phenomena of life, psychical phenomena are directly and intimately interrelated with the individual's organismal processes of life (Lewin 1935; Pauli 1927; Schrödinger 1958). The emergence of psychical phenomena essentially presupposes and is bound to physical phenomena of life. Psychical phenomena, in and of themselves, are immaterial; but in contrast to all other phenomena of life, they cannot be conceived of as being physical. The properties of psychical phenomena essentially differ from material and immaterial physical phenomena because they feature no spatial units or at least rather constant interrelations to the physical phenomena (e.g., electric and neurotransmitter activity in the brain) that

⁴ Similarly, people are allergic, not allergologic; it is the medical treatments of allergies that are allergologic and that are developed by the science studying allergies, allergology. Unfortunately, such differentiations are not made consistently in either English or German; for example, biological (*biologisch*) refers to both the organisms' phenomena and their scientific exploration.

accompany them (Fahrenberg 1979, 1992, 2008a, 2008b; Kant 1798; Wundt 1894). These properties are conceived of as “non-physical” in the TPS-Paradigm. They entail that the “psyche”, as the entirety of psychical phenomena, cannot be conceived of as a spatial entity that could be directly perceived (as is possible for the individual’s body); it therefore does not and cannot imply reification as a concrete entity. The psyche can only be conceived of as an entity, thus as a subjectively or intersubjectively constructed entity (Uher 2015a).

In contrast to all other phenomena of life, psychical phenomena are entirely internal and directly accessible only by their carrier (Pauli 1927), thus introjectively, and they are inherently subjective and idiosyncratic (Weber 1949). One and the same event can never be perceived by multiple individuals (Locke 1689), precluding direct comparisons of their phenomenal properties (called *qualia*; Levine 2003) between individuals (Schrödinger 1958; Toomela 2008; Uher 2013). Internality and “non-physicality” of psychical phenomena entail particular intricacies—both for their carriers and for other individuals.

As phenomena of life, psychical phenomena are interrelated also with events that are external to the individual (Brunswik 1952; Lewin 1935). External physical events can directly interact with events in the individual’s psyche through sensation and perception (see below) and the internal physical phenomena with which psychical phenomena are connected in complementary ways (e.g., sensory organs). But, vice versa, psychical events in and of themselves and the internal physical phenomena accompanying them cannot directly connect with external phenomena and thus cannot have any direct effect on external events (Schrödinger 1958; Sherrington 1940). This is referred to as the *one-sided psyche-external surrounding connection*⁵ in the TPS-Paradigm. Bridging this one-sided gap requires externalisations—other kinds of phenomena that serve as mediators from the individual’s internal physical and psychical phenomena to external physical phenomena (Uher 2013, Uher 2015a).

The individuals’ primary mediators for externalising information from psychical events are behaviours, including behavioural events that form part of semiotic language (see below; Uher 2013). The morphological and physiological phenomena that are functionally necessary for behavioural phenomena to occur (e.g., muscle fibres and their enervation) are not specifically considered because they are internal to the individual’s body and thus, cannot in and of themselves directly connect to phenomena in the individual’s external surroundings. Behavioural phenomena are so flexible and so neatly intertwined with psychical phenomena that individuals hardly notice the behaviours’ mediating function in externalising information from psychical phenomena. This may contribute to conceptions of psychical phenomena as “inner behaviours” (e.g., Koffka 1963; Skinner 1957; Sprung & Sprung 1984). The philosophy-of-science perspective taken in the TPS-Paradigm highlights that for behavioural phenomena different constellations of metatheoretical properties can be conceived than for psychical phenomena. These different constellations entail profound differences in these phenomena’s perceptibility by individuals and therefore require conceptual differentiations (Uher 2015a).

Importantly, the different metatheoretical properties that can be conceived for the phenomena that individuals use for externalisations precludes one-to-one conversions of information from psychical events. Isomorphisms between phenomena of different kind are generally low, if not largely absent (cf. Wolpert 1992). This has important implications for individuals’ possibilities to make inferences from behavioural events to psychical events. Moreover, externalising phenomena are connected not only with psychical phenomena but also with further kinds of phenomena, both internal and external to individuals. These interrelations influence these externalising phenomena in ways that are unrelated to the psychical phenomena from which information is being externalised, which further constrains individuals’ possibilities for unequivocal externalisations and, vice versa, for making inferences from behavioural events to psychical ones (Uher 2013, 2015a).

In a nutshell, psychical phenomena can be conceived of as multi-contextually embedded into the individual’s life, both internally and externally. The TPS-Paradigm

⁵ Previously labelled the *mind-environment connection* (Uher 2013).

therefore refers to the psyche also as the individual's psychical system, implying some properties of organisation that are common to all systems of living beings. Like all living systems, psychical systems can be conceived of as self-organising and therefore also as self-referential to considerable extent (cf. Luisi 2003). As living systems, psychical systems can be explored for both their compositional structures and the process structures by which their structural components function together in continuous and irreversible ways of development (Caprara 1996; Sato, Wakabayashi, Nameda et al. 2010; Uher 2015c; Valsiner 2000, 2012). The speed of change and development essentially differs between two kinds of psychical phenomena that the TPS-Paradigm differentiates on the basis of their temporal extension.

Experiencings and memorised psychical resultants

In line with concepts and terminology from German-language psychology, the TPS-Paradigm differentiates two kinds of psychical phenomena. Contrary to common practice in the English-language literature, the German term *Erleben* (Stern 1924) is translated as *experiencing* that is opposed to the *experiences*, German *Erfahrungen*, that one can make in terms of information gained from past events of experiencing. *Erleben* and *Erfahrung* both translate into experience; but they are not the same. *Erfahrung* is derived from *Erleben*; it is the empirical—the *a posteriori*—whereas experiencing is bound to the immediate moment (see below). Therefore, empirical sciences are also called *Erfahrungswissenschaften* in German; only few of these sciences explore experiencing in and of itself.

Experiencings are strictly bound to the present moment (Valsiner 1987; 2012). Experiencings are “actualities” (Gillespie & Zittaun, 2010, p. 72), which Stern (1924) referred to as the “immediacy of the product of internalizing⁶” (*Unmittelbarkeit des Innerungserzeugnisses*, p. 203). Pauli (1927) similarly ascertained experiencing is nothing persistent (*nichts Beharrendes*) but in continuous processes of change and characterised as ongoing events (*als Geschehen*). In this continuous flow of experiencing, every event is unique and never repeatable (James 1980; Salvatore, Valsiner, Gennaro, & Simon Travers 2010; Toomela & Valsiner 2010; Valsiner 2012).

Events of experiencing leave “impressions” in the individual that change his or her overall psychical system (von Uexküll 1909).

„Animals' vital activities toward outer stimuli do not simply proceed as in any machine, the construction of which cannot change. In contrast, animals' body plan continuously changes under the influence of the surrounding, such that one can say with exaggeration, a stimulus never encounters the same animal twice⁷” (von Uexküll 1909, p. 25).

Thus, individuals can retain in their psychical systems past events of experiencing in processed forms that are conceived of as *memorised psychical resultants of past experiencing* in the TPS-Paradigm. Importantly, events of experiencings are not simply stored in the same form as originally experienced. Experiencings are processed, thus becoming experiences that are interconnected with other experiences and integrated into the individual's psychical system the structure of which thereby continuously changes and thus develops (e.g., Le Poidevin 2011; Peirce 1902, CP 2.84; Sato et al., 2010; Uher 2013; Valsiner 2012). It follows that individuals can operate—internally and externally—only from

⁶ “*Innerung*” is not listed in German dictionaries in contrast to its opposite *Äußerung*, which means expression or externalisation for which, however, separate German words exist (*Ausdruck* and *Externalisierung*). Therefore, “*Innerung*” is translated here in the likewise non-existing English word “internalizing” rather than as impression or internalisation, for which separate Germany words exist as well (*Eindruck* and *Internalisierung*).

⁷ Translated original: „Es läuft die Lebenstätigkeit der Tiere auf äußere Reize nicht einfach ab, wie in irgendeiner Maschine, deren Bauplan sich gar nicht verändern kann. Im Gegenteil ändert sich der Bauplan der Tiere dauernd unter dem Einflusse der Umgebung, so daß man mit Übertreibung sagen kann, niemals trifft ein Reiz zum zweiten Male das gleiche Tier.“

within the repertoire of their hitherto reached systemic structure. This psychical structure, because it is *memorised*, is not strictly bound to the immediate moment—in contrast to the experiencings from which it results. Psychical resultants are inherently more temporally extended and therefore conceived of primarily as structures, although they are—just as experiencings, but necessarily slower than them—in continuous processes of development as well (Uher 2015a, c; Valsiner 2000, 2012).

Not only is the genesis of memorised psychical resultants inherently bound to experiencing but also their use. Reviving an *Innerung*⁷ once had is an *Erinnerung*—a remembering and *reminding* (Stern 1924). But reviving a past experiencing is not that same experiencing anymore because it has already ceased to be (Le Poidevin 2011; Uher 2013). Rather, it is a new experiencing that is (re)constructed in the given moment (Bartlett 1932) from the processed memory of that past experiencing as it has been retained and integrated in the hitherto reached mnemonic structure of the individual's psychical system (cf. Schacter & Addis 2007). Retrieved and reconstructed experiencings are processed again (e.g., rebuild, remodelled, reshaped) before they are memorised anew—a fact well known in psychotherapeutic research (Kelly 1955). Experiencing is the working mode of psychical systems. Experiencing can be conscious and also subconscious (Freud 1915); but it ceases to be in various states of loss of consciousness, such as during deep sleep, anaesthesia and in some clinical conditions (e.g., vegetative state; Casali, Gosseries, Rosanova et al. 2013).

Because memorised psychical resultants can be retrieved only in experiencings, individuals commonly do not notice a sharp division between them as can be made on metatheoretical levels. This can be illustrated by the example of perceiving (Gibson 1967).

