Reframing Temporality:
A Design for a Relational View of Chronoference

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ABSTRACT

The essay starts with the methodological concept of "recurrence" as a biographical and historical "backward running" generation of knowledge, as elaborated by Gaston Bachelard within the framework of historical epistemology. On the basis of this paradigmatic model case, a relation-theoretical reconstruction of temporality is undertaken with reference to Walter Benjamin's and Achim Landwehr's philosophy of history, in which the three temporal orders *past*, *present* and *future* are no longer conceived as separate dimensions. The temporal relational structure acquires epistemological significance, among other things, through the phenomenon of "absence", i.e. through the temporal effectiveness of an actual "present absence of the past" in biographically or historically reconstructed temporal relational networks. The relevance of educational theory can be clarified historically, transgenerationally, disciplinary-historically and socio-historically, which we outline in the outlook.

KEY WORDS

recurrence; temporality; chronoference; relational constellation.

Reenquadramento da Temporalidade:
Um Projeto para uma Visão Relacional da Cronoferência

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RESUMO

Este artigo baseia-se no conceito metodológico de "recorrência" enquanto geração de conhecimento através da "análise do que passou", biográfica e histórica, segundo Gaston Bachelard no contexto da epistemologia histórica. Com base neste caso paradigmático, efetua-se uma reconstrução relacional-teórica da temporalidade com referência à filosofia da história de Walter Benjamin e Achim Landwehr, na qual as três ordens temporais *passado*, *presente* e *futuro* deixam de ser vistas como dimensões separadas. A estrutura relacional temporal adquire significado epistemológico, entre outras coisas, através do fenómeno da "ausência", isto é, através da efetividade temporal de uma real "ausência presente do passado" em redes relacionais temporais biográfica ou historicamente reconstruídas. A relevância da teoria educacional pode ser esclarecida historicamente, trans-geracionalmente, disciplinar-historicamente e socio-historicamente, como sublinhamos neste artigo.

PALAVRAS-CHAVE

recorrência; temporalidade; cronoferência; constelação relacional.

Reencuadrando la Temporalidad:
Un Diseño para una Mirada Relacional de la Cronoferencia

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RESUMEN

El artículo parte del concepto metodológico de "recurrencia" como una generación de conocimiento biográfico e histórico "acerca de lo que pasó", elaborado por Gaston Bachelard en el marco de la epistemología histórica. Sobre la base de este modelo paradigmático, se emprende una reconstrucción teórico-relacional de la temporalidad con referencia a la filosofía de la historia de Walter Benjamin y Achim Landwehr, en la que los tres órdenes temporales, pasado, presente y futuro, ya no se conciben como dimensiones separadas. La estructura relacional temporal adquiere significación epistemológica, entre otras cosas, a través del fenómeno de la "ausencia", es decir, a través de la eficacia temporal de una actual "ausencia presente del pasado" en redes relacionales temporales reconstruidas biográfica o históricamente. La relevancia de la teoría educativa puede esclarecerse históricamente, transgeneracionalmente, disciplinario-históricamente y sociohistóricamente, lo cual esbozamos en este artículo.

PALABRAS CLAVE

recurrencia; temporalidad; cronoferencia; constelación relacional.

Reframing Temporality: A Design for a Relational View of Chronoference

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INTRODUCTION

The essay is a relational-logical attempt to bring together several discourses of science relevant to temporal theory in a transdisciplinary manner to make "chronoference" (Landwehr, 2016) visible as an "epistemic object" (Rheinberger, 1992, 2001/2019) of temporal-theoretical development of knowledge. Due to the limited scope of the essay, the paradigmatic research perspective can only be outlined and not explicated in detail. In the tentative effort to draw on relation-theoretical thinking for the development of a temporal theory, the category of reference is given a key position in theory strategy (e.g. Johnson, 1976; Quine, 1974/1976). Relationality is a specific relational quality of a reference in a temporal reframing.

The "relational reframe" (Ebner von Eschenbach, 2019; Schäffter, 2019) of the recurrent procedure of backward epistemological practice is chosen as a research-practical problem approach and applied as a model case to the reference between the three temporal orders: *past—present—future*. This raises the question of how epistemological processes that progress stepwise from their immanent course can be modelled in their recurrent temporal structure. From a relation-theoretical point of view, a view is to be gained, with which the temporal orders can be put into relation to each other in their mutual reference. This is, however, beyond chronological linearity and naive assumptions of continuity. The references, thus, differ in their specific relational quality. Conceptually, with the now visible network of temporal orders referring to each other, this study builds on previous research on a transdisciplinary theory of relations (among others, Alexander, 2021; Ebner von Eschenbach, 2021a; Schäffter, 2021).

The relational-logical view of transformative developmental processes offers the possibility of grasping historicity as a performative movement of execution, out of which the hitherto linear orders of time past, present, and future intertwine in their interference to form a referentially interwoven temporal structure and in the elastically deforming dynamics to form a temporal relational structure.

In the "virtual" context of a temporal relational structure, temporal transitions in time modes are formed between the three temporal orders and offer them interfering interfaces of "not-yet-more" or "not-yet-yet". The epistemological gain of the structural-hermeneutical transgression of a previously linear temporality can be seen in its making the phenomenon of a backward epistemological practice formally representable in relation theory. "Structural hermeneutic" here applies to a procedure by which differentiated relational qualities such as correlative, complementary, dichotomous, contrastive or reciprocal are distinguished within a relational structure and meaningfully related to each other. With the relation-logical construct of a transference that interlaces the three temporal orders, one gains the preconditions for accessing a developmental perspective that cannot be anticipated in advance, as an exploratory research design strives to do.

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To make such an unusual framework of interpretation comprehensible, the argumentation progresses through three steps. First, it starts with the initial problem of recurrence as a methodological procedure of backward-proceeding epistemological practice and then resorts to further development in the concept of the experimental system. Its regulative principle can be illustrated by Søren Kierkegaard's (1843/1923, p. 203) aphorism: "Life is lived forward, but only understood backward" (First section). Second, the historical-epistemological procedure of recurrence is formally modelled as a relational-logical structure of temporal dialogicity. The "retrograde forward movement" can be unfolded in a temporal-theoretical manner towards a topological relational structure from an epistemological perspective (Second section). Third, the paper concludes with an outlook.

LIVING FORWARDS, UNDERSTANDING BACKWARDS

RECURRENCE—BACKWARD EPISTEMOLOGICAL PRACTICE (GASTON BACHELARD)

Gaston Bachelard (1938/1987) paved the way for an approach to the historiography of science that does not understand the production of scientific knowledge and the bringing forth of knowledge as a continuous development process of constructing knowledge. Instead, Bachelard assumes a continuous discontinuity in the development of scientific knowledge (Canguilhem, 1963/1979), which proceeds via a retrospective examination of epistemological obstacles *(obstacle* épistémologique). Bachelard understands this approach as beginning with the barriers to the development of knowledge. This approach marks the barriers and strives to overcome them, in temporal theory, as recurrence (*récurrence*) and the perspective of a "retrograde history" (Bachelard, 1938/1987, p. 341). The recognition of discontinuous progress in knowledge, which does not proceed through the accumulation of knowledge but through the registration of "ruptures" (*rupture épistémologique, coupure*) with epistemological obstacles that must be retrieved from latency, constitutes a "scientific experience" (Bachelard, 1938/1987, p. 44). This process is why Bachelard pays particular attention to recurrence.

