The French-Anglophone divide in lithic research: A plea for pluralism in Palaeolithic Archaeology

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Chapter 2

Pepper's four world hypotheses as an epistemological framework to examine the divide

> *"If we desire to be undogmatic, and unexposed in the rear of our cognitive endeavors, we must be prepared to change our minds about the reliability of any evidence whatever. Facts do not guarantee our hypotheses. Facts and hypotheses cooperate to guarantee the factuality and the truth of each other. Cognitive enterprises open in a field of uncriticized fact. How much of this field will remain unaltered as a result of critical scrutiny, one cannot risk stating in advance. A constant recollection of this field of uncriticized fact, which quite correctly every hypothesis tries to abandon, is the greatest insurance against the fallacies of dogmatism."*
>
> – Stephen C. Pepper (1935: 367)

Abstract

This chapter introduces American philosopher Stephen C. Pepper's *World Hypotheses* (1942) as a viable framework for understanding research conflicts, which provides the key concepts for the comparison that follows. I start with a short discussion of why Pepper is useful for the task at hand and why his perspective offers some advantages that other available epistemologies of science do not. I then turn to the general structure of Western thought outlined by Pepper in order to expose the characteristics of its four cognitive pillars – 'formism,' 'mechanism,' 'contextualism,' and 'organicism' – including the dynamic interrelationships that exist between them. These four 'world hypotheses' disagree on the fundamental nature of reality and its essential building blocks; each of them musters a different repertoire of concepts and ideas for examining the empirical evidence. There are two 'analytic' theories – 'formism' and 'mechanism' – and two 'synthetic' theories – 'contextualism' and 'organicism.' The 'analytic' theories seek to understand reality from the perspective of parts and regard wholes as derived entities. The 'synthetic' theories, by contrast, recognise wholes as primary and view parts as dependent entities. The other two sets of two theories form the 'dispersive'-'integrative' boundary. The two 'dispersive' world theories – 'formism' and 'contextualism' – seek the proliferation of fact, regard reality as weakly determined, and try to take into account as much evidence as possible. Conversely, the two 'integrative' theories – 'mechanism' and 'organicism' – prefer a highly focussed reading of the evidence, regard reality as strongly determined, and more consequently discriminate between relevant and irrelevant information. Each of the four world theories provides a vastly different cognitive orientation, even bringing forth its own theory of how to assess and secure corroborative truth: 'formism' supports a correspondence conception of truth; 'mechanism' promotes a causal-adjustment theory of truth; 'contextualism' encourages an operational theory of truth; and 'organicism' champions a coherence conception of truth. Altogether, Pepper's four-partite epistemology delivers a powerful means to understand the nature of underdetermination in specialised fields of inquiry and helps us to recognise the principal coordinates along which knowledge conflicts are likely to occur.

2.1 **Why Pepper?**

Before we can start exposing Stephen Pepper's epistemological framework and to render it fruitful for analysing the French-Anglophone divide in lithic studies, a few comments on my motivation to draw on Pepper's work are in order here. Given that Pepper's contributions to the metaphysics of thought and the philosophy of science have largely been forgotten, the value of his work is not self-explanatory

(see **Box 4** for a biographic note on Pepper). It has to be said, however, that this situation is in principle also no reason to not consider him. Just because he is not as routinely called upon as thinkers such as Kuhn, Popper, or Foucault does not mean that he musters less useful resources to understand scientific practice. In this section, I will indeed argue that Pepper has unjustly been marginalised and that he provides a unique conceptual toolkit to make sense of science when it is *complicated* – that is, when the definition of science itself is put at stake and when multiple branches of science – e.g., the humanities, social sciences, life sciences, and the natural sciences – come together within a single disciplinary matrix. These conditions are met especially in 'hybrid' disciplines – disciplines that draw on multiple strands and branches of science in order to interpret their object matters. Clearly, Palaeolithic archaeology and the various threads of lithic research it hosts reflect such complicatedness, and may even be regarded as a paradigmatic example of a 'hybrid' field. Having said this, we can start asking for the advantages of using Pepper rather than other available epistemologies of science. Why is Pepper useful in the problem-context at hand?