Sensual, perceptual and psychical representations

Sense organs have evolved in ways that enable individuals to physically interact with physical events of particular kind. Interactions with events that are external to individuals are of particular importance for individuals' abilities to preserve their physical organismal properties. These physical interactions between external physical events (e.g., light) and individuals' sense organs (e.g., photoreceptor cells in the retina of the eye) produce neural signals—*sensations* (Gibson 1967; Schrödinger 1951). Sensory phenomena are internal to the individual's body; they are *sensory representations* of those external physical phenomena that elicit them. Like these external phenomena, sensory representations are also physical—some are material (e.g., chemical signals), others are immaterial (e.g., electrical signals). Sensory representations, given their different metatheoretical properties, internally present information from external physical phenomena in forms that differ from those of the phenomena from which information is being represented (e.g., the image of a tree that is created on the retina has different properties than the tree in and of itself that is being reflected and that is located external to the individual's body).

Sensations are physiological processes; but they are special ones operating at the border from the physical to the psychical into which they become processed as *perceptions* (Ader 2006). Sensory phenomena enable individuals to convert information from external physical events into information in internal psychical events—i.e., to externally perceive. Importantly, the patterns according to which sensations are converted into percepts are not fixed (see below) and sensations are not the only ways in which perceptions are generated (Gibson 1967).

Sensory impressions are occasional, highly fluctuating and incomplete because stimulus patterns in external events are never unchanging—already due to activities of the individual him- or herself, such as eye blinks or own movements. In addition, individuals' can flexibly shift their “perceptual lenses” and focus on particular details of physical events. This enables individuals to increase their sensory input but cannot fully make up for its inherent fragmentation (Brunswik 1952, 1956).

When individuals explore the invariant elements of an external physical phenomenon (e.g., by walking around a tree or by turning some of its leaves), variants in the individuals' sensations result from their own body movements. Because these changes have subjective reference to the individuals' own bodies (i.e., are *proprio-specific*; Sherrington 1906), these

sensory variants can be controlled by the individuals themselves, thus enabling them to extract those (sensory) invariants of their sensations that reflect properties of the external physical phenomenon that they are exploring. When invariant properties of external physical phenomena correspond to invariants in individuals' sensory impressions, individuals can obtain from these invariant sensory impressions information about the external phenomena under exploration and can develop *perceptual representation* of them (Gibson 1967).

Perceptual representations, unlike sensory ones, represent external physical phenomena in “non-physical” ways, thus *uncoupled from the physical laws* to which the physical phenomena that are being represented are bound. This further reduces the possibilities for isomorphisms between individuals' perceptual events and the physical events that are being perceptually represented.

Orientation toward life and self-maintenance imply that individuals can identify interrelations between elements—*information*—that are significant for their survival (cf. Gibson 1967). Individuals can psychically represent these interrelations as psychical associations. Of particular significance for living organisms are interrelations in and with the physical world. In millions of years, exposed to the physicality of this planet, many complex species have evolved that are equipped with organismal properties enabling each of their individuals to develop psychical representations that are sufficiently functional for their survival in those particular details of the physical universe to which their species has adapted (cf. Darwin 1859; Merleau-Ponty 1967).

During ontogeny, individuals' sensory and psychical representations develop from tight interplays with their external surroundings, often promoted by active explorations that are characteristic for the young individuals of mammalian species. Changes in individuals' sensory representations are often confined to particular temporal windows during their ontogenetic physical development (Rosenzweig, Leiman & Breedlove 1999). But changes in individuals' psychical representations are, given their “non-physical” properties, theoretically unlimited.

By comparing with one another psychically represented elements and their associations, individuals can identify commonalities and differences. These psychical processes enable *abstractions, generalisations and categorisations*, thus internal organisations of the elements that are being psychically represented. Abstracted and generalised representations, because they are being psychically derived, need not have direct counterparts in the external physical events that are being internally represented and analysed. No single tree exactly features the average properties that can be abstracted from many trees. Abstractions and generalisations are ideals—*ideas*—that represent only in approximated form those particular properties of external physical events that are important for the given individual (cf. Lahlou 1998).

In individuals' psychical systems, the *perceived*—the what-is-taken-in—becomes *conceived*—taken together in *concepts*. The pertinent everyday terms of the French language—*apercevoir* (to perceive)—*concevoir* (to conceive)—*voir* (to see) directly reflect that individuals can “see” (i.e., visually perceive) only when the sketchy sensory input is put together. Concepts also enable individuals to perceive different physical events as being *of the same kind* (e.g., “trees”) although the single events occurring in individuals' sensory perceptions are never identically repeated (Brunswik 1956). Concepts enable individuals to perceive physical objects as stable despite the fact that individuals' sensations of physical objects are always incomplete and vary rapidly (Gibson 1967). These properties enable individuals to perceive events with just minimal sensory input—a glance becomes sufficient to “see” a “tree”.

Individuals can also perceive internal physical events for which they are receptive, at least to some extent. As the events to be perceived occur internal to individuals, information from them need not be taken in from the external (for details, see Uher 2015a). Internal perception can also occur through bodily organs other than sensory ones (e.g., blood sugar levels). Individuals can process and abstract information from these internal perceptions, thus developing *conceptual representations* of inner organismal conditions (e.g., hunger).

Through these processes, individuals' psychical representations can become ever more detached from mere perceptual concepts. From *concrete* concepts, individuals can derive *abstract* concepts that no longer refer to concrete physical events that are directly perceivable. Individuals' conceptions of phenomena become independent from their embodied perception of single events of these phenomena. This enables individuals to internally represent the physical phenomena encountered in life also in the moments and situations in which the particular phenomena that are being psychically represented are not present (cf. Tomasello 2014).

Over time, psychically represented elements and associations and their abstractions and generalisations are taken together in concepts in ever more complex ways. Associations between concepts emerge resulting in networks of interconnected and contextualised concepts—i.e., *knowledge*. With increasing complexity and degrees of abstraction, new structures and qualities can emerge (cf. principle of emergence). By *performing* (i.e., changing the forms of) psychical representations of physical phenomena, individuals can also infer properties and interrelations in the properties of physical phenomena that are not directly perceivable, in and of themselves (cf. Tomasello 2014).

But inferences, as they are derived from psychical—thus “non-physical”—operations, are prone to the many fallacies, biases, illusions and errors that are intrinsic to human minds (Uher 2015a, c). Common-sense beliefs therefore represent the properties of physical matter that are important in individuals' everyday life in ways that are *viable* for the individuals' functioning in their particular physical surrounding (cf. Kelly 1955; Valsiner 2000). But regardless of their viability (e.g., in everyday life), individuals' psychical representations need not adequately *correspond* to what is given in physical phenomena and need not be “*correct*” in the scientific sense. In fact, physical laws are often ill-represented in everyday thinking (Wolpert 1992). Incongruencies between information in physical phenomena and in individuals' pertinent psychical representations can become apparent when individuals notice (e.g., from exploration or experimentation) that their psychical representations cannot predict the occurrences of physical events sufficiently well for enabling particular functionalities in interactions with these events. If such incongruencies are noticed and considered to be significant by (particular) individuals (e.g., scientists), given the abilities of psychical systems to self-organise, these psychical representations tend to approximate the new evidence, thus generating new knowledge.

Psychical representations of space and time and of “non-physical” phenomena

The abilities to internally represent physical phenomena disembodied from their immediate perception and to process and abstract psychical representations enable individuals to identify between the physical phenomena that are being represented also spatial relations that are not directly perceivable in and of themselves. Individuals can psychically represent such abstracted spatial relations in cognitive maps that enable them to psychically identify novel ways that they have never used before to reach places that they already know (Haas 2004; Tolman 1948). With increasing psychical capacities, individuals can develop more general and more abstract concepts of *space*.

When individuals' psychical systems reach certain degrees of complexity and abstraction, individuals can also notice changes in the psychical representations that they have developed about the same physical phenomena. Individuals may notice, for example, that they psychically represent the sky as bright but also as dark or the selfsame tree with green leaves, but also with yellow leaves and without any leaves. Changes that individuals become aware of are conceived of as *time* (St. Augustine 397 CE). Like all experientings, individuals' abilities to consciously perceive changes are embedded into the particular contexts of their current situatedness (see below). Therefore, individuals' abilities to become aware of changes vary within and between individuals—and thus also their perceptions of time (Le Poidevin 2004; Mellor 1985).

Awareness of physical changes that are directly perceivable in consecutive moments, such as the grains of sand in an hourglass flowing from the upper compartment into the lower one, leads to awareness of the passage of time in the *present* and of its flowing into

the memories that result from these experiencings, which are conceived of as the *past*. By mentally projecting changes into the what-is-not-yet, individuals conceive the *future* (James 1890; Le Poidevin 2004, 2011; Valsiner 2012). Hourglasses illustrate this concretely: The upper compartment is filled with the grains of sand that have not yet passed (the future) the minuscule border through which some grains are continuously flowing (the present) into the lower compartment that thereby becomes steadily filled with those grains that have already passed (the past).

Thus, although time itself is real, tense is not (Mellor 1985); past and future are constructions of the human mind (St Augustine 397 CE). Time always flows in just one direction (Prigogine 1996; Valsiner 2014). But individuals' psychical abilities, especially their mnemonic abilities, enable them to mentally travel backward and forward in time. Individuals use their memories of past events to imagine possible future events. This is also reflected in patterns of physical brain activity; the brain regions that are active when individuals retrieve past events and those that are active when individuals imagine possible future events show remarkable overlaps (Addis, Wong, & Schacter 2007).

The ability to conceive of various tenses presupposes conscious awareness of the passage of time—an ability that develops only with increasing levels of complexity of individuals' psychical systems during ontogeny (Fraisie 1964; Piaget 1969). But conceptions of the passage of time are immanent to all psychical phenomena, even if not consciously noticed by individuals. In fact, the ability to conceive temporal relations is central for individuals' ability to extract invariants from their rapidly varying sensations, thus for developing perceptual representations and other kinds of memorised psychical resultants. Individuals may not notice this because they can retrieve and reconstruct memorised psychical resultants only in their experiencings in which the present merges indistinguishably with the past (Gibson 1967).