A scientific experience is characterised by the fact that it "contradicts habitual experience" (Bachelard, 1938/1987, p. 44). With this aspect, Bachelard addresses a boundary he draws *vis-à-vis* everyday thinking as the usual or the self-evident or common sense, which for him is "first experience" (1938/1987, p. 59). For Bachelard, the maintenance of this demarcation or the manifestation of this epistemological break with everyday thinking is indispensable to make any progress in scientific knowledge production. Scientific knowledge is therefore gained "against" (1938/1987, p. 59) common sense and the self-evident. Against this background, Bachelard arrives at the premise that the "problem of scientific knowledge must be approached under the concept of the obstacle" (1938/1987, p. 46) to deal with "traditional knowledge" (1938/1987,p. 47) on the one hand and to advance the formation of the scientific mind on the other (Ebner von Eschenbach, 2021b). In this respect, Bachelard, with his perspective of uncovering and correcting epistemological obstacles, is resolutely committed to formulating a "retrograde history, a history illuminated by the finality of

the present, a history that starts from the certainties of the present and discovers in the past the most advanced formations of truth" (Bachelard, 1971/1974, p. 215).

Such a "perspective of corrected errors" (Bachelard, 1938/1987, p. 44)—the recurrent reflection on epistemological obstacles—is the central prerequisite for a scientific experience. However, this does not yet clarify what proves to be an epistemological obstacle and at what point an epistemological break is entered. It is only through the backward-looking (recursive) uncovering of the construction path of a result, the "reversal of the construction order" (Bachelard, 1938/1987, p. 341), that it is possible to manifest epistemological obstacles and subject them to revision. Such a recursive perspective can therefore be seen as a retrospective reflection on epistemological practice. This reflection assists in "helping to become aware of certain barriers" (Bachelard, 1938/1987, p. 341) whose construction lies in the past and which impair the development of scientific knowledge. Bachelard's "attitude of open, recurrent doubt about the past of secure knowledge" (Bachelard 1934/1988, p. 163) also includes the certainty that new knowledge, which proceeds precisely via the uncovering and correction of epistemological obstacles, can again "degenerate" (Bachelard, 1938/1987, p. 47) into new barriers to knowledge. The recurrent perspective is therefore not a teleological way of thinking about progress, but one that looks backwards and progresses discontinuously. Through a recurrent analysis, the self-evident things that have sunk into the past are ultimately brought to mind, made contingent, and problematised—*ad infinitum*.

The central epistemological concepts of Bachelard's philosophy of science have been outlined with the *obstacle épistémologique*, the *rupture* and the *recurrence*. Against a background of an interest in temporal theory, these concepts need to be supplemented by the concept of phenomenotechnique (*phénoménotechnique*), which Bachelard introduced in the 1930s. Phenomenotechnique "extends phenomenology" as a "technique of realization" (Bachelard 1934/1988, p. 111). In bringing forth objects of knowledge, technique is made so prominent that Bachelard, following Édouard Le Roy, can state that ultimately even a measuring instrument "is (always) a theory, and one (must) understand that the microscope is more an extension of the mind than of the eye" (Bachelard 1934/1988, p. 348). For Bachelard, "new phenomena are not simply found, but invented and constructed from scratch" (Bachelard, 1931–32/2017, p. 18f.). There are no simply given objects, but all objects should be understood as made. They are objects of knowledge or objects of investigation or scientific objects and always already brought about by instruments, apparatuses, and technology. Bachelard, therefore, argues that "true scientific phenomenology ... is by its very nature a phenomenotechnique" (Bachelard, 1934/1988, p. 18.).

EXPERIMENTAL SYSTEM AND EPISTEMIC OBJECTS (HANS-JÖRG RHEINBERGER)

For Gaston Bachelard, every scientific discovery only becomes "clear" (Bachelard, 1938/1987, p. 13) retrospectively. He argues that the "revelation of the real ... is always turned backwards" (Bachelard, 1938/1987, p. 46). According to Bachelard, this backward-looking perspective on the development of scientific knowledge in the sense of a recurrent revision does not involve a mere retrospective reassurance. Rather, he focuses on the prospective aspect of this retrograde forward movement. Scientific epistemological practices are characterised for him as a "project" (Bachelard 1934/1988)

that is driven by recurrence. This idea of the recurrent perspective on the development of scientific knowledge has been taken up by many historians of science. Hans-Jörg Rheinberger gives this perspective special attention by unfolding it in his historical-epistemological reflections on "experimental systems" and "epistemic things". Rheinberger is primarily interested in the emergence of the new and sees this realised in the experimental practice of knowledge production in the sciences.

He takes the term "experimental system" from biochemistry and molecular biology, both fields in which Rheinberger was actively involved. It must be taken into account that he provided experiment and system, each with their own semantics. On the one hand, Rheinberger does not focus on an understanding of experiment, which is an empirical verification procedure to confirm or refute hypotheses formulated in advance. Although this function of experiments is commonly asserted and identified with modern science, Rheinberger puts this into perspective. The view that an experiment is merely a testing instance is a special case of experimentation and obscures the groping and testing function of experimentation, which includes open, tentative and unpredictable search movements. For Rheinberger, the latter is the crucial function of experimentation, which he explores in his research (Müller-Wille & Rheinberger, 2009; Rheinberger, 1992, 2001/2019). On the other hand, Rheinberger's use of the term "system" does not refer to the axioms of social systems theory in the sense of Niklas Luhmann, but "assumes, against system-theoretical conventions ..., that experimental systems have, as it were, fuzzy edges, that is, that they are not closed in any precisely definable sense" (Rheinberger, 1994, p. 202). For Rheinberger, the systemic nature of experimental systems rather means instability and openness since experimental systems,

> insofar as they are research systems, (operate) on the border of their collapse or dissolution. They derive their coherence not so much from their operational or logical closure as from their fractal change, from their location on the border between knowledge and non-knowledge, and from their ecological niche existence in relation to other experimental systems surrounding them. (1994, p. 202)

To further elucidate Rheinberger's understanding of an experimental system, it is helpful to look more closely at the concepts of "epistemic" and "technical things". In an experimental system, following Rheinberger, objects are brought into appearance as objects of knowledge or as objects of investigation or as epistemic things or epistemic objects (Rheinberger, 1992). Rheinberger, therefore, understands experimental systems as spaces of representation, in which