The first point to be stressed is that Pepper remains one of the rare thinkers, at least to the knowledge of the author, who has seriously considered the totality of Western thought and presented a comprehensive taxonomy to capture it. In contrast to Kuhn (1996 [1972]) and Foucault (1969), for instance, who have come to their respective views on the problem of science and knowledge through an analysis of particular model-sciences – in Kuhn's case physics, in Foucault's case history and the humanities – Pepper's panoply of metatheoretical positions is disciplinarily 'neutral' and consequently avoids the general problems tied to the model-based approach. Pepper explicitly embarks on a maximally broad survey of the dominant tendencies in speculative and metaphysical thought, and to this end examines in particular the history of philosophical questioning. The advantage of this perspective is that philosophical reflection is older than any of the specialised branches of science, and is thus more likely to register and anticipate the full spectrum of human 'world-making' strategies, independently of their disciplinary framing. Moreover, philosophy is traditionally concerned with understanding the world as a whole rather than keeping itself busy with particular problems, themes, objects, or aspects of reality. It can be added that, from a systematic and historical point of view, philosophical reasoning is at the roots of most of the specialised fields of inquiry that we call the 'sciences' today. It is in this sense that Pepper's methodological manoeuvre allows us to take a step back and to search for structures of thought that are pre- and perhaps even trans-disciplinary. Pepper's classification of scientific cognition, as a consequence, promises to transcend well-cemented epistemic boundaries such as the old demarcation between the humanities [*Geisteswissenschaften*] and the natural sciences [*Naturwissenschaften*].[49] By offering such a broad coverage, Pepper avoids self-defeat and questions of scientificity can finally be addressed on comparative grounds, rather than simply reproducing the heralded views of particular fields and research projects.[50]

The second point is a follow-up of the first and has to do with the specific way in which Pepper maps the diversity of credible scientific cognition. The contrast to Kuhn (1996 [1972]) and Foucault (1969), and to a certain extent also to Bachelard (1938), may serve as a foil to clarify this aspect. Both Kuhn, in *The Structure of Scientific Revolutions* (1996 [1972]), and Foucault, in *L'Archéologie du savoir* (1969), put their emphasis on the 'verticality,' that is, the historicity of scientific knowledge developments. Both argue that the diversity of human thought is mainly a product of processes operating on a temporal plane. Kuhn's 'paradigms' and Foucault's notion of « *épistémè* » specify different kinds of historical *a priori*, which are continuously replaced in time.[51] The implication is that there can only be one dominant 'paradigm' and only one dominant 'discursive formation' at any given moment. It is therefore not surprising that many approaches to science that draw on Kuhn or Foucault face difficulties with making sense of intra-scientific fractures and serious intra-disciplinary conflicts. Pepper anticipates this problem and lucidly brings into focus that cognitive diversity is not only a matter of his-

[49] This is at least in part a consequence of Pepper's biography and the people he worked with during his career; it is for instance notable that Pepper interacted quite intensively with seminal psychologists such as Edward Tolman (learning theory, cognitivism) and Kurt Koffka (Gestalt psychology) as well as the influential social theorist Georg Herbert Mead (interactionism, social behaviourism) (cf. Hahn 2000).

[50] This universalist aspiration is only underscored by the central role that Pepper assigns to 'metaphors' and metaphorical reasoning in general (see *infra*); obviously, metaphors have the ability to shape human cognition independently of the specific part of reality or object matter that is investigated.

[51] Foucault (1969) even invokes the idea of *Zeitgeist* ('spirit of an age') to illustrate and support his notion of historically specific 'discursive formations' which replace each other as time goes by.

tory, but also an issue of the 'here and now.' He maps this diversity in its 'horizontality' and acknowledges that different cognitive formations compete for cognitive and social supremacy at any given time. Needless to say, this complies much better with the present project, namely to lay bare the basic sources of conflict which have prompted and solidified the French-Anglophone divide in Palaeolithic archaeology.