Individuals whose psychical systems have reached certain levels of structural and organisational complexity are also able to evaluate, reflect on and monitor the outcomes of their own behaviours. Higher levels of complexity enable individuals to conceive and imagine (i.e., anticipate) possible outcomes of own possible future behaviours. Then individuals can make deliberate choices about own future behaviours, plan ahead and develop intentions (Tomasello 2014). The possible future outcomes that individuals can anticipate and imagine in their experiencings also function as motivators and guides of individuals' current and future behaviours that thereby become *actions* (Bandura 2006). With increasing complexity of psychical systems, individuals can construct appropriate action plans and motivate and regulate their execution (Searle 2003). Through these abilities, individuals can increasingly become *actors* of their own lives who are able to partially chose and influence their own life circumstances as well as the directions and courses of their own development (Bandura 2006).

Individuals with more complex psychical systems can also conceive of their own psychical phenomena in and of themselves and reflect (within limits) on the operations that they use to process experiencings and to construct meanings and knowledge (e.g., abstraction, inference; Bandura 2006). As agents, individuals can also reflect on the experiences that they have made in relation to themselves and their own functioning and they can integrate these experiences in their autobiographical memories, thus expanding their psychical worlds by *psychical representations about themselves—their selves* (Gillespie 2006). Every individual becomes unique through his or her own self-related memories. On the basis of the continuity that individuals perceive in their memories and from which they conceive and imagine their possible futures, individuals construct their own personal identities and they develop and pursue goals and plans for their lives. By imagining possible events and outcomes in the more distant future, individuals make sense of their lives (Bruner 1986; Harré 1983; McAdams 2001; Thomae 1988).

Psychical representations about psychical phenomena are representations of a very special kind because, for psychical phenomena, physical properties cannot be conceived. There are thus no physical counterparts toward which these psychical representations could be approximated. Moreover, the “non-physicality” of psychical phenomena does not offer

any point of reference that the introquesting individual could use to reliably differentiate in his or her continuously flowing experiencings various kinds of experiencings (e.g., those often referred to as thoughts, emotions, feelings, impulses) and various kinds of memorised resultants that he or she can reconstruct from his or her psychical system (e.g., those often referred to as self-concepts, attitudes, abilities, motives, interests, knowledge; cf. Kant 1786).

However, the specific formations that psychical representations take in any given individual are not important. What is important is the functionality that psychical representations have for the given individual in his or her given internal and external multi-contextual embeddedness. This functionality of psychical representations—their *meaning*—arises from the individuals' abilities to self-organise and to preserve themselves (Uher 2015a).

Socially shared psychical representations

As members of the same species, individuals share much of their organismal properties—their basic physical systems (i.e., morphology, physiology, behaviour) as well as their general relations to the external physical phenomena that commonly occur in their particular habitat (i.e., their ecological adaptation; Uher 2011b). On the basis of their conspecifically shared organismal properties, individuals develop psychical representations that, despite their inherent idiosyncratic formation and development, show some functionalities that are generally similar. Individuals tend to conceive similar—i.e., conspecifically and thus socially shared—meanings that are functional for all members of their species (cf. Merleau-Ponty 1967; von Uexküll 1909). It is because of these similarities that individuals of humans and of other social animals are able to acquire knowledge—i.e., *learn*—from each other.

The most elementary forms of social learning presuppose that multiple individuals can perceive *one and the same* event of a given physical phenomenon, thus they presuppose phenomena that are extroquestively accessible. These forms of social learning also presuppose that individuals are able to externalise the *meanings* that they have constructed for their psychical representations and to produce externalisations (e.g., behaviours) that allow other individuals to correctly infer the individually constructed meanings. These other individuals must be able both to make the correct inferences and to construct similar meanings—each individual for him- or herself and in their own idiosyncratic formations. For example, from the temporal and spatial proximity between sight of a snake and an individual's warning call (i.e., externalisation; both extroquestively accessible) and on the basis of the already shared meaning of the call (e.g., “danger on ground”), other individuals nearby may infer that the caller may associate a snake with a danger and they may, on the basis of this inference, construct pertinent associations in their own psychical systems. Predator-specific alarm calls are known from many species, such as rhesus macaques and vervet monkeys (Cook & Mineka 1989; Seyfarth, Cheney & Marler 1980).

This form of *social co-construction of psychical representations* occurs *in reaction to* particular events (e.g., snakes appearing). In addition, it depends on specific *constellations of occasions*. First of all, it depends on the temporal and spatial proximity of the relevant event and multiple individuals who can perceive this event and for which some individuals (the knowers) already construct a particular meaning, whereas others (the learners) do not. It furthermore depends on the learners' correct interpretation of the knowers' externalisations and of these externalisations' reference to the particular physical object being perceived in proximity as well as of the learners' perceived relevance that both the knowers' externalisations and the objects perceived have for themselves. The TPS-Paradigm therefore refers to this form of social learning as *reactive and occasion-based co-construction* of psychical representations. Phylogenetically seen, this may be the oldest form of how individuals co-construct psychical representations.

The abilities to become aware of and sensitive to others' perception and focus of attention (Call & Tomasello 2007) and to achieve joint attention to one and the same event (Tomasello 2009) further increase individuals' abilities to co-construct psychical

representations. Individuals with psychical systems of higher complexity are also able to infer, from reflecting about themselves and from observing others' externalisations, that other individuals as well perceive and conceive of the world and develop psychical systems that may be analogous to their own (Gibson 1967; Schrödinger 1958). With increasingly complex psychical systems, individuals can infer others' intentions, take others' perspectives on the world and imagine themselves in the role of others, thus establish *intersubjectivity* (Mead 1934; Piaget 1928). Psychical representations about others' psychical systems, often referred to as *theories of mind* (cf. Whiten 1991), also enable individuals to substantially increase and refine their abilities to co-construct psychical representations.

Semiotic representations: Tools enabling exchange between individual minds

For co-constructing psychical representations (e.g., of external physical phenomena or of mental, emotional or volitional experiencings), individuals must overcome the unique intricacies that arise from the one-sided psyche-external surrounding connection and the fundamental imperceptibility of psychical phenomena by other individuals. Psychical phenomena, in and of themselves, as they are entirely internal and "non-physical", cannot directly interact with phenomena that are external to the individual's body—and thus not with other individuals' sensations and perceptions. To interact with external phenomena, individuals must *externalise* the meanings that they have constructed for their psychical events. That is, individuals must convert these meanings—through *external physicalisation*—into information in physical phenomena that others can sense and perceive (i.e., access extroquestively), such as into information in the physical phenomena of behaviour (Uher 2013) and of matter other than those of the individuals' body (i.e., *objectivation*; cf. Moscovici 1961).

To externalise and communicate meanings that are essential for individuals' survival, species-specific behavioural repertoires that are shared by all conspecifics have evolved. These behaviours and the particular meanings that they convey are often acquired quickly and with little tolerance for error. Socially raised dog puppies learn quickly to correctly interpret snarls. In adult dogs, lack of this knowledge is rare, often resulting from social deprivation. Species-specific behaviours (e.g., snarls) typically refer to concrete physical events that are present in the given moments in which the behaviours occur (e.g., food, conspecifics) and they convey concrete meanings (e.g., defence readiness). Species-specific behaviours that are used to externalise vitally important meanings are *not completely arbitrary* but often linked with other behaviours of similar function and meaning. Snarls occur close to the teeth, which can be used to injure. Baring the teeth additionally supports the meaning conveyed by the snarling. Such links between functionally similar behaviours can reduce the risks of misinterpretation at least within a given species as the meanings that behaviours can convey are often species-specific (cf. the different meanings of physically similar behaviours of dogs and cats; Uher 2008a, b).

Importantly, the communication of meanings through species-specific behaviours presupposes *temporal and spatial proximity* of the individuals between which it occurs and of the physical objects to which the meanings refer. No dog snarls for defending food unless he perceives both food and a potential competitor. In addition, the possibilities to infer meanings are *bound to the behaviours* in which they are externalised—and thus *to the particular moments in which these behaviours occur*.

Genesis, types and metatheoretical properties of semiotic representations

Meanings can also be externalised in external bodily activities or changes (e.g., vocalisations, movements) that have no a priori fixed (and likely evolutionarily derived) function in a given species and that thus need not be behaviours. Therefore, meanings can be assigned *arbitrarily* (cf. Holloway 1969) to such externalisations that thereby become functional—and thus behaviours. Through reactive co-construction, multiple individuals can psychically represent specific *assignments* in similar (i.e., socially shared) ways. The particular physical events (e.g., movements) that are used to externalise information from

particular psychical events (e.g., constructed meanings) thereby become *signs* (e.g., semiotic behaviours).

Unlike species-specific behaviours, semiotic behaviours—i.e., *behavioural signs* (e.g., gestures, spoken language)—allow individuals to uncouple the transmission of meaning from the spatial and temporal coincidence of the particular physical events to which the meaning refers (e.g., snakes)—thus, from individuals' immediate perception of these events. This opens up further possibilities for individuals to co-construct socially shared meanings (see below). However, the transmission of meaning is still bound to the particular moments in which the behavioural signs are displayed. It is also still bound to the individuals who externalise the meanings (which, however, provides opportunities for other individuals to immediately check the inferences that they have drawn from the behavioural signs displayed).

Individuals can also externally physicalise meanings in matter other than that of their own bodies—i.e., in *material signs* (e.g., clothing, pictures, written language, numerals). Compared with behavioural signs, material signs are temporally more extended. As they are independent from individuals' bodies, material signs allow individuals to uncouple the processes of encoding meanings in signs from the processes of decoding the meanings from the signs again. This opens up unprecedented possibilities to *transmit meanings in absence of the objects* to which they refer and *across time and space* (though at the expense of possibilities to immediately check the inferred meanings with the individuals who have externalised the meanings). Material signs can therefore be conceived of as *physicalised resultants of past externalisations* of socially shared meanings.