> objects of knowledge and the technical conditions of their production (are) indissolubly linked with each other. They are at the same time local, individual, social, institutional, technical, instrumental and, above all, epistemic entities. Experimental systems are thus thoroughly mixed, hybrid arrangements; within the boundaries of these dynamic entities, experimental scientists give shape to the epistemic things with which they are concerned. (Rheinberger, 2001/2019, p. 8)

Elsewhere, Rheinberger explains,

When I speak of experimental systems, I am referring to the material structures of epistemic practice in which individual scientists or groups of scientists produce those epistemic products that they refer to as the results of their work. A positive result is a finding that can, in principle, re-enter the system as a component and thus expand or change it. (1994, p. 202)

Objects in an experimental system are made into scientific objects and thus become an epistemic object that can be investigated. Under certain circumstances, this object becomes a component of the experimental system, where the latter changes and again becomes open to new facets of the epistemic object brought into appearance. The object is inscribed in a developmental dynamic close to Bachelard's reflections on phenomenotechnics. Rheinberger adopts this idea and emphasises the developmental dynamics described in this framework as back-referential taking of relations: "I prefer to call this kind of back-referentiality of the research process recurrence, with reference to Gaston Bachelard" (1994, p. 202).

If one follows Rheinberger, then experimental systems do not act permanently on their own, but connect with other experimental systems and can thus (continue to) develop into "experimental cultures" in certain constellations. As Hagner, Rheinberger and Wahrig-Schmidt have argued, "experimental systems are functionally autonomous in certain sequences of their history, but neither fundamentally nor permanently. On the contrary, they are always capable of networking and in need of networking. Conjunctions occur between them" (1994, p. 11). As Rheinberger illustrates with the case of the development of the gene (1992), the conjunctures do not develop systematically, but are often the results of unpredictable searching and groping movements. As soon as new connections between individual experimental systems are established, they have a retroactive effect. In the developmental dynamics from individual experimental systems to emergent experimental cultures, there are also conjunctures "that lead to a complete reorientation of the research direction within a particular experimental system or even to its splitting up" (Rheinberger, 1994, p. 201).

The objects that become objects of knowledge in an experimental system are "epistemic things" (Rheinberger, 1992, 2001/2019). What becomes an epistemic thing is historically bound (see also Canguilhem, 1966/1979). According to Rheinberger, therefore, different objects can be made epistemic objects by apparatuses or recording devices. Epistemic things can be understood as a separate expression of what is hitherto not known, which is made intelligible in appearance within the framework of the experimental system. For objects to appear as epistemic things within an experimental system, however, they require a stable infrastructure surrounding them. Rheinberger refers to these infrastructural conditions and prerequisites as "technical things" or also as "experimental conditions". They include instruments, recording devices, storage media or specific forms of craftsmanship in research.

Technical things thus define the horizon and the boundaries of the experimental system. The central difference to epistemic things is that technical things are determined, while epistemic things are characterised by their indeterminacy. Technical things determine the scope and also the representations of an epistemic thing. This difference is lost or transformed in the process of an experimental system, so that an epistemic thing can become a technical thing and thus the range of the experimental system is extended:

ORTFRIED SCHÄFFTER | MALTE EBNER VON ESCHENBACH

whether an object functions as epistemic or as technical depends on the place or node it occupies in the experimental context. (Rheinberger, 2001/2019, p. 27)

The technical things of an experimental system are directly interrelated with the conditions of possibility of epistemic things. Due to their nature, technical things limit the framework of an experimental system and "enable the visibility of something that is still unknown. In the experimental system, the connection of the not-yet-known epistemic thing with the already known technical things thus takes place" (Rheinberger, 2001/2019, p. 29). Against this background, an experimental system has the function of giving form to epistemic things since it requires an architecture supposed to provide answers to questions that cannot yet be asked, and it must also be capable of differential reproduction and must not only address copies of the known, but must generate variations and allow the not-yet-known, the new, to become intelligible.

CHRONOFERENCE—THE RELATION BETWEEN PRESENT AND ABSENT TIMES (ACHIM LANDWEHR)

In his essays, the historian Achim Landwehr critically examines absolute concepts of time in historical scholarship. His criticism culminates in the assertion that there has rarely been reflection on historiography, which "ultimately goes back to Newton and his ideal of an absolute time" (Landwehr, 2016, p. 284). With the concept of chronoference (Landwehr, 2016, pp. 149-165; 2020, pp. 244-248), Landwehr attempts to present a temporal-theoretical proposal that distances itself from absolute times and the linearisation of historical development trajectories of absent times.

For Landwehr, making chronoferences a topic means "leaving classical historical causality behind" (Landwehr, 2016, p. 157). Referring to Josef Mitterer, Landwehr is no longer concerned with categorically maintaining uncomplex temporal dichotomies, for example, past and present or past and future. Instead, he focuses on the question of how such dichotomies could be grasped in temporal theory as reciprocal, interrelated movements, which does justice to the complexity of times. According to Landwehr, it would be crucial to inform temporal relations in terms of relation theory. He emphasises the adoption of a relational perspective with which "above all the constitutive significance of such references" (2016, p. 28) between the tenses can be examined far more adequately. Landwehr is convinced that recourse to relational theory assists in "arriving at a multipolar understanding of the relationship between times (and other phenomena)" (2016, p. 143).

With the concept of chronoference, understood in relation-theoretical terms, Landwehr draws attention to the relations that are "established between present and absent times" (2016, p. 150). In doing so, he distances himself from a dichotomous opposition of present and past (and future). He contingently sets the linearisation of historical development of absent times as a powerfully discursive chronoference. Landwehr emphasises that the conventional narrative of historiography and the temporal-theoretical considerations associated with it is the "succession" that he intends to thwart. It is rather the through- and side-by-side of times that the linear historical narrative of history cannot bring into view. Landwehr concludes that research with "the help of chronoferences ... can and must rely on another form of

causality, which can re-establish or also break off relationships, influences, effects and causes and which seeks its references in distant or nearby times" (2016, p. 157).

Against the background of his interest in the relation between the absent and present times, the question of the quality of the relation is relevant for Landwehr. The relation of a chronoference is not one-sided, but "sends its streams, albeit in different quality, in both directions, i.e. also from the past and the future into the respective present" (2016, p. 151). The consequence of this is that the establishment of chronoferences always produces a difference, which is why Landwehr, following Jacques Derrida, speaks of a "'chronofärenz' (sic!)... as a constant postponement of the object and the meaning of historical descriptions" (2016, p. 152).

For Landwehr, chronoferences are specific relations that can be established between present and absent times. The establishment of a chronoference or even the relinking or severing of an existing one are acts for which it is necessary to take responsibility and accountability. These ethical aspects of a chronoferential foundation of connections and separations between present and absent times point to the epistemological relevance of temporal-theoretical stakes.