The third point is that Pepper's survey of cognition anticipates many, if not most, of the main topics of contemporary philosophy of science and, for that matter, other fields that study science.[52] As the exposition that follows will show, this concerns issues such as: 'theory-laden observation'; the dichotomy of 'facts' and 'values'; the 'prejudice structure' of knowledge formation; the 'disunity' of scientific knowledge; the tension between 'explanatory' and 'interpretive' science, between 'holism' and 'atomism', and between 'reduction' and 'emergence'; the difficulty to make sense of 'part-whole' configurations; the status of 'data,' 'theories,' and scientific 'truth'; the socio-historical framing of knowledge and the role of the individual therein; the 'integration' of disparate knowledge claims; and many more. Some of these issues are explicitly addressed in Pepper's work, while others are only implied or hinted at. The purpose of the present chapter is to reveal this genuine potential and to develop some of it in relation to the problems at hand. It should be uncontroversial to accept that this should help us in clarifying the cognitive stakes of the French-Anglophone divide.

The fourth point is that Pepper helps to retrieve some of the conceptual insights which have largely been lost in the aftermath of the intellectual turmoil of the Second World War. The 'takeover' of Anglophone philosophy by the Logical Positivists and Logical Empiricists and the rise of 'analytic' philosophy in the U.S. and the U.K. only marks the apex of this development. Its consequence was that philosophy itself became a somewhat specialised field of inquiry, characterised by a rather narrow conception of scientificity. This is still the normative dilemma of modern philosophy of science, partly a consequence of the attempt to establish conceptual continuity with the empirical sciences. For Palaeolithic archaeology even worse, its Anglophone practitioners have engaged mainly with the then mainstream 'normative project' in philosophy of science – a project that sought to establish what science *ought* to be rather than how science, as a matter of fact, *is* already practiced and *why*.[53] Pepper can help us to break these bonds and to get rid of the 'prescriptive' baggage of the debate.[54]

The fifth point is that Pepper's exceptionally broad coverage of Western thought can likely contribute to our understanding of the preconditions for the 'underdetermination' of lithic knowledge (cf. Chapter 1). In some ways, this point is certainly a culmination of all other points since an adequate approach to general questions of knowledge underdetermination may have been compromised by overly one-sided understandings of knowledge and science.

As a sixth and last point, it is important to emphasise that Pepper has occasionally been used in other disciplines to examine their respective epistemological structure – for example in psychology (Gillespie 1982; Hayes et al. 1988; Long 1990; Karimi-Aghdam 2016; cf. Goerner 1992; Staddon 1993), biology (Brent 1972), economics (Daly 2000), and systems science (Overton 2007).[55] The results of these studies are generally promising and show the potential of using Pepper for similar purposes. One can add what I have alluded to before: because of the unusual 'hybridity' of Palaeolithic research, it is probable that Pepper is even more fruitful to expose the latter's structure of reasoning. I would argue

[52] This topic is seriously under-researched (but see Reck 1982) – a situation that is perhaps unsurprising given the general neglect of Pepper's contribution at large.

[53] One may indeed argue that this was the critical moment in the history of modern Palaeolithic archaeology after which its Anglophone division in the wake of Binford's *New Archaeology*, Clarke's *Analytical Archaeology*, and Howell's *Paleoanthropology* on the one hand – all modelled on an image of science based on the 'hard' natural sciences – and French 'prehistory' in the wake of Leroi-Gourhan's *« Ethnologie préhistoire »* and Tixier's *« Technologie préhistoire »* on the other – modelled on an image of science based on the 'soft' sciences (humanities, history, interpretive sociology, ethnology, etc.) – became irretrievably disconnected.

[54] The point here is not to say that Anglophone Palaeolithic archaeology is misguided to take up the conception of science favoured by the 'normative project'; the point, again, is merely to emphasise that this already implies a very specific stance to science, a form of perspective-taking that is a part of the difficulty to navigate the French-Anglophone divide. To clear the view for the actual stakes of the divide, we must therefore also clear the view for the full spectrum of conceptions of science that can be seriously considered.