Given that meanings are assigned arbitrarily to behavioural and material signs, the specific physical events used as signs have no immanent meanings in and of themselves. In behaviours, individuals' possibilities for creating sets of diverse yet distinct signs (e.g., phonemes) are constrained by their bodily abilities. For example, the phonemes of the words “dog”, “chien”, “cane” and “Hund”, which denote the same animal in different languages⁸, sound entirely different, but each of them centres on a vowel. By contrast, matter other than that of individuals' own bodies provides more opportunities for individuals to create sets of distinct signs (e.g., graphemes) because these materials are much more diverse and they can be designed and transformed. For example, across different spoken languages, humans have developed very different writing systems (e.g., Latin, Cyrillic, Greek, Arabic, Kanji or Hebrew alphabets). In some of these systems, single signs denote concrete phenomena or even associations of several concrete phenomena that denote abstracted phenomena. But in other systems, single signs denote only word stems, syllables or just letters that must be compounded into “words” before they are able to denote concrete and abstracted phenomena.

Behavioural signs and material signs can be created to externally physicalise *all kinds* of meanings. Communities en route to developing semiotic systems (most likely) first create signs that refer to concrete physical phenomena the events of which can be directly perceived by multiple individuals (e.g., a dog, a lightning stroke). By referring to the physical phenomena as such, the meanings of such signs are *denotative* (i.e., literal). To both the signs and the physical phenomena that are being denoted by these signs, communities of individuals can assign additional meanings that are *connotative*. Connotative meanings often refer to the value that communities attribute to the phenomena to which the meanings refer or to their use (e.g., dogs as pets, guards or meat deliverers; cf. Bühler 1934; Shweder & Sullivan 1990).

Denotative meanings, as they refer to physical phenomena as such, are constructed on the basis of criteria that are bound to structures and associations occurring in nature and that therefore cannot be changed without introducing contradictions (cf. Bühler 1934; Shweder & Sullivan 1990). Horses are quadruped animals, bipedal animals are not horses. Material signs (e.g., drawings) denoting concrete physical phenomena (e.g., horses) are therefore not completely arbitrary because individuals can approximate their psychical

⁸ In English, French, Italian and German language.

representations to the physical properties of these phenomena that the individuals, given their shared organismal properties, likely perceive in similar ways. Therefore, denotative material signs often show similarities across sociocultural communities. Horses are typically depicted as quadruped creatures—even in Palaeolithic cave paintings up to 40,000 years old (Bahn 2007).

The construction of connotative meanings, by contrast, is not necessarily bound to structures and associations that can be found in nature. For some sociocultural communities, horses are meat deliverers, for others they are status symbols and for still other communities horses are means for transportation or for carrying out heavy work. Variations in material signs (e.g., in horse paintings) may therefore result from and thus indicate variations in the connotative meanings that particular communities attribute to the phenomena that these signs denote. Variations in material signs can therefore be used to explore sociocultural differences in connotative meaning systems (as demonstrated, e.g., in analyses of children's drawings of their family members; Gernhardt, Rübelling & Keller 2013). In language, however, such inferences are complicated because humans (most likely) first developed written language on the basis of behavioural signs (e.g., vocal and gestural language). The first material signs (e.g., written language) were developed only much later in human phylogenetic history and, most likely, these material signs were created to externally physicalise meanings for which behavioural signs had already been developed.

Over time, communities of individuals develop complex systems of systematically interlinked signs to which they assign denotative and connotative meanings. With increasing sophistication of the semiotic systems that have already been developed, communities are also able to establish signs that refer to phenomena that are not directly perceivable, such as properties that can only be inferred or abstracted from concrete events. Such communities can also create signs that refer to psychical phenomena in and of themselves, thus to phenomena for which physical properties cannot be conceived and that, moreover, can be perceived only by each individual him- or herself (i.e., introquestively). Given this, the pertinent material signs vary more strongly than signs representing concrete physical phenomena. The same applies to signs that refer to ideas of supernatural phenomena (e.g., spiritual beings) to which individuals ascribe properties that are incompatible with the properties of physical phenomena. Similarities in the pertinent signs developed by different communities (e.g., sculptures or pictures representing deities) can still be found because the social co-construction of inferred, abstracted and fictitious meanings presupposes signs that represent concrete meanings. Material signs representing spiritual beings therefore often show anthropomorphic or animalistic properties, thus properties of physical phenomena that can be directly perceived (e.g., physical beings).

To recapitulate, signs are created to represent meanings externally—thus necessarily physically (i.e., in behaviours or matter), which enables their direct perception by multiple individuals. Signs therefore facilitate the co-construction of meanings referring to concrete phenomena and first enable the co-construction of meanings referring to phenomena that cannot be directly perceived. Like all psychical phenomena, meanings are bound to the individuals who conceive them. Thus, although many signs are created in matter that are independent of individuals' bodies, semiotic representations are always *bound to the individuals who create and co-construct them*. The TPS-Paradigm therefore conceives of semiotic representations as *composite kinds of phenomena* that comprise psychical phenomena that are tightly intertwined with external physical phenomena that are used as signs. Hence unlike behavioural or psychical phenomena in and of themselves, *semiotic representations are phenomena with heterogeneous metatheoretical properties* comprising both internal and external phenomena, both physical phenomena and “non-physical” ones and both phenomena that are bound to the present moment (e.g., spoken words, constructed meanings) and phenomena that are temporally more extended (e.g., written words, hieroglyphs).

Importantly, between phenomena with opposed metatheoretical properties isomorphisms can generally be only low even if they are directly interrelated. Therefore, semiotic representations are phenomena with heterogeneous structures and of *particular*

complexity. It follows that signs cannot be considered independently from the meanings that are assigned to them by particular communities, unless the physical phenomena used as signs are considered only as such rather than as signs (Uher 2015a, b, c).

Stability and change of semiotic representations

Meanings, given their „non-physical“ properties, can never be replicated in identical form as this is possible for the events of physical phenomena to some extent. Meanings must always be (re-)constructed anew by individuals in each given moment. Therefore, meanings *change* continuously.

Co-constructions of meanings and of semiotic representations are based on processes of *ex-change* between two or more individuals—i.e., on *dialectical* transmissions of meanings. In dialectical processes, amongst others, interactions between elements can result in changes of the elements and their interrelations in and of themselves, thus leading to irreversible processes of change and development (Caprara 1996; Prigogine 1996). Processes of social *ex-change*, given their dialectic properties, have their own dynamics that are unlikely to be isomorphic to the processes that occur in the psychical systems of each participating individual (cf. principle of emergence). Dialectical processes contribute to the particular dynamics that occur in the co-construction of socially shared meanings, thus fuelling their permanent and continuous change.

Importantly, changes in meanings need not correspond either to changes in the physical phenomena to which the meanings refer (e.g., dogs, horses, family members) or to changes in the behavioural or material signs that are used to externally physicalise these meanings (e.g., gestures, writing systems, sculptures). Meanings can also be forgotten, such as the meanings that ancient communities have once co-constructed and externally physicalised in material artefacts. Without sufficient knowledge about their creators, the meanings of many ancient artefacts cannot be reconstructed anymore and some remain mysterious for present-day-humans. Meanings of socially shared representations, can be only as stable as the mnemonic systems of the individuals who co-construct these meanings. Meanings decay with individuals' memories (e.g., in dementia) and with their lives. Communities therefore develop various ways to preserve and propagate their systems of shared meaning.

Communities of individuals can be conceived of as living systems. Communities organise themselves and develop structures and mechanisms enabling their members to systematically co-construct and propagate socially shared meanings and to preserve the functionality that these meanings have for them. For this purpose, human communities systematically install physicalisations in both individuals' behaviours (e.g., practices, institutions) and external matter (e.g., buildings; cf. World Installation Theory; Lahlou 2008, 2011). The possibilities to create, propagate and preserve semiotic systems depend on the particular kinds of external physicalisations used. Behavioural signs (e.g., gestures, practices, spoken language), as they are bound to the individuals—and thus always available (i.e., “at hand”)—may be created more quickly than signs that are externally physicalised independently of individuals' bodies and for which additional materials are needed (e.g., stones, chisel, paper, ink). But behavioural signs, as they are bound to the present moment, may be more difficult to preserve and to propagate over longer distances. Variations in spoken language between regions and over time emerge more quickly than in written language and may therefore be more pronounced. Technologies to create material signs (e.g., stone inscriptions, letter press, computers) increase communities' possibilities to create, propagate and preserve signs. Audiovisual technologies can also promote the propagation of behavioural signs—today even globally. When the behavioural sign of showing the soles of one's shoes to externalise anger and insult, originating from the Arab world, became known globally, it was soon also used by protesters in countries outside the Arab world and where it had previously been unknown, such as in Germany or the United States.

Social practices and institutions are mechanisms and structures that are aimed at governing individuals' behaviours in order to establish and to enforce social order and cooperation in communities (Durkheim 1895).

"Arbitrary symbols enforce consensus of perceptions, which not only allows [community] members to communicate about the same objects in terms of space and time ... but it also makes it possible for social relationships to be standardized and manipulated through symbols. It means that idiosyncrasies are smoothed out and perceived within classes of behavior. By enforcing perceptual invariance, symbols also enforce social behavioral constancy, and enforcing social behavioral constancy is a prerequisite to differential task-role sectors in a differentiated social group adapting not only to the outside environment but to its own membership" (Hollway 1969, p. 406; cf. also Baldwin 1896a, 1896b).