RECURRENCE—A RELATIONAL STRUCTURE OF TEMPORAL DIALOGICITY

INTRODUCTORY CLARIFICATION OF TERMS—REFERENCE

Before discussing a relation-theoretical modelling of temporal structure—reframing temporality—since it underlies Bachelard's methodological construct of recurrence, it is first necessary to clarify an adequate set of concepts. This set is available in the relevant discourses and related preliminary work (see above) and is introduced here in summary. Relationing is understood as a higher-level form of reference. If a structurally meaningful reference is to be established in the determination of the relationship to be developed between the initially separate temporal orders of their own logic, namely between *past—present—future*, then the category of reference has a fundamental epistemological significance (Quine, 1974/1976; Rami & Wansing, 2007; Rüth & Schwarze, 2016; Serres, 1972/1992). Reference denotes a performative movement of turning from one "side" to the other. However, turning towards in this way can have a different quality of relationship. Conceptually, the following differences in the meaning of a reference must be considered: (i) reference as a one-sided turning toward; (ii) two-sided interference; and (iii) transference as a structure of relational entanglements between different temporal orders, which are differentiated into temporal modes.

The conceptual distinction focuses on a different determination of the relationship and with it a specific quality of the relationship *(Beziehungsqualität)* between the orders of time, as follows:

> (to i) In the one-sided reference to the other order of time, this is understood as a delimitable time regime with an alien structural logic that cannot be directly influenced;
> (to ii) In inter-reference (inference), two orders that continue to be separated enter a relationship with each other or are put into a relationship with each other by a

third party. In terms of structural hermeneutics, it is decisive that, in inter-active referentiality, the sides involved remain unchanged in their structural core despite external adaptations. This is precisely what constitutes the dichotomously boundary-emphasising relational quality of interference;

(to iii) The autonomy of the sides involved, which continues to be secured in an interactive reference, can be regarded as a decisive distinguishing feature from the relational reference of a transference. In the latter, the (temporal) orders placed in relation to each other are already subject to a mutually "transforming" (*anverwandeln*) transformation (Ebner von Eschenbach, 2021a) *uno actu* due to the functionalisation. In the process of their relationalisation, they become relations within a formal-logically overarching order structure of their own developmental logic. This is explained by the fact that a relational structure moves on a higher level of emergence.

As temporal orders, *past*, *present* and *future* only transform themselves into relations of a temporal structure that spans them temporally when they can form mutually transferentially overlapping transitional times at the interfaces to the other orders and time regimes. In their functional status as relations within a comprehensive temporal experimental system, the virtual resonance surface of an in-between time differentiates itself in all three orders, which can be described as present absence (Schäffter, 2021) or, following Landwehr, as present absence of the present past.

TEMPORALITY FROM THE PERSPECTIVE OF RELATIONAL THEORY

The Temporal Field of a Relational Time Structure

To make the internal structure of the three temporal orders formally representable as temporally differentiated relations, it helps to list and explain them in their inferential intersections. A multi-layered complexity then appears within a virtual interspace in the interface of the temporal orders, with which the multitude of possible references opens up to a temporal-spatial transference. In the totality of relationally entangled transference, the following relational structure of temporal references can be determined in a formalised differentiation (Table 1). [2]

To conceptually distinguish temporal references from the three orders of time past-present-future, they are given the designation time mode in their relation-theoretical, space-forming configuration and are explained below in terms of their respective relational quality. The time modes differentiated here have a different status. While the present time modes can claim the orienting status of a point of view in their respective time order, the other time modes have a referential character in the direction of past or future presences. In their quality as transitional times, they could be classified as transitory modes, through which the entire temporal network of reciprocal reference can be cybernetically controlled.

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[2]   The referential differentiation was developed on the basis of Kornwachs (2001) but differs significantly from his temporal-theoretical approach in its background assumptions and, therefore, also in the relation-theoretical interpretative horizon developed here (Schäffter, 2012).

Table 1

The temporal field of a relational time structure

	Past	Present	Future
present	prePa	prePr	preFu
past-tense	paPa	paPr	paFu
future-tense	fuPa	preFu	fuFu

Explanation of the Transitory Time Modes in the Intermediate of the Three Time Orders

Taking the tabular overview (Table 1) as a guide, each time order, in its status as a relatum within a temporal-topological space, not only has a presentness in the here and now but also has transitional times, at which its transitory positional relationship to one of the others tends to appear as a chronoference through a relation between present and absent times. Depending on the epistemological interest, this modelling could therefore also investigate a "chronotopos" (Bachtin, 1975/2008), in which (from the historical position of research practice) absent time modes are referentially intertwined with those that are also absent.

It is therefore worthwhile to first obtain a systematic overview so that, against the background of a polyphony of possible reference patterns, a "figuration of the temporal "(Öhlschläger & Perrone Capano, 2013) based on reciprocity can finally emerge with the help of Mikhail Bakhtin's concept of dialogicity. The set of temporal modes is not a classification of chronotopoi that are already known situationally. Rather, a formal-structural heuristic is provided here, within the framework of which—analogous to the periodic table of chemical elements—hitherto unknown phenomena also come into view, which can only be made to appear observably within the epistemological practice of the experimental system. Such research relies on methodological procedures of memory work, but also on investigative explorations to uncover different "forms of forgetting" (Assmann, 2020). The nine variants for this purpose are discussed in the following subsections.

Present

Present past (prePa)—This temporal respect is the interface of a present with a past that is still present in it, which can no longer be taken back, but as a current event requires a continued situational presence. As a temporal event, the transitory presence of the past in situations of farewell (Bohrer, 1996/2014) and mourning over a loss that can be experienced at present can be experienced empirically as a transitional period that has now occurred in the sense of a caesura.

Present time (prePr)—Present time is dealing with the self-reference of a here and now, with a time mode that requires considerable cultural preconditions and personal competence to access it. Despite this, it can formally be regarded as the "normal zero" of scientific measurability for the outcome of temporal epistemological practice, which,

in the execution of successful epistemological practice, simultaneously moves into the mode of a future already becoming present.

Present future (preFu)—Analogous to the present past, this interface refers to a future or a multi-optionality of structurally possible futures as they are currently available or can be made possible in the sense of a transitory situation relation. Here, Wygotskij's (1934/2017) construct of a "zone of next development" could be assigned in the sense of a temporally interlocking interface function. A present opening up to the future can be experienced biographically at critical life events and in historically epochal times of upheaval in political or social contextual conditions. In the temporal reference of a present future (preFu), the present (prePr) is thought of and shaped in its temporal relevance from the perspective of the future that makes it possible.

Past tense

Past (paPa)—Every time order structurally has an interface to its respective specific past, which is accessible or available from its historical constellation. In this respect, origins are a question of identity orientation, with socio-political relevance for the study of history.

Past present (paPr)—Even a time order that has meanwhile passed once had the here and now of a temporal positioning to which a before and after could refer the measuring point for temporal orientation. Past present (paPr) therefore designates the topologically decisive point of reference from which the former past (paPa) but also the developments possible from it (paFu), depending on the path, had taken their starting point. In historical constellation research, a temporal analysis must therefore refer to the past present (paPr).