[55] See also Stroud (2015) for an engagement with Pepper in terms of the 'rhetorics of criticism' in science and aesthetics.

that the results obtained by the present investigation support this claim (see Chapter 6), but I leave it to the readers to be the judge of this.[56]

2.2 **The landscape of Western thought**

In *World Hypotheses* (1942), Stephen Pepper argues that the diversity of credible trajectories of Western thought can be comprehensively captured by four distinct ways of making sense of the world, all of which are relatively adequate in their own right (*ibid*.: 1).[57] These 'world hypotheses' are surprisingly 'empirical' according to Pepper and have developed out of ordinary or common-sense experience (cf. Pepper 1967: 1). As world hypotheses, they have been constantly refined and expanded over the course of the centuries and are, in their core, at least as old as philosophical speculation itself. World hypotheses represent hypotheses about the world and are as such distinguished by their *unrestrictedness* – they contain statements about the structure of the world as a whole and help to organise the totality of the available and possible evidence (Pepper 1942: 78, 1943: 602);[58] their peculiarity, moreover, lies in the fact that no world hypotheses can be rejected as completely irrelevant (*ibid*.: 1). We can thus say that world hypotheses encapsulate the pillars of refined cognition.

World Hypotheses originally identified and discussed six of such world hypotheses, from which, however, only four were diagnosed to have withstood the scrutiny of history – with 'animism' and 'mysticism' failing the test of time. The remaining four – 'formism,' 'mechanism,' 'contextualism,' and 'organicism' – are considered the only world hypotheses to have shown great *cognitive adequacy* (Pepper 1935a: 370, 1942: 141-150). This cognitive adequacy, according to Pepper (1936: 576), renders them the best tools we currently possess to transform uncriticised 'common sense'[59] into 'refined knowledge' – into what Pepper (1942: 39-70) broadly identifies as scientific knowledge.[60] Yet, all of the four world hypotheses have their respective problems and are far from ideal in making sense of the world – *none* of them is fully or perfectly adequate and all of them seem to truncate and/or marginalise some critical aspects of the world (cf. Pepper 1935a: 370, 1942: Chapter VI; these relative weaknesses of each of the four adequate world theories are exposed in some detail in **Appendix II**).

Although a world hypothesis is constantly corroborated and tested by the evidence it makes available (Pepper 1967: 5; cf. Monast 1975: 95f.), its unrestricted nature concurrently renders it a necessary precondition for marshalling evidence, formulating theories, and identifying or discussing problems that arise during the research process. A world hypothesis in Peppers sense is therefore something that *must* be formulated or accepted – at least tacitly –before any serious scientific inquiry can start.[61] Even though world hypotheses themselves, as hypotheses, are empirical entities and as such maintain links to common-sense experience throughout their use-life, they are hence also 'pre-empirical' insofar as they help to structure how evidence is gathered, analysed, and finally interpreted; they constitute elementary cognitive devices to orient any examination of fact.[62] To this effect, a world hypothesis delineates a wider cognitive system that includes basic statements on how the world is hold together and thereby makes possible to systematically access this world (cf. Pepper 1942: 74). A world

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[56] This is Lakatos' argument of 'eating the cake.' The argument holds that in order to judge how well a cake is made, one needs to eat it. By analogy, theoretical claims or frameworks literally have to be "eaten" first before their fecundity can be evaluated – "eaten" in the context of theories usually means "applied" or "executed."

[57] In a later book, *Concept and Quality* (1967), Pepper sought to establish a fifth relatively adequate world hypothesis – 'selectivism.' Due to its unclear and somewhat controversial status, I will, however, limit my investigation to Pepper's original four world hypotheses here (see **Box 4**).

[58] More specifically, this means negatively that a world hypothesis rejects no evidence from its field and positively that it seeks to organise the totality of evidence (Pepper 1943: 602).