However, the organising functions of social practices and institutions can be fulfilled and preserved only, if all individual members of the community internalise (i.e., psychically represent) the meanings of the normative semiotic representations that are established for these purposes (e.g., norms, rules, rituals, religions) and only if the individuals co-ordinate their activities accordingly. As these normative semiotic representations are directed at individuals' *behaviours*, their meanings are primarily transmitted through behavioural signs. This requires individuals who physically represent the given institutions with their own bodies and behaviours, who communicate the normative meanings, and who control and enforce individuals' adherence to these norms. Given the limitations of behavioural signs in terms of their boundedness to individuals and the present moment, larger communities and institutions also externally physicalise their normative semiotic representations in material signs (e.g., formal clothing, codices). But written norms and rules, in and of themselves, cannot affect anything unless individuals act upon them (cf. Weber 1922). This again reflects the heterogeneous metatheoretical properties of semiotic representations comprising both psychical and external physical phenomena (Uher 2015a).

Communities must also deal with the inevitable and continuous changes in meanings. If meaning systems that diverge too strongly from the physical phenomena to which they refer become established, and if meanings with non-proven, insufficient or even missing functionality are propagated and preserved, communities may become unable to self-organise and preserve their functional structures, both internally and across their boundaries so that, eventually, communities may collapse. The processes of creating, implementing and propagating social practises, norms, rules and institutions are important means for communities to self-organise. The temporal and spatial extensions of these processes have decelerating effects on the inevitable and continuous change of meanings. This gives communities the time needed to test the functionality of inventions and novel adaptations (see below; cf. Baldwin 1896a, 1896b). Specifically, the processes involved in social exchange contribute to the communities' abilities to identify, promote and preserve those socially shared meanings that are important and functional for their survival (e.g., belief systems, religions), to adapt these meaning systems to changes occurring in their physical surroundings (e.g., economic or ecological changes) and to other similarly changing meaning systems within and beyond the boundaries of the particular community (e.g., social or ecological movements, political or societal systems), and to install the external physicalisations of their meanings systems accordingly (e.g., social practices, community buildings). These processes enable communities to influence and direct their own development, and thus to become actors in their own histories.

To preserve meanings, as they are not immanent to the physical phenomena that are used as signs in and of themselves, communities also develop semiotic representation systems in which meanings, especially normative ones, are encoded in contextualised ways, such as narrative histories of communities and nations (e.g., myths, legends) and their external physicalisation in textual documents (e.g., the Bible, the Koran, the Torah, national law codes). *Contextualisation* of the physical representations can reduce but not prevent

variations in the meanings that individuals reconstruct from them; one and the same text is interpreted differently by different communities leading to different behavioural practices. Supreme courts not only create new laws and physicalise them in textual documents; they also survey and decide on the interpretation of laws that are already textualised.

Significance of semiotic representations for human development

By enabling the transmission of experiences and knowledge between individuals and across times and places—though always bound to individuals' memories—semiotic representations open up new dimensions for development that increase individuals' opportunities to actively influence and create the conditions of their own lives.

With the creation of semiotic representations, individuals' development is no longer confined to their physical organismal properties that are derived in comparably fixed ways from genetically inherited molecular codes (Schrödinger 1944; Watson & Crick 1953). These genetic codes are generated from mechanisms of *random* variation and are acted on by selective external pressures (Darwin 1859; Wallace 1858). Genetic codes are also acted on by epigenetic processes, enabling the transgenerational transmission of *physical* changes that individuals' have acquired over the courses of their lives (Mayr 1966; Waddington 1942; Bradbury 2003).

The organisational structures and functional processes of individuals' psychical systems, which are derived from each individual's interactions with and adaptations to his or her particular internal and external physical conditions, contributes to individuals' survival additional functionalities that are unequalled by any of the functionalities derived from their physical properties. These functionalities of psychical systems together with the external physicalisations of their central elements (i.e., their meanings) in behavioural and semiotic systems open up additional dimensions that affect individuals' development in highly complex ways and far beyond mere randomness and the physicality of matter (Bandura 2006; Jablonka & Lamb 2005). The complex composition of semiotic representations linking physical and psychical phenomena with one another accelerates and diversifies the processes of ontogenetic and phylogenetic development to an unprecedented extent, both quantitatively and especially qualitatively.

Most central to these additional functionalities is the individuals' organismal ability to self-organise their psychical systems—i.e., their *individual learning*. Baldwin (1896a) assumed that not the specific functionalities that individuals develop during ontogeny, in and of themselves, are selected on but rather individuals' general capacity for developing specific functionalities (cf. also Dobzhansky 1972).

Of particular significance are the individuals' capacities for developing psychical processes that are conscious. Conscious psychical processes go beyond the psychical properties that individuals develop on the basis of congenital properties enabling individuals to survive on the basis of spontaneous activities (e.g., instincts; Baldwin 1896a). The psychical properties that individuals develop from their interactions with the particular internal and external physical conditions that they encounter in their lives contribute to individuals' survival—and thus also to the maintenance of those heritable organic variations that enable the development of these psychical properties. “This principle secures by survival certain lines of *determinate phylogenetic variation* in the directions of the *determinate ontogenetic adaptations* of the earlier generation” (Baldwin 1896a, p. 447; emphases added), thus preventing “incidences of natural selection” and allowing for more time for the population to produce variations, both novel and congenital ones (Baldwin 1896a, 1896b).

Unless the organic variations that enable the individuals of a given population to develop particular kinds of psychical properties have already become genetically heritable (e.g., properties of sensual perceptions), individually developed psychical properties are functionalities of novel kind (e.g., mathematical abilities). Thus, it is by using these novel functionalities that the individual can survive and propagate the novel kinds of psychical properties in his or her population, such as by externally physicalising the meanings of these functionalities in behavioural or material symbols (e.g., mathematical symbols; cf. Peirce

1902). External physicalisations allow individuals to build on these novel functionalities in order to develop additional and more complex psychical properties with even more complex functionalities (e.g., architectural and engineering abilities). In this way, individually developed psychical properties with *proven functionality for the particular internal and external physical conditions that are present in individuals' lives* rather than only random mutations of a priori neutral (i.e., blind) functional value can become gradually and transgenerationally incorporated into the genetically and epigenetically transmissible organic variations of the population while the principle of natural selection may be still operative (Baldwin 1896a; Tomasello 1999).

In socially living species, individual development into *determinate* directions rather than into random ones is also enabled by the “purely extra-organic ways of social heredity” (Baldwin 1896a, p. 539)—i.e., by transmissions through behaviours and semiotic representations (Jablonka & Lamb 2005). Both organic and non-organic inheritance may contribute to the *same psychical functionality*; individuals' conscious psychical processes may lead them to consciously do what they may also do congenitally (i.e., instinctively). Transgenerational transmissions through behaviours and semiotic representations also enable populations to preserve functionalities that either are not yet or never will be organically heritable. Although this kind of transmission is not based on organic heredity in and of itself, it keeps alive heritable organic variations. It “thus sets the direction of ontogenetic adaptation, thereby influences the direction of the available congenital variations of the next generation, and so determines phylogenetic development” (Baldwin 1896a, p. 537).

Of particular significance are individuals' psychical abilities to co-construct psychical representations because socially shared representations enable coordinated activity and cooperation between individuals (Lahlou 2001). Individuals who are able to develop novel psychical properties that promote social coordination and cooperation have therefore advantages over individuals who are less or (still) not able to develop such psychical properties. This creates new—i.e., social—selection pressures that determinate the directions for future development in a given population. In addition, these social selection pressures may also raise the functionality of a social community to a new standard such as by enabling novel behavioural performances (e.g., metalworking), thus changing the frame of selection within and across communities and populations (Baldwin 1896a, 1896b; Dennett 1991).

Within a given population, as behavioural and semiotic transmissions become more important for propagating the development of psychical properties that enable novel and significant functionalities, capacities for developing specific psychical properties on the basis of heritable organic variations (e.g., instincts) become more broken up to allow for the plasticity that individuals need for their individual learning. “The [human] child is the animal which inherits the smallest number of congenital co-ordinations, but he is the one that learns the greatest number” (Baldwin 1896a, p. 540).

Individual learning allows for the development of highly individualised psychical systems (often referred to as „personality“; Uher 2015a, b, c) that are idiosyncratically adapted to the particular physical conditions that the given individual encounters in life, both internally (i.e., the own body and its particular organic variants) and externally (e.g., ecological system, physical installations of the sociocultural community). This high plasticity in the individual development of adaptations during ontogeny, as compared with the adaptations enabled by instincts, is considered one of the driving forces behind humans' accelerated phylogenetic development. Through behavioural and semiotic externalisations, individually developed functionalities and knowledge can be passed on to other individuals, thus preventing social retrogression and enabling cultural evolution (Jablonka & Lamb 2005; Tomasello 1999).

For enabling such transmissions, young individuals must have the capacities to develop their psychical properties not only from processing their *own* experiencings and from constructing their *own* meanings but also from reconstructing and processing meanings that *other* individuals have behaviourally and semiotically encoded—through *observational*

learning, instruction and education (Baldwin 1896c). This entails particular challenges for young individuals because these meanings were constructed by *other* individuals—thus originate from other psychological systems that are each highly individualised and historically unique. Young individuals must be able to develop the psychological abilities that are needed to infer and to reconstruct these meanings from others' behavioural and semiotic externalisations, to process and psychologically represent these reconstructed meanings and to develop pertinent psychological properties that are sufficiently functional for themselves and in their own lives. In addition, young individuals must psychologically represent the particular assignments of these socially shared meanings to the particular behavioural and material signs that are established in their community. This means, young individuals must organise the structures of their psychological systems not only in *ego-centric* but also in *allo-centric* ways.

Individuals with pertinent inherited properties can develop complex psychological systems through reactive co-construction. By observing their mothers and other individuals, young individuals can develop complex psychological properties enabling them to acquire complex functionalities that have been developed by individuals of previous generations. In this way, individuals of various species of non-human primates, amongst others, learn to use tools to crack open oysters, crustaceans or nuts (e.g., crab-eating macaques, Gumert, Kluck & Malaivijitnond 2009; capuchin monkeys, Visalberghi & Fragaszy 2012; and chimpanzees, McGrew 1992).