Past future (paFu)—According to their respective path-dependent positioning in historical development, structurally speaking, specific, potentially possible but not actualised development strands open up for each time order. This proceeds largely independently of the intentionality of the actors interacting in this knowledge space of a past epistemology (Rheinberger, 2021, p. 142). The temporal reference does not refer solely to epoch-specific fears and hopes for the future—or to anticipatory anticipations— but assumes a process-immanent development logic of evolutionary self-controlled connection possibilities. The temporal reference of a past future (paFu) thus brings to light the respective multi-optionality of a hinge point, which, according to Ernst Bloch (1959/1973), could consist in releasing the dynamic potentiality of the future of a previously (as yet) "unlived life" still slumbering in the past. In the temporal relational structure of transference, the boundary surface (paFu) thus acquires the significance of access to a potentiality generated in the previous course of development but not yet realised, and which can still be dynamically actualised unexpectedly when the opportunity arises. It is precisely this momentum that distinguishes a relation-theoretical understanding of temporality from a linearly reified sequence of self-contained temporal orders.

Future tense

Future past (fuPa)—With this reference, we are dealing with the grammatical tense sequence (*consecutio temporis*) of a future tense II: "I will have recognized". Thus, as in

the knight jump, we are "thinking around the corner". Only after the occurrence of a future event will the present to which we are referring here be encountered. To put it more simply, afterwards, one is always wiser.

Future present (z)—Structurally analogous to the past present (paPr), this reference also involves a decisive point of reference from which the other two interfaces can be determined. From the future present, one can refer to the present positioning as a past present (paPr) from the state of its here and now that is yet to appear.

Future (fuFu)—Structurally analogous to the future past (z), this reference runs via a reference point that has yet to be reached, which prevents reliable anticipations due to a complex optionality and leads to considerable indeterminacy. In a positive interpretation, however, one could also speak of openness to the future.

ABSENCE—MODES OF TIME BETWEEN PRESENCE AND ABSENCE

Before the temporal structure of mutually referenced temporal orders can be examined in all their diversity, it is necessary to explain the relational quality of absence, which is central to temporal theory. Absence is to be understood as the presentness or presence of someone who is not present. Under the aspect of reference also introduced here, the question now arises as to what is actually being referred to in an absence. One refers to an object conspicuous by its absence. This perceptual-theoretical moment is aesthetically crucial for artistic representation because it is used to interrupt an immediate reference between artistic representation and the everyday, which is perceptible in the sense of a rupture. Here, absence meets a broad discourse on image theory, in which access to a virtual world view comes into view (Grutschus & Krilles, 2010; Lehmann & Weibel, 1994).

The situation of an absence does not sound unfamiliar to educational practice. For those working in education or theology, it is not least the "non-participant" or the "dropout" to whom full attention is given as a "lost son complex". A provider-centred educational organisation directs a worried gaze at its participants that is ironically formulated by the comedian in their paradox: "Unfortunately, I see many among you today who are not (anymore) there". The comedian aptly expresses the phenomenon that in specific situations or socio-historical constellations it is precisely the non-presence of a person or the non-thematisation of a factuality present to all participants, through which their absence becomes surprisingly and suddenly (Bohrer, 1978, p. 186) present and can lend it virtual imaginative presence. The paradox of a present presence in absence can arise from the fact that, from a socio-psychological point of view, in a particular constellation and alienating atmosphere, the effectiveness of a positioning or influence can even be higher than in presence. In strategic communication, this is staged in a politics of the empty chair, and, in relation theory terms, in making a gap visible (Schäffter, 2021), which now receives media effectiveness (Kümmel-Schnur & Schröter, 2008). If the aesthetic, theoretical discourse on structural efficacy is transferred to the phenomenon of absence, it becomes apparent that every time mode draws its current meaning from a constellation of its visualisation. Against this background, the temporal-theoretical, experimental system to be clarified here and the phenomeno-technically operationalised memory work can be understood as an educationally practical research design for the visualisation of past epistemological practice within a socio-historical constellation. The system can be put into action in science didactics.

THE DIALOGICITY OF RECURRENT REFLECTION AND ITS RELATIONAL RECONSTRUCTION

In the design of an experimental system, a phenomenotechnical operationalisation of historical "memory work" (Haug, 2021; Pentzold & Lohmeier, 2022) allows specific patterns to stand out figuratively from the highly complex and cognitively overwhelming versatility. For temporal pattern formation of a *consecutio temporis* ("I will have known" or "from then on, one began to understand") to pass over into processes of mutual attunement, it becomes necessary to introduce specific framework conditions, as they are known from memory research. If one follows the formal aesthetic considerations of the Russian literary and cultural scholar Bakhtin Sasse, 2018; Soboleva, 2010) in this context, it is necessary to move from the noise of an inference of antagonistically contrasting temporal orders and their perspectivity to the transference of their mutual attunement.

To conceptualise such a structural change in formal aesthetics, Bakhtin developed his groundbreaking theorem of dialogicity, which was first elaborated as a communication-based theory of action (Bachtin, 2011) and subsequently as a structural hermeneutic figure of thought in formal aesthetic literary studies. Due to its paradigmatic significance for communicative situational relations (chronotopos), which take on an overwhelming, if not threatening, character due to dialectical diversity and polyphony and unmanageable referentiality, the construct of dialogicity experienced a transdisciplinary effectiveness far beyond literary studies. The following discussion uses Bakhtin's formal aesthetic construct as a regulative principle for the phenomeno-technical production of time patterns and their chronotopoi. Bakhtin's construct is used to make thematic the inferences between the present present (prePr) of research in the history of science and the past present (paPr). To state this process metaphorically, recurrence is interpreted in relation theory as a procedure in which an actual present can be "dialogically brought into conversation" with an absent present that has become present.

The crux is what is meant by dialogically bringing into conversation. Dialogicity is based on a profound difference between the sides involved. In the understanding of dialogicity, a literally "agonal" (Bohrer, 2012) but not antagonistic discussion takes place. However, it does not aim to build consensus or to resolve the underlying difference through a compromise solution. Rather, Bakhtin's polyphony concept aims at a mutually responsive detuning in which initially self-centred individual voices can swing upwards to the complex productivity of a spatial sound through mutual recognition of their difference. The decisive prerequisite for this, however, is a movement of responsive transference between the diverse individual voices. Diversity alone does not guarantee quality, but noise.

In relation-theoretical interpretation, Bakhtin's action-theoretical construct is based on the dialectic of a transition from empathic attention to distancing self-assurance. Dialogicity transcends the level of interactive reference in the double movement of an initially empathically understanding, turning towards the strangeness of the other. Then there is a return to the exit of his or her sphere of ownness after reaching the boundary surface on both sides that has become recognisable in this way. Finally, there is a reassuring of oneself of significance within the entire relational structure. Only when such an encounter takes place from both sides simultaneously can a common two-sided figure of the in-between emerge, which—formulated in terms of relation theory—connects them in their separation and distinguishes them from each other (see also Ebner von Eschenbach & Schäffter, 2021).