[59] What Pepper names 'common sense' has also been termed 'opinion,' 'middle-sized fact,' 'pre-analytical fact,' or 'folk-psychological view' to name but a few (cf. Pepper 1935a).

[60] Pepper (1942) is of course more rigorous in his account but because his differentiations do not matter much for the present purpose, I will not linger on them for any longer. It should be mentioned, however, that he refers to the realm of common sense in which uncriticised facts or evidence in the form of 'dubitanda' are found as the 'roots of knowledge,' whereas criticised facts come in the form either of 'data' or 'danda' and are referred to as the 'fruits of knowledge' (cf. *ibid*.: 68).

[61] This, of course, does not mean that each scholar has to consciously formulate such a world theory before she/he can begin her/his localised inquiry. Most of the time, world theories are only loosely attached to individuals and their role is "passive" rather than "active" (see *infra*). This also means that they are rarely made explicit during the research process although they can be shown to substantially guide it. I will return to this point in Chapter 6.

[62] Pepper (1942: 72-74) tries to capture this 'structuring' effect of world hypotheses by their capacity to "cognitively prescribe," an ability that common-sense experience lacks. This ability to structurally *prescribe* is not to be confused with the ability to predict – a specific instance of the prescriptive aptitude proper to the world theory of 'mechanism.'

hypothesis understood in this way constitutes a somewhat 'passive' yet all-encompassing theory – a 'world theory' – which can be distinguished from the more 'active' local theories that are explicitly developed, discussed, and negotiated in practiced science but remain constrained and bounded in their application (Pepper 1935b: 16; cf. Monast 1965: 98).

Each world hypothesis is quite specific about the type and nature of the evidence it typically carves out (cf. Pepper 1942: 68). This means that the specification of observations that can serve as *data* is part of the work that a world hypothesis does (Pepper 1935a: 371, 1942: 51f., 68). Consequently, different world hypotheses tend to marshal different types of evidence, or at least evidence that is not directly comparable (cf. Monast 1975: 132).[63] This clearly constitutes one of the key sources of the cognitive autonomy of world theories. Each world hypothesis generally differs in how it handles and 'digests' common-sense experience – a situation which, in turn, results in basic disparities in how the world is partitioned, what is brought into focus, and what is downplayed or even whitewashed. As Pepper (1935a: 369) puts it, world hypotheses therefore emerge as "our ultimate source for the discovery of the nature of facts."[64]

In providing such general cognitive orientation, world hypotheses inevitably entail value judgements and favour their own view(s) of science – views that seek compatibility with the heralded values.[65] This is the unescapable normativity of world hypotheses (cf. Efron 1980: 20).[66] World hypotheses constitute relatively enclosed cognitive systems, in which understandings of the world, types of evidence, values, methods, theories, arguments, and interpretations are circularly coupled. They are constantly adapting to each other in order to render the world theory internally coherent. As a result, the conceptual framing provided by different world hypotheses will typically support unequal interpretations of all of the respective dimensions of research (cf. Pepper 1935a: 367, 1942: 79f., 1967: 5).[67] In general terms, this situation should be familiar to students of philosophy of science and may count as an early formulation of the inevitable *value-* and *theory-ladenness* of all scientific endeavours, later popularised by Kuhn (1977) and his followers.[68] The ingenuity of Pepper's *World Hypotheses* lies in the fact that it elegantly anticipates the Kuhnian idea of 'theory-laden observation'[69] and combines it with the core insight of hermeneutic thinking – that is, the empirically grounded *prejudice structure* of all knowledge formation – which was later systematised by Gadamer (1960) and others.[70] In doing so, world hypotheses arise as indispensable, highly effective, yet extremely dynamic catalysts of human reasoning in general.