In humans, however, the psychological functionalities that have been developed by previous generations (e.g., mathematical abilities, natural science knowledge) and the psychological abilities that are necessary to acquire and to successfully apply these psychological functionalities have meanwhile reached such levels of complexity that these functionalities cannot be transgenerationally transmitted by means of reactive co-construction alone. Their transmission additionally requires processes of co-construction in which still less capable individuals are exposed to purposefully induced (rather than incidental) co-occurrences of events and are actively guided in their psychological development (i.e., their learning) by individuals who already have developed the particular kinds of psychological functionalities and capabilities. This is referred to as *active and intention-based co-construction* in the TPS-Paradigm.

Active intention-based co-construction and guidance (i.e., instruction, education) presuppose the ability to make valid and differentiated inferences from the externalisations (e.g., behavioural performances) of other individuals—especially of (still) less capable ones—on the hitherto reached psychological properties of these individuals (cf. theories of mind; Baldwin 1906). More capable individuals can actively guide the learning of (still) less capable individuals by making such inferences from the learners' previous externalisations, by considering possible constraints and opportunities that are available to the learners in the given settings and moments and by mentally constructing the learners' potential capacity for developing particular kinds of psychological properties in the near future (cf. zone of proximal development, Valsiner 1987; Vygotsky 1978). With increasing capabilities and levels of complexity of their psychological systems, young individuals are increasingly able on their own to further differentiate their psychological properties and to develop novel functionalities by encoding behaviourally and semiotically encoded meanings (e.g., by studying text books).

Semiotic systems comprise both physicalised resultants of past externalisations of socially shared meanings (i.e., signs) and co-constructed memorised psychological resultants derived from past individual experiencings (i.e., socially shared meanings). As resultants of past lives, semiotic systems implicitly reflect the experiences and the knowledge made and created by individuals of previous generations who were exposed to other internal and external physical conditions and who have lived in other times (cf. Gergen 1973; Peirce 1902; Valsiner 2012; Vygotsky 1934). Thus, the meanings of signs are derived from the past—even the meanings of the signs that are used to refer to the present and even though their particular meanings will inevitably have changed over time within and across communities.

In a nutshell, semiotic representations are of crucial significance for individual development and human evolution. Semiotic systems contribute to human's ability to actively

create external physical conditions that are highly complex and rapidly changing and that, in turn, require human individuals to continuously develop and propagate novel psychological functionalities. As these processes are inherently irreversible and historically unique, they increase and accelerate processes of diversification in the developmental history of life.

Present thyself: Artificially modified outer appearances—semiotic representations of special kind

An obvious core characteristic of the human species found in all communities around the globe are the artificial modification of individuals' natural external morphology (e.g., hairstyle, body painting, fragrances, clothing, accessories). The TPS-Paradigm refers to these modifications as the phenomena of individuals' artificially modified outer appearances. These phenomena are external to individuals' bodies and primarily material physical. They are used to change individuals' outer appearances selectively on an individual level and in addition to those changes that emerge naturally during ontogenetic development (e.g., in body sizes, shapes and proportions; cf. Uher 2013, 2015a). Besides some functions for protection and warmth, these phenomena are often used to convey particular meanings to other individuals. In fact, they are often targeted towards others' perceptions, thus playing important roles in social perception. The TPS-Paradigm therefore conceives of artificial outer-appearance modifications as special kinds of semiotic representations comprising both psychological phenomena (i.e., meanings) and external material phenomena that are attached to individuals' bodies (e.g., clothes), in contrast with other material signs.

The temporal extension of the phenomena of artificially modified outer appearances differs from that of other external physical phenomena of individuals' bodies. Specifically, individuals can artificially modify their outer appearances far more quickly than natural changes can occur in their external morphology. But compared with the fluctuating and momentary phenomena of behaviours, artificially modified outer appearances are much more temporally extended, which facilitates their perception by others, thus promoting their semiotic function. Individuals use artificial outer-appearance modifications to physicalise meanings of normative semiotic representations, such as to indicate their membership to a particular social community or their social status within the given community (e.g., uniforms, insignia). As these phenomena can be modified by the individual him- or herself, artificial outer-appearance modifications are also used to construct meanings that have particular relevance for their carrier, such as to (co-)construct the individual's "personality"—both by him- or herself and by others (Uher 2015a, b, c).

Contexts: "Environments" that are inseparable from individuals

The phenomena of contexts, in the broadest sense, refer to the events that are considered with regard to particular phenomena in a given individual and that are commonly referred to as "environments", surroundings, circumstances, conditions, background or settings, amongst others. In everyday life—but also in science, individuals often conceive of the "environment" as the external physical events (Gifford 1997) that surround or encircle (i.e., environ) the individual being considered, thus conceptually separating the given individual as the actual target of consideration from all other phenomena (Valsiner 1987). This dualistic concept likely reflects individuals' experiences of themselves as agents who encounter, actively seek out and also create the conditions of their lives. Individuals always perceive these conditions from the particular viewpoints that are enabled by their own psychological systems. Given the particular perceptual and conceptual representations that individuals have developed of their world, they also tend to conceptually separate specific parts of the "environment" from one another, such as abiotic from biotic parts (i.e., non-living versus living matter) or natural from social and built parts (i.e., nature versus culture). But such differentiations always depend on the particular conceptual perspective taken by a given individual in a given situation. Specifically, the biophysical "environment" also comprises non-conspecific and conspecific—thus social—settings (e.g., animal and human family members are present not only with their bodies but also with their psychological systems

and social relationships). Vice versa, the socioculturally built “environment” also comprises abiotic and biotic physical phenomena (e.g., cities, gardens, agriculture).

Exclusive conceptual separations of individuals from their “environment”, although they may appear obvious from each individual’s own viewpoint, are not tenable, however, because the same external physical condition is not the same for all individuals (Lewin 1936). Von Uexküll (1909) therefore differentiated *Umgebung*, the given-around or surrounding, from *Umwelt*, the world-around. The *given-around* or surrounding is conceived of as the physically given in which organisms are included as physical objects. The *world-around*, by contrast, is determined by the individuals being considered and their particular organismal properties that enable them to perceive only particular properties of their surrounding. Hence, the world-around is not just physical and not just external to the individual. As self-organising living organisms, individuals are so intimately interconnected with the external physical surrounding that both cannot be conceived of independently from one another. As a consequence, elements of the external physical universe cannot be conceived of as being *exclusively separated* from the individuals who are being considered. Instead, they can only be conceived of as *inclusively separated* (Valsiner 1987).

Inclusive conceptual separations can be made on the basis of the particular forms that can be conceived with regard to the three metatheoretical properties for the different kinds of phenomena that are involved in an individual’s world-around (Uher 2015a, c). The TPS-Paradigm therefore conceives of the *phenomena of contexts as composite kinds of phenomena* that comprise at least one basic kind of phenomenon (i.e., morphological, physiological, behavioural or psychical), which is thus physically inseparable from the studied individual’s body (without destroying its integrity). In addition, a given contextual phenomenon may comprise further basic kinds of phenomena and/or external phenomena that are independent from the studied individual’s body (e.g., family members, books, interiors). Hence, contextual phenomena may comprise both physical and psychical phenomena, both external and internal phenomena as well as both phenomena that are bound to the immediate moment and phenomena that are temporally more extended. Given these heterogeneous metatheoretical properties, isomorphisms between interrelated events of the different kinds of phenomena that are comprised by contextual phenomena are necessarily low. Given these heterogeneous metatheoretical properties, isomorphisms between interrelated events of the different kinds of phenomena that are comprised by contextual phenomena are necessarily low.

Concepts of situations and of their behavioural and psychical relevance

The TPS-Paradigm conceives of an individual’s *situation* as the particular *constellation of the internal and external events that are present in a given moment and that the individual can therefore directly perceive*. With regard to explorations of experiencings, this concept considers the fact that psychical events are dynamically interrelated to and co-determined by all concurrent physical events both internal and external to the individual as well as by the physical and psychical resultants that the individual has retained from past events in his or her physical and psychical systems. Specifically, as the individual’s body is always present and interrelated with his or her psychical events, an individual’s situation always comprises internal physical events and physical resultants (e.g., blood sugar level, nutritional condition, health status, etc.). The universe of all external physical events may be infinite, ranging from the immediate surrounding (e.g., micro-organisms on the skin surface, food on the table) over the conditions that are present on this planet (e.g., climate, world population) up to events in the outer space (e.g., solar wind, comets). From this universe of external physical events, only those concurrent events form part of the individual’s situation that are immediately present in a given moment such that the individual can, at least theoretically, directly perceive these events (whether consciously or not). Finally, from the universe of the individuals’ memorised psychical resultants, a situation comprises only those elements that the he or she retrieves and reconstructs in his or her experiencings in the given moment.

Similarly, in his field theory, Lewin (1936) conceived of “life-space” as the entirety of all internal and external influences on the individual in a given moment that dynamically interact with one another and that are governed by psychical forces. From this “life-space”, Lewin distinguished the “foreign hull” that he conceived of as all those external physical influences that are not governed by the individual’s psychical properties (Lewin 1936, p. 73) and that are thus not perceived by or not relevant for the individual.

*Behavioural situations*⁹ are specified in the TPS-Paradigm as a particular kind of situation that is conceived of as the constellation of those particular external physical events that functionally mediate the individual’s external changes or activities in a given moment—i.e., his or her behaviours. Thus, behavioural situations, in and of themselves, are external to the individual. But the criterion for demarcating from the universe of all external physical phenomena those particular events that constitute a behavioural situation for a given individual in a given moment is bound to properties of that individual. This criterion is defined as the effectiveness with which external physical events make functional the individual’s external changes and activities that thereby become behaviours. Thus, in the concept of behavioural situations, external physical events are *separated only inclusively* from the individual and these inclusive conceptual separations are made on the basis of the different metatheoretical properties that can be conceived for the different kinds of phenomena that behavioural situations comprise.