THE MULTIPLE ENTANGLED TRANSFERENCE OF TEMPORAL ORDERS—A STRUCTURAL HERMENEUTICS

With the formally differentiated classification of nine modes of temporal reference and their mutually responsively sensitised interfaces (Speckmann, 2020), a relations logical network of relationships becomes visible in its confusing complexity. In a categorically conceived modelling, such a classification can be a background foil for the identification and relation-logical determination of selected temporal figurations. In the function of an epistemological heuristic, a topological representation of temporal references offers access to overarching connections that can be termed "transference", referring to linguistic theories of reference (Hänßler, 2015).

With the relation-theoretical clarification of a recurrent epistemological practice, the overarching horizon of meaning of a transference of mutually entangled temporal orders offers, due to its complexity, a high-resolution grid and a screen on which different figurations of temporal patterns of relations can be vividly displayed (Fig. 1). The manifold intertwined transference of temporal orders can be produced phenomenotechnically in an experimental system based on cultural studies. In this design, figurations of temporal patterns can be made to appear and their relational relationship quality can be explored. In this interpretive horizon, the recurrent procedure of a backward epistemological practice introduced in the first part of this essay now appears as a temporal pattern that can be determined structurally hermeneutically in its referential figuration.
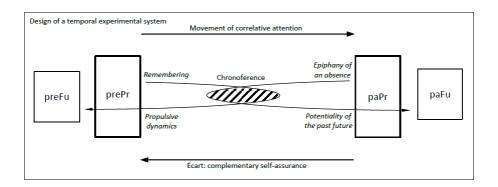

Figure 1. Experimental System: Temporality of Recurrence.

EXPERIMENTAL SYSTEM IN A SCIENCE-DIDACTIC PERSPECTIVE—ON THE TEMPORALITY OF RECURRENCE

The Experimental System in Science Didactics

In the first part of the essay, the historical-epistemological concept of the experimental system was introduced. In close connection, a phenomenotechnical procedure was made possible within this experimental system. The observed interplay of programmatic-

ORTFRIED SCHÄFFTER | MALTE EBNER VON ESCHENBACH

normative with structural-analytical moments forms the horizon of interpretation in the history of science. A developmental process of theory creation over several generations can be traced under an epistemological research interest. In its outcome, such a reconstruction amounts to determining epistemic objects that have constituted themselves in such a development without a subject as the object of disciplinary research practice and could be made permanent in disciplinary institutional terms. The concept of an experimental system presented for discussion here builds on this structural hermeneutic analysis, which now acquires a science-didactic function and transcends its original meaning in the history of science. From a research-methodological point of view, the experimental system is no longer to be understood as a development-theoretical context of interpretation, but rather as a design to be shaped in a science-didactic fashion. This system is a protective, enabling space in which events are evoked with a phenomenotechnical set of instruments and become systematically observable in a manner that would not be possible in life-world contexts and under everyday conditions.

In a science-didactic experimental system, design refers to what Rheinberger calls technical things in scientific epistemological practice, which distinguishes them from epistemic things. In a temporal-scientific research design, framework conditions, such as memory work in remembering *(Eingedenken)* (Marchesoni, 2016), belong to the technical things with which a temporal phenomenon first exhibits visibility. Chronoference, chronotopos or the shock experience of abruptly recognising what was not known at the time would be attributed to the epistemic things of a recurrent epistemological practice in temporal theory (Ehrlicher, 2016).

The Temporality of Recurrence

In the diagram (Fig. 1), the outer frame indicates the science-didactic context of a temporal experimental system. It provides the enabling context for a phenomenotechnical procedure in which two temporal orders (here: prePr and prePa) can be placed in relation to each other. In a dialogical relationalisation, both temporal orders experience the "opposability" (*Gegenwendigkeit*) (Ebner von Eschenbach, 2021a) of complementarily interlocking relations within a temporal reference system of a higher order that spans both sides (transference). Within a topological field of tension, temporal relational quality becomes structurally determinable at the interface between the complementarily interlocking temporal orders based on a phenomenotechnical procedure. The decisive elements and moments of the procedure are clarified below as methodological cornerstones.

In the experimental system, a topological positional relationship is constituted by the tension between the present presence of a scientific epistemological practice (prePr) and the present absence of a past presence (paPr). This tension is actualised through techniques of memory work, of a horizon of thought that has become historical in the meantime, which could now experience a realisation within the framework of memory work despite its absence and only in this responsive encounter to release a "future slumbering in it" (Bloch, 1959/1973).

The design—a topological field
The topological tensions only acquire the character of a topological field through the fact that in the design of the experimental system they are set in relation to each other on

both sides in a dialectical double movement and are transformed into relations of an opposite chiasmus.

The movements of correlative attention and complementary self-assurance
Graphically, the reciprocal reference of both time modes is represented by the upper and lower vector as an arrow. At the top, it is a turning towards, in which the practice of epistemological moves from its positioning of the present present (prePr) in an actualising memory work in empathic re-enactment of the past present (paPr) that has become historically accessible to it. The lower double arrow refers to Merleau-Ponty (1964/1986, p. 172ff.). This arrow refers to the distance (*écart*) between the two temporal orders, which must be established or maintained despite all visualisation, so that the other can be perceived as a sphere of its own.

Distance-emphasising return to representation
The complementary moment of dialogicity now comes into play in the step towards its self-assurance of its own location. The reason this movement of self-assurance is depicted as a double arrow is that both relations, here the present presence of research practice (prePr), but also the present past phenomenologically expressed in its appearance in the historical memory work, are in contact with each other. It only "comes into its own" in this responsive research process (Marchesoni, 2014, p. 18).

This thesis clarifies that, with the relation-theoretical reconceptualisation introduced here, a process of profound rethinking can be advanced in formal logic, as it can already be found in the philosophical thinking of Bloch and Walter Benjamin. It could not be transmitted in its radicality, however, in these discourses.

> Thus the "canonical dreamer" always remains mindful of his dreams because he does not understand in their depth a deception to be regarded with longing, a consoling substitute, but senses a crack in the given to be pursued further, which can prove to be a path to be actively realised. But a diversion is necessary to have an effect in the present, the diversions through the past. (Marchesoni, 2014, p. 25)

From a relation-theoretical point of view, it is easy to agree with Bloch's interpretation. Difficulties are encountered by a style of thinking that has not yet abandoned the dingontological hypostasis of the three orders of time and does not yet understand how to interpret them as the endpoints of an opposite relationality.

Two reversing (gegenwendige) loops
After explaining the basic dialogical structure of the design, in which the present (prePr) and a past present (paPr) are entangled in a mutually responsive dialogue, the inner movement sequence of the design can be examined. Here, movements of mutual approach emanate from both relations of opposite time modes, which overlap centrally as reversing loops. Through both movements, they constitute a common field of overlapping, which is highlighted by hatching and called chronoference. In its interlacing, it is of central importance for dialogicity. Before its explanation, however, the process of its constitution needs to be outlined, based on the chiasmus of the two loops, each of which starts from one of the opposite time modes and leads back to them again.