Having said this, it is important to recognise that each wider cognitive system centred on a world hypothesis can easily integrate multiple 'localised' theoretical and epistemological positions while not being reducible to them; this is because world hypotheses signify *meta-theoretical standpoints* that group epistemic and, by extension, scientific stances on a higher level. For instance, 'materialism' and 'realism' tend to be associated with 'formism,' whereas 'naturalism,' 'behaviourism,' and 'adaptationism' generally gravitate towards 'mechanism.' Similarly, 'interactionism,' 'social constructionism,' and 'pragmatism' tend to be associated with 'contextualism,' while 'structuralism' and many holistic evolutionary theories strongly gravitate towards 'organicism.' Already this brief sampler makes immediately clear why Pepper's framework is so useful for the purpose at hand: it promises to estab-

[63] This may or may not include different ways of transferring evidence into analysable data.
[64] For Pepper (1942: 79), evidence and interpretation are thus inescapably merged in a world hypothesis: "[i]n a world theory it is impossible to say where pure fact ends and interpretation in fact begins. Within the theory itself the distinction is clear. The theory will tell you what a fact 'is' and what in fact is theory. But another equally reliable theory will draw the line in another place" (cf. also Pepper 1943: 602).
[65] This is another reason why the normative quest for the one adequate 'method of science' – if the hypothesis of world hypotheses is correct – appears to be deeply misguided. What science *is* or *ought to be* can only be answered relative to already accepted world hypotheses and can hence only be objectively determined in relation to the standards established by their cognitive framing.
[66] This is effectively a rejection of the fact-value dichotomy for the separation between 'facts' and 'values' is pointless within world hypotheses.
[67] For a detailed exposition of the prominent although not always immediately evident role of *value* in Pepper's work, see Efron (1980: 20).
[68] For a recent sampler of key discussions on the role of values in science, see Schurz and Carrier (2013).
[69] There is in fact reasonable ground to suspect a certain influence of Pepper on Kuhn's formulation of the concept of the 'paradigm' (cf. Efron 1980: 23).
[70] Gadamer's (1960) original German concept for this is *Vorurteilsstruktur des Wissens*.

lish a simple taxonomy of epistemic positions without getting lost in the intricacies and details of particular theoretical stances – details that may be unimportant for comprehending the bigger picture.[71]

2.3 **Root metaphor theory**

The core of each world hypothesis is constituted by what Pepper calls 'root metaphor.' A root metaphor is both the core and origin of a world hypothesis (cf. Pepper 1935a: 365). To identify and analyse root metaphors enables a general understanding of how different world hypotheses operate. In general terms, root metaphors specify the core intuitions and features found in common-sense experience, around which a world hypotheses is built (Pepper 1942: 91f.). Root metaphors are the primary devices which carry over these core intuitions and basic insights in order to systematise and develop them, so that the world can be described, interpreted, and criticised in relatively reliable and adequate ways. This interrelationship between a world hypothesis and its root metaphor is what Pepper tries to encapsulate in his 'root metaphor theory' (cf. Pepper 1928, 1935a: 369). The theory entails a number of theorems ('maxims') which inform about the nature of world hypotheses and prepare the ground for analysing them – an analysis that Pepper (1942: 91-96) aptly terms 'root metaphor method.'

Pepper's root metaphor theory generally responds to the simple question of 'how a world hypothesis is constructed in the first place.' This question can easily be reformulated so that it transforms into a historical question – in Pepper's terms, we can ask: "how does a world hypothesis arise?" (Pepper 1935a: 369). While root metaphor theory tries to advance analytical and systematic statements about the status and functioning of varying world hypotheses, it thus also places emphasis on their *historical development*. This last point cannot be overemphasised since it allows us to grasp how world hypotheses may alter over time and is generally consistent with the recurrent emphasis on the 'historicity' of science and its ever-transforming character that pervades science studies at large.[72]

As the historical and conceptual origin of world hypotheses, root metaphors specify the conditions under which 'uncriticised' knowledge is transferred into 'scrutinised' and 'criticisable' scientific knowledge. In contrast to world hypotheses themselves, which by definition are 'global' in scope, root metaphors always have a 'local' origin (cf. Pepper 1967: 3). They are propelled by strong common-sense intuitions[73] which derive from *specific domains of observation* or *selected groups of facts*.[74] These are then 'cognitively digested' by reference to the root metaphor as Pepper (1935a: 369) calls it – they are systematised and refined so that their analysis enables their *expansion* to other domains or parts of observation in order to elucidate them (*idem*).[75] It is this capacity of a root metaphor to pro-