Importantly, this demarcation is based on individuals’ *external* bodily events (i.e., on behaviours) rather than on internal physical or psychical events. As both the individuals’ behavioural events and the physical events in their external surroundings can be directly perceived by multiple individuals, these events can be directly related to one another for exploring which particular external physical events are, in fact, functionally mediating particular behavioural events in a given individual and moment. This is important as the specific events that constitute a behavioural situation need not be consciously perceived or be known a priori either by the individuals being considered or by those individuals observing them (e.g., parents, scientists).

Given that individuals’ psychical systems can be conceived of as “non-physical”, self-organising and in parts also self-referential, the diversity of the psychical properties that individuals may develop and that they can also combine with one another may exceed by far the diversity of the behavioural properties that individuals can produce given the physical constraints of their bodily abilities. Individuals may therefore develop more diverse interrelations between external physical events and their psychical properties than they may be able to establish between external physical events and their behavioural properties. Hence, as with semiotic representations, it is the psychical phenomena that constitute the essential component of situations. But given the fundamental imperceptibility of psychical phenomena by other individuals, exploring and understanding the ways in which behavioural events enable individuals to bridge the one-sided psyche-external surrounding connection is essential for exploring individuals’ psychical systems (cf. Uher 2013, 2015a, b, c).

Behavioural situations, as they mediate the individuals’ behaviour in a given moment, are always also psychically relevant to them. But conversely, not every situation is also behaviourally relevant for individuals. Reading a book hardly involves any behavioural events at all (e.g., turning a page, saccadic eye movements). But through perception, (capable) individuals can semiotically encode from the particular external physical events that are present in this situation (e.g., printed words in a book) a lot of new information that are psychically relevant for them in the given moment and that enable these individuals to further develop their psychical properties and to construct new knowledge. The individuals interact with the external physical events only on the basis of their particular physical properties (e.g., sensory ones) and their particular psychical properties (e.g., perceptual and conceptual ones), thus only *internally*. Such internal interactions enable individuals whose psychical systems have already reached a certain degree of complexity to further develop their psychical systems without necessarily having to behaviourally, thus externally interact

⁹ Previously called the “environmental situation” (cf. Uher 2013; Uher et al. 2013a).

with these events as well (e.g., physically disabled or paralysed individuals can read and learn from books and can also make science such as Stephen Hawking). In most situations, however, individuals interact with external physical events both internally and externally yet to a varying extent.

The ability to internally interact with external physical events entails particular intricacies for investigations of the psychological phenomena of individuals who suffer from complete loss of voluntary motor control and who therefore cannot externally interact with their external surrounding (e.g., patients suffering from locked-in syndrome; Laureys, Pellas, van Eeckhout et al. 2005). The inability of these individuals to produce behaviours considerably complicates the physicians' possibilities to correctly diagnose these pathological conditions—i.e., to make the correct inferences on these individuals' psychological events. This illustrates the outstanding importance and the direct relevance that explorations of individuals' behaviours have for explorations of their psychological phenomena in exceptional circumstances but also in everyday life situations (Uher 2013, 2015a).

The situational concepts provided by the TPS-Paradigm differ from some previous concepts. For example, the concept of "psychological situations" (Rotter 1954, 1981; Shoda, Mischel & Wright 1994) denotes external physical properties that are subjectively relevant to the individual yet without differentiating the particular involvement of the individuals' behavioural and psychological events. But in line with the concepts of the TPS-Paradigm, the concept of "psychological situations" is built on the recognition that particular external physical events have, in different constellations, different relevance for different individuals. The TPS-Paradigm complements this recognition by showing that the relevance that situations have for individuals' behaviours differs from the relevance they have for individuals' psychological systems.

The particular constellation of external physical events that are psychologically and behaviourally relevant to a given individual in a given moment (i.e., that constitute the individual's situation), in and of themselves, can but need not be bound to the present moment. These events become part of the individual's situation only *while* the individual is internally and externally interacting with these events—i.e., *while* the individual is perceiving these events and *while* they are mediating the individual's behaviour. Before and thereafter, these events conceptually belong to the universe of external physical events. This immediacy corresponds to Lewin's (1936) concept of "life-space" and the actuality of its functioning.

Events in the individuals' wider contextual layers of that external universe (e.g., *socio-economic, sociocultural or societal systems*; cf. Bronfenbrenner 1979) can affect individuals only indirectly as mediated through the physical events that are present in a given situation so that the individuals can directly perceive them (e.g., goods in the supermarket, governmental decisions publicised in the print media, the behaviour and body of institutional representatives, such as policemen). Once individuals have psychologically represented the meanings of such events happening in their wider surrounding, these events can also further affect the individuals (again only indirectly) when the individuals revive their pertinent psychological representations in a given moment and situation (e.g., when individuals recall what they know about the ways in which the goods that they find in the supermarket have been produced).

Likewise, individuals themselves can form part of each other's situations only if they can directly perceive the others' externalisations or revive others' past externalisations from their own memories (e.g., remembering someone's request to buy a particular product in the supermarket). Today, communication technologies (e.g., phone calls, emails, skype) enable individuals to transmit their externalisations over large distances all around the globe so that individuals' immediate bodily presence is no longer required for transmitting externalisations as has been the case for most of human evolutionary history.

Depending on individuals' organismal properties, particular external physical events enable individuals to perform particular activities that are called *affordances* (Gibson 1979). One and the same external physical setting (e.g., a text book) affords very different possibilities for activities to individuals of different age groups (Gibson 1979) and different

species (von Uexküll 1980), for both solitary and social activities (Gaver 1999). Moreover, individuals themselves can offer for one another possibilities for activity through both their bodies and their externalisations (e.g., soccer games, choirs; Valenti & Good 1991). The TPS-Paradigm therefore conceives of affordances as *potential behavioural situations*. The entirety of those affordances that are actually perceived by a given individual and involved in his or her behaviours in a given moment constitutes the behavioural situation of that individual.

Present-day humans also actively create in their external surroundings affordances that are aimed at matching individuals' particular psychical properties and at promoting their self-preservation and prosperity, such as external physicalisations of semiotic representations (e.g., text books) and other physical installations (e.g., school rooms, socio-technical systems in agriculture and industry; Lahlou 2008, 2011b). These systems in turn, influence, pre-structure and organise individuals' lives. Thus, present-day human individuals live in conditions largely of their own making (Bandura 2006).

Individuals' perceptions of their external physical surroundings, the affordances both naturally present and artificially created as well as individuals' psychical representations of these affordances continuously change and develop over time. Therefore, contextual phenomena are not only species-specific (von Uexküll 1909) and individual-specific (Rotter 1954, 1981; Gibson 1967) but also culture-specific (Barker 1968; Hall 1966).

Cultures: Systems of semiotic representations

Cultures, in the broadest sense, denote semiotically mediated systems of socially shared meanings (Geertz 1973; Weber 1904), thus systems of semiotic representations. The TPS-Paradigm therefore conceives of cultures as *composite kinds of phenomena* comprising psychical phenomena (i.e., individuals' psychical representations of socially shared meanings) and external physical phenomena (i.e., behavioural and material signs) in which these meanings are externally physicalised (e.g., behavioural practices, written documents, sculptures, monuments). In each of these different kinds of phenomena, some events are bound to the present moment, whereas others are not. As meanings are bound to individuals' psychical systems but not immanent to the signs in which they are externally represented, individuals must always reconstruct anew in their ongoing experiencings the particular meanings that particular signs have for them. Therefore, and given the dynamic processes of social exchange in which cultural representations are being developed, cultural meanings are continuously changing—despite their physicalisation in external matter. Like all semiotic representations, cultures are therefore phenomena with heterogeneous metatheoretical properties and highly complex structures in which isomorphisms between interrelated events of the different kinds of phenomena that they comprise are low.

Hence, *cultural phenomena always involve psychical phenomena* and therefore cannot be conceived of as exclusively separated from the individuals who create and use them (Valsiner 1987). Language, one of the most important kinds of human cultural phenomena, is conceptually inseparable from the conscious workings of human individuals' psychical systems (cf. Geertz 1973).

Culture is “an organizing principle of each and every human mind, in any society. It is thus everywhere—always in action, but usually rarely noticed. We do not notice the most basic and ordinary facets of living” (Valsiner & Han 2008, p. 3).

Cultural representations, as they comprise both psychical and external physical phenomena, allow for transmitting meanings across individuals, time and space. This enables cultural representations to contribute to the directed individual development within and across generations—i.e., to the “cultivation of individuals through the agency of external forms which have been objectified in the course of history” (Levine 1971, p. xix, citing Simmel). The social exchange processes that are involved in the creation, maintenance and propagation of cultural representations have important functions for the communities' self-organisation and self-preservation. These processes enable communities to canalise the

continuous processes of change that are inherent to both the individual and the socially shared construction of meaning, such as by creating a common “cultural identity (cf. Geertz 1973).

The reiterative processes of encoding and decoding meanings that are necessary for developing cultural representations involve repeated conversions of information between psychological phenomena (i.e., meanings) and their external physicalisations (e.g., in behavioural and material signs; cf. Uher 2015a, c). These processes also promote the creation of novel meanings, thus novel psychological functionalities.

“In cultural formations, the mind has reached an objectivity that makes it independent from the coincidences of subjective reproduction and, at the same time, subservient to the central purpose of subjective accomplishment¹⁰” (Simmel 1919, p. 223-253).

Writing is a means not only to externally physicalise psychological representations that individuals have already developed but also to develop new psychological properties and to create new knowledge, thus novel meanings and functionalities. Writing therefore is an inherent part of scientific work. But the physicalised end product is not the essence of cultural (i.e., semiotic) representations. The driving forces propelling individual and community development arise from the continued and iterative processes of back and forth conversions of information between meanings constructed by individuals and their external representation in physical phenomena that other individuals can perceive and from which these other individuals can reconstruct, integrate and further develop these meanings in their own minds.