The left loop: Remembering and propulsive dynamics
The movement that starts from the present (prePr) and, after the encounter in the alien contact of chronoference with the past present (paPr), returns to its own sphere of being, and has passed through two relational qualities in the consummation of its reference. In its empathically comprehending turn towards the knowledge practice that has become foreign, the correlative relational quality is expressed phenomenotechnically in a form of memory work conceptualised by Bloch and, following him, by Benjamin in the philosophy of history as "remembering" (*Eingedenken*) (Marchesoni, 2014, 2016). Remembering denotes a historical consciousness and a specific form of remembering in which the past is not conceived and transfigured as something closed, but on the contrary, its presentness is emphasised. Bloch conceptualises the form of memory as a phenomenotechnical capacity with which the past is not understood as something closed off in a sedimented layer, but on the contrary, the vivid presentness of its absence is emphasised. The crucial point of temporal theory and the surprise that an experimental system provides is represented in the diagram by the retrograde movement from chronoference to epistemological practice, whereby this self-assuring relational quality of temporal dialogicity is marked by propulsive dynamics. Contact with an envisioned historical-epistemological practice and the particular "thought atmosphere of this time" (Bloch, 1918/2018, pp. 235ff.) leads to a self-transformation in which the previously occupied epistemic location could already transform and become a propulsion towards a present future that has now become accessible. To reconstruct the dynamic that has become visible, temporal dialogicity, in terms of structural hermeneutics, is necessary to consider the other loop.

The right loop: Epiphany of an absence and potentiality of the past future
The reverse loop of movement, which starts from the past present (paPr) and, after its encounter of chronoference in foreign contact with the present (prePr), returns to its sphere of peculiarity, has also undergone two relational qualities in the consummation of its reference. The phenomenotechnical actualising memory procedure in the temporal experimental system leads to a long-past "thought atmosphere" being actualised as a past present (paPr) and standing vividly before one's eyes. This generation of a phenomenon, which is due to the temporal experimental system, is formulated in the diagrammatic representation "epiphany of an absent presence". It is based on Bloch's (1918/2018) philosophy of history theorem: "Only now, in the present moment, does what has been come to itself, since it was waiting for us, wanting to be related to us" (Marchesoni, 2014, p. 18). In its complementary self-assuring return to the sphere of its ownness, it no longer encounters the exit—analogous to the transformation on the left side of the diagram—but a time mode also temporally transformed.

If one follows Bloch's thesis that the phenomenological technique of remembering, guided by the theory of memory, releases a "future slumbering in the past", then the reference movement encounters a past present that transforms itself during chronoference. The recurrent reconstruction now encounters an envisioned epistemological practice, which in its time, and that means in the socio-historical constellation of the time, was authoritative and practically available, from which the further course of development represented only one of many options. Bloch's transformation-theoretical axiom of an unexploited potentiality of "non-lived life" is based on this multi-optionality. In relation-theoretical terms, the temporal phenomenotechnique of remembering actualises the potentiality of past futures (paFu), in which previous interpretations of the past can now be contingently posited, possibly even seen as missed opportunities from the epistemological practice of a present present

(prePr). However, analogous to the propulsive dynamics in which the plurality of possible developmental courses in the historical constellation are opened up for a present epistemological practice, this also applies to the remembering of a past present. Its epistemological practice had a multi-optionality of future development variants to which only the doors and windows could still be opened in the constellation of the time and yet only the path was taken that, from the retrospective perspective of a present time, is interpreted in a truncated way as "without alternative".

On the dynamics of temporal relational structures
With the extension of the orienting time modes prePr and paPr by their respective future-opening transitory time modes preFu and paFu, the relation-theoretical modelling goes beyond the classification of the first overview in the Table 1. With the introduction of a dynamising process course, the modelling switches to a spherical form of representation. It can also be taken into account in the modelling that the entire temporalised relational structure is dynamised with and due to a successful epistemological practice. One moment of the extended experimental system takes on the central significance of a key position, the two-sided interface between the time modes, referred to as chronoference. It requires an epistemic transition to a previously inaccessible form of knowledge to clarify the dialogicity of the temporal experimental system and a relation-theoretical reconstruction of the figures of thought (Gabriel, 2019).

Chronoference—An Epistemic Object of Temporal-Theoretical Epistemological Development
From the diagrammatic representation of the experimental system, the dialogical entanglement of the two-time modes becomes apparent. The phenomenon that, due to a specific design, they do not exclude each other in their boundary contact, but rather significantly overlap in an interfering manner, is also clear. Due to the structural dialogicity of their contact movements, which are synchronised on both sides, a topological space of tension is formed, which is visually highlighted in the diagram by hatching due to its high significance. Structurally, a "chiasmus" rich in tension can be located here, which unites both modes of time and their opposing epistemological practice by separating and dividing by uniting. A decisive transformation-theoretical feature of experimental dialogicality is that opposing structures of order do not come into contrast and are thus horizontally juxtaposed as dichotomous opposites. The point of Bakhtin's action-theoretical construct is based in the performance of a "unity of difference". Instead of a horizontal contrast, the figure of the in-between moves on a level of knowledge that dialectically overlaps both orders. From the vantage point of view that has now been reached, a transversal observation of both sides simultaneously becomes possible. In the context of chronoference in temporal design, the prerequisites are fulfilled that the interface between complementary (time) orders not only transcends, but such a transgression can appear recognisably as a phenomenon and becomes representable with a suitable set of instruments.

It is of interest to educational science that in a recurrent reconstruction of the difference between the background assumptions, the non-knowledge of a past present can also be determined retrospectively and can often be assigned to a "chronotope" or to a disciplinary network of "chronotopoi of non-knowledge". In the understanding of an epistemological obstacle as a "mobilisation event" (Schäffter, 1997), the discovery of non-knowledge takes on the positive meaning of a "blank spot" on the cognitive map of a disciplinary or biographical epistemological practice and serves expansive learning. If

the recurrent reconstruction of earlier non-knowledge relates to the development of one's own discipline and a conspicuous continuity or conformist harmonising epistemological practice, it cannot be surprising if the now unavoidable "shock" of encountering the view of that time turns the chronotopos into a place of horror (Bohrer, 1978; Engelmann & Schröder, 2017). A discourse in the philosophy of history can be found here, which could be productively transferred to experiences of resistance to a reflection of disciplinary resistances to knowledge.

OUTLOOK

In the temporal dialogicity of a recurrent reflection of explorative research processes, these take their impetus from the vantage point of view of a present present (prePr). From this "here and now", a past present is first brought to mind with regard to its then respect. In the reflection step, the empathically comprehended actualisation of a point of view that in the meantime belongs to the past is put into relation with the point of view that has been reached at present. In this dialogue, both positionings can experience a historical-epistemological depth of focus. In the contrasting of both perspectives, both their epistemological distance (*écart*) and, in the now disclosed in-between, the epistemological obstacle as a critical event in an interruption *(rupture)* visibly appear. With the determinability of the *écart* between a previous and a present respect, the historical significance of the positioning achieved in the meantime in the tentative course of a goal-generating exploration is transformed.