[71] What I try to investigate in the present study is whether and to what degree this seems to be the case. A brief survey of the available theoretical literature suggests that previous attempts to structure the landscape of archaeological thought have often led to unnecessary confusion by going astray in a multitude of 'isms' – 'isms' whose cognitive significance and heuristic power cannot be taken for granted and has rarely been demonstrated.

[72] This indicates that Pepper already recognised that science cannot escape its historicity, even though his conception of history stresses multi-linearity rather than uni-directionality and recasts scientific progress as a complicated and not always transparent process (see *infra*).

[73] The concept of 'intuition,' although not spelled-out in detail, is central to Pepper's theory of knowledge. Intuitions in Pepper's sense are assessments of the structure of reality with unparalleled immediacy; intuitions are produced in direct interaction with the parts of the world and hence derive from formative common-sense experiences and other observations that are deemed key to understand the nature of reality. They are not infallible, however, and not every intuition is as good as any other. Even though epistemic intuitions form the necessary starting point of developing a world theory, they always have to *prove* their fruitfulness while they are systematised and refined scientifically. Pepper's notion of 'intuition' comes perhaps closest to what Gopnik and Schwitzgebel (1998) refer to as the interpretation of *intuitions as hypotheses*; accordingly, intuitive judgements are simply "particularly plausible hypotheses about the nature of the world" (*ibid*.: 78). The difference to non-intuitive judgements – the kinds of judgement science naturally aspires to – is simply that intuitive judgement is not based on some kind of explicit reasoning process which the person who makes the judgement can consciously observe (*ibid*.: 77). Rendering judgment-making "observable" in this sense marks the crucial transition to scientific cognition. At any rate, appeals to 'epistemic intuitions' are clearly not obscure and still permeate modern epistemological theorising. Epistemic intuitions for instance still serve to evaluate whether claims fall on one or another side of some significant divide in epistemology (cf. Nagel 2007). In psychology, intuitive cognition is now widely recognised as a foundational element of all human reasoning and decision-making (Kahneman and Tversky 1996; Gigerenzer 2007). The important point about intuitions in science, however, seems to be that the latter, through its reflexive attitude, tends to cultivate specific intuitive predispositions and to hide them in seemingly hyper-conscious processes of reasoning.

[74] Cf. "[…] [P]erhaps the only way, in which metaphysical hypotheses [world hypotheses] can be derived is through the analysis of a selected group of facts (which I call the root metaphor) and the expansion of that analysis among other facts." (Pepper 1935a: 365)

[75] Pepper closely converges with Nelson Goodman's (1966) account of *reflective equilibria*. According to this idea, cognitive progress is made primarily by adjusting our local and more general theories to better match with our case-bound intuitions while also adjusting these intuitive judgements to better conform to our theories – this is what Goodman (*ibid*.: 66) refers to as

cess a local but persuasive common-sense understanding in such a way that reality as a whole can be grasped that renders it constitutive for its world hypothesis. Root metaphors, in other words, are metaphors that can be intuited in the 'local' and based on what they thereby encapsulate furnish an effective canon of conceptual resources to interpret the 'globality' of fact which they gradually encounter during their expansion.[76] Eventually, it is this friction between the global aspiration of a world hypothesis and its local origin that helps to explain a world hypothesis' partial yet unavoidable inadequacy – domain-specific intuitions have to be 'stretched' and thereby to be altered in order to accommodate the totality and richness of reality as a whole.[77]

Additionally, the constitutive tension between the 'local' and the 'global' elucidates why each world hypothesis maintains some traces of *dogmatism* (cf. Pepper 1935a: 372, 1942: 115-120). The initial set of 'facts' and common-sense experiences that define any world hypothesis' point of