“At the end of the pathway, there is not the artefact, in the persistent existence of which the creative process is frozen, but there is the “you”, the other subject, that receives the artefact for including it into his or her own life and thereby transforming it back into the medium from where it originates¹¹” (Cassirer 1942/2011, p. 114).

Summary and conclusions

This article applied the Transdisciplinary Philosophy-of-Science Paradigm for Research on Individuals (TPS-Paradigm) to explore different kinds of phenomena and their perceptibility by individuals in everyday life. A particular focus was placed on exploring the properties that make psychological phenomena unique among the phenomena of life.

The unique properties of the phenomena of the psyche

Like all phenomena of life, psychological phenomena occur naturally in individuals of all age groups and across species. But unlike all other phenomena of life, their immaterial properties cannot be conceived of as being physical (i.e., featuring spatial units or at least rather constant interrelations to the physical phenomena to which they are connected) and that are therefore referred to as “non-physical” in the TPS-Paradigm.

Also unlike all other phenomena of life, psychological phenomena cannot be directly perceived by multiple individuals (i.e., extroquestively accessed) as is possible for all physical phenomena. Psychological phenomena are perceptible only by each individual him- or herself through introquestion; in other individuals, they can only be inferred from individuals’ externalisations. But externalisations are phenomena of different kind for which different metatheoretical properties can be conceived and that are therefore unlikely to be isomorphic

¹⁰ Original: „In den Kulturgebilden hat der Geist eine Objektivität erlangt, die ihn von allem Zufall subjektiver Reproduktion unabhängig und zugleich dem zentralen Zweck subjektiver Vollendung dienstbar macht.“

¹¹ Original: "Denn am Ende dieses Weges steht nicht das Werk, in dessen beharrender Existenz der schöpferische Prozess erstarrt, sondern das „Du“, das andere Subjekt, das dieses Werk empfängt, um es in sein eigenes Leben einzubeziehen und es damit wieder in das Medium zurückzuverwandeln, dem es ursprünglich entstammt".

to the psychical phenomena to which they are related. This precludes straightforward inferences from individuals' externalisations to their psychical phenomena, especially if individuals are concerned who cannot report about themselves (e.g., young children, animals) and who thus cannot validate the inferences made by others. It follows that psychical systems cannot be studied without also exploring individuals' externalisations—their behaviours and (in humans) their semiotic representations.

Individuals' access to their own psychical phenomena—both ongoing experiencings and memorised psychical resultants (i.e., experiences)—is strictly bound to the present moment, the here and now. Experiencings are highly ephemeral and fluctuating. There never is a moment to pause or at least to slow down the continuous and irreversible flow of events to become more fully aware and to reflect on the events experienced. At the same time, awareness and reflection inevitably introduce changes to the course of experiencings. These peculiarities preclude any possibilities for systematic and undisturbed self-explorations (Kant 1786; Wundt 1904). Moreover, experiencings are being continuously processed and integrated into the individual's psychical system that thereby continuously changes and develops in self-organising and partially self-referential ways and largely uncoupled from the physical laws to which physical phenomena are bound. The systematic structures and functionings emerging from these processes are therefore intrinsically idiosyncratic.

Psychical abilities enable individuals to internally represent the physical phenomena encountered in life also in the moments and situations in which these phenomena are not present, thus disembodied from their immediate perception. Therefore, and because of the “non-physical” properties that can be conceived for psychical representations, individuals can psychically operate and transform the represented information and properties in ways that are not enabled by the physical phenomena that are being represented in and of themselves. Individuals can therefore make inferences to properties that are not directly perceptible in the given physical phenomena. Individuals can make abstractions, comparisons and generalisations to develop conceptual representations of abstract properties that need not have direct counterparts to concrete physical phenomena that can be directly perceived. From processing psychical representations, new structures and qualities can emerge, enabling new functionalities for individuals' abilities to organise and preserve themselves in the particular internal and external contexts of their own lives—and already within their own lifetimes.

But these peculiarities also entail intricate challenges for individuals' abilities to communicate and exchange about their psychical properties. Different species and, in particular, humans have evolved various solutions to overcome these challenges, such as passive occasion-based and active intention-based co-constructions of psychical representations. The creation of behavioural and material signs to externally physicalise individually constructed meanings enabled humans to systematically communicate about their psychical properties—despite the imperceptibility of these properties by other individuals—and, in doing so, to propagate inventions across times, places and generations. These unprecedented possibilities opened up new pathways, enabling humans to actively select, influence and create the conditions of their own development—as individuals, communities and species.

Transdisciplinary and philosophy-of-science perspectives: Opening up new avenues for exploration

The unique constellation of properties characterising psychical phenomena entails challenges unknown to other sciences. Even more so as it is precisely these phenomena—and no others—through which all science is made.

The TPS-Paradigm applied in this research explicitly considers the fact that it is human individuals who make science and that thus, any scientific endeavour inherently depends on and reflects the particular psychical abilities of human individuals—and their limitations. Among all the many fallacies, biases and errors in reasoning that are intrinsic to

human minds and known so far, the TPS-Paradigm considers those that are particularly relevant for scientists exploring individuals and their psychical systems.

To limit the biases derived from the individual scientists' own particular perspectives on their objects of research given their own background in particular scientific disciplines and research traditions, the TPS-Paradigm adopts transdisciplinary perspectives to develop comprehensive research frameworks that can be used and refined by scientists across disciplines. To first enable comparisons between concepts and methodologies from different disciplines in order to identify commonalities and differences and to enable coherent integrations into interrelated frameworks, the TPS-Paradigm adopts philosophy-of-science perspectives to scrutinise the very means by which scientific knowledge is generated. It aims to make explicit as comprehensively as possible and to scrutinise the absolute presuppositions that scientists make about their objects of research (e.g., about individuals as living organisms such as the principle of emergence) and the metatheories and methodologies that scientists use to gain knowledge about these objects (e.g., the epistemological principle of complementarity). The interrelated philosophical, metatheoretical and methodological frameworks provided by the TPS-Paradigm are targeted at supporting scientists to critically reflect, discuss and further develop previously established theories, models and research practices and to derive strategies and ideas for novel lines of research in the future.

With the consideration of three central metatheoretical properties—1) location in reference to the individual, 2) temporal extension and 3) physicality versus “non-physicality”—that can be conceived in different forms for all phenomena and that determine the phenomena's perceptibility by individuals, the TPS-Paradigm provides an elementary system that can be used straightforwardly to differentiate various kinds of phenomena from one another on a metatheoretical level. On the basis of this elementary system, the TPS-Paradigm differentiates the phenomena of morphology, physiology, behaviour and the psyche. These phenomena are conceived of as basic kinds of phenomena because they are physically inseparable from the body of the intact individual and because each given kind of phenomenon has rather homogeneous constellations of metatheoretical properties. It was shown that, given their different perceptibility by individuals, some of these phenomena should be differentiated from one another more clearly than previously done, such as psychical from behavioural phenomena and experiencings from memorised psychical resultants (as two kinds of psychical phenomena), in both theoretical and especially empirical research.

It was also shown that, conversely, conceptions of some other kinds of phenomena as being mutually exclusive and distinct are not warranted, such as the widespread dualistic conceptions of person versus situation, individual versus “environment” and “personality” versus culture—thus, of nature versus nurture that are widespread in people's everyday knowledge but also in science (Uher 2015c). To conceive of such phenomena, the TPS-Paradigm introduces the concept of composite kinds of phenomena that comprise several different kinds of phenomena, among them at least one basic kind of phenomenon, and that may also comprise external physical phenomena that are independent of the studied individuals' bodies (e.g., material signs). The phenomena of semiotic representations (e.g., language), artificially modified outer appearance (e.g., clothing, hairstyle) and contexts (e.g., situations, “environment”) are conceived as composite kinds of phenomena. This metatheoretical concept explicitly considers that particular kinds of phenomena are tightly interrelated and that from these tight interrelations new properties emerge (e.g., semiotic properties, abstractions). These new properties cannot be understood if the different kinds of phenomena that are involved are considered independently from one another. This novel concept allows to explore these interrelations by enabling inclusive conceptual separations that are made on the basis of the particular metatheoretical properties that can be conceived for each given kind of phenomenon of which composite kinds of phenomena are composed.

Building on the philosophical and metatheoretical elaborations presented in this research, a subsequent article (Uher 2016) will derive methodological implications for scientists exploring individuals and the workings of their minds. It will elaborate basic

methodological principles that meet the particular challenges identified to comprehensively investigate each given kind of phenomenon explored in individuals, again putting the main focus on psychical phenomena. The article will present and illustrate methods from various fields of research that are suited for the empirical implementation of the methodological principles elaborated and it will outline ways in which suitable methods that have yet to be developed could be devised in future research.

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Author biography

Jana Uher is a Research Fellow at the London School of Economics and Political Science. She received her PhD from Free University Berlin in 2009, where she set up and headed the research group Comparative Differential and Personality Psychology from 2010-2013, funded by the Deutsche Forschungsgemeinschaft (DFG). In 2013, Jana Uher was awarded a Marie Curie Fellowship by the European Commission. Her research is transdisciplinary, concentrating on philosophy-of-science issues of psychological and behavioural research on individuals from culture- and species-comprehensive perspectives. To demonstrate her metatheoretical and methodological developments, she has been working empirically with human children and adults with different sociocultural backgrounds and more than ten different nonhuman species including the great apes, capuchin monkeys and macaques. Jana Uher employs a broad portfolio of methods including non-invasive experimental studies, behavioural observations, and audiovisual and computerised methods for contextualised investigations. She has also been conducting studies with adults and human observers, respectively, about human impression formation using standardised assessments of both human and nonhuman individuals. Her empirical research projects are rooted in international and national collaborations with scholars from different disciplines. She has been working at the Max Planck Institute for Evolutionary Anthropology in Leipzig (2003-2005) and has also been a visiting scholar at the Institute of Cognitive Sciences and Technologies, National Research Council of Italy (ISTC-CNR) in Rome (2011-2013).

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