With the view of the distance to the end of the search movement achieved so far, its development logic, which has been latent until now, becomes recognisable in retrospect and structurally understandable. With the insight that the currently achieved state could once again be a zone of the next development that has released new options, the view becomes free for paths that can now be connected. The recurrent view of the developmental course implicitly followed so far not only leads to a more precise determination of the vantage viewpoint reached in the meantime, but also paves the way for a now only currently available present future (preFu) due to its discontinuity in the present (prePr). The reflective reassurance of a view of a formerly present location (paPr), therefore, drives development a further step forward into a future that has only thus become accessible. The look back paves the way in the future present, without already making it visible in a forward-looking way. This is precisely what Benjamin's metaphorical philosophy of history shockingly makes visible in Paul Klee's painting *Angelus Novus*:

His eyes are open, his mouth is open and his wings are stretched out. The angel of history must look like this. He has turned his face towards the past. Where a chain of events appears before *us*, he sees a single catastrophe that ceaselessly heaps rubble upon rubble and hurls it at his feet. He would like to linger .... But a storm blows from paradise .... This storm drives him inexorably into the future, to which he turns his back, while the heap of rubble before him grows skywards. That which we call progress is this storm. (Benjamin, 1940/1980, pp. 697-698)

In comparison to Benjamin, Bloch draws the opposite conclusion from the backward-looking development of knowledge, as reconstructed here in relation theory, from a "spirit of utopia". In connection with the developmental dynamics elaborated here, which can be released by the memory-theoretical concept of remembering, Bloch derives the *principle of hope* (*Prinzip Hoffnung*) of a goal-generating search movement and thus of a dynamic of self-changing developmental courses whose deep structure can form an immanent corrective function.

Reframing temporality: Consequences of a relational understanding of temporality
The relational reconceptualisation of the recurrent generation of knowledge presented here is yet another example that can be used to show that in the course of a structural hermeneutic procedure, already existing transdisciplinary discourses become visible and thus accessible, which otherwise would not have come into view and which are highly relevant for educational research for its future development. If one condenses the considerations presented in the article at this point, then a multitude of qualitatively different "past relations" (*Vergangenheitsverhältnisse*) (Denschlag, 2017) can be observed and discussed.

(a) Historiographical consequences: With the problematisation of the linear chrono-reference (*past–present–future*), which has so far been taken for granted, we have presented a line of argumentation that challenges future temporal studies in adult education to reveal which temporal ideas are being operated with. Temporality can no longer be schematised into yesterday, today and tomorrow! To continue to follow this dominant chronologisation points to an obstacle to knowledge that serves classical temporal dichotomies (yesterday-tomorrow, yesterday-today, today-tomorrow), which must now be transcended.

(b) Transgenerational consequences: The desire for conventional understandings of temporality (linear chrono-reference) makes it impossible to discover the contingent play of possibilities in past biographical development processes and their effects. It is precisely linearisation that ensures that the contingency of the past does not (and should not) appear. Making fruitful and visible alternatives that lie in the past then aims at an emancipatory act that requires an elaborate temporal-theoretical approach. The ontogenetic development of individual biographies is embedded in overarching contexts such as family and contemporary history. It thus proceeds diachronically with their familial and, via these, mediated collective processes of change on the level of a socio-historical epochal change. From the perspective adopted here, trans-generational transitions can be reconstructed as tense transformations within a temporal relational structure. This applies in particular to documented family history, as in the case of dynasties or family businesses spanning several generations, which are able to develop an obstinate logic. In addition, a certain interweaving with political and contemporary historical developments can be observed. Of interest to educational science is the transgenerational reflection in the interpretive context of a temporal relational structure with regard to family socialisation in specific constellations. Among other things, "transitory identity" (Straub & Renn, 2002) due to a transgenerationally experienced break in an epoch or the "passing on" of a problem that was unsolvable in a historically earlier constellation to the following ones, who are now able to use more favourable conditions for this.

(c) Consequences for the history of discipline: The opening of new futures through the reconstruction of recurrent courses of development is able to call up epistemic decisions made in the past, more precisely: preconditions and historical constellations of decisions, and make them thematic. Thus, from a temporal-theoretical perspective, questions

become possible as to whether what was not realised also had effects on decisions. Bringing the "forgotten and unrealised futures" back to light and thus making them actualisable in their potentiality has epistemological consequences for disciplinary historiography. Which events remain invisible in disciplinary memory then depends on the extent to which a recurrent perspective is employed (Ebner von Eschenbach, 2022; Schäffter, 2022; see also Rieger-Ladich, Rohstock, & Amos, 2019).

(d) Socio-historical consequences: A central socio-political utopian moment in the reconstruction and pedagogical analysis of the temporal relational structure found consists in the determination of the significance assigned to the future in each case: on the one hand, it endeavours in the process of remembering and thus a visualisation of a "forgotten future", which thus becomes available in the form of a potential. From the perspective of the current historical constellation, however, the problem arises as to what extent a past and forgotten future perspective does not open Pandora's box. The construct of the temporal relational structure shows that each of the temporal orders involved conceptualises particular ideas of the future. In terms of relational logic, the future is subject to a historical a priori and is thus to a large extent the programmatic expression of a social constellation. However, this is especially true for historical times of fear of the future. In terms of the philosophy of history, we are confronted here with the apocalyptic figure of an end time towards which a development seems to be running. From a temporal-theoretical point of view, the understanding of the present is transformed on the basis of such a well-founded fear of the future, so that it must be understood largely or exclusively as a "hold-up", i.e. as the *kat-echon* of an impending end time (Taubes, 1987, p. 22). Understood in terms of temporal theory, the present has thus come under the "tyranny of a future" (Lemke, 2014), which threatens it existentially, but also opens up a view back to earlier, long-forgotten end times, in which past worlds also perished in their own way. In terms of educational science, this could be taken as an opportunity to turn to the "end" and the various figures of its apocalyptic form of thought (Schmidt, Ebner von Eschenbach, & Freide, 2022; Stierle & Warning, 1996).

If one examines the previous course of European adult education science in its transdisciplinary versatility and polyphony in the interest of recurrent knowledge acquisition, the structural hermeneutic heuristics put up for discussion here seem far less over-terminated and complex than the research object it would have to constitute. Without a doubt, a significant number of hidden points of departure would be encountered and possibilities for development that have not been knowingly considered. It might be worthwhile to bring such lost and later "forgotten" options for the future (Assmann, 2020) back into our present time in forms of educational, practical thinking, if only to strengthen the power of imagination for a future to be shaped together. Educational science is also based on a high potentiality of a life that has not (yet) been lived.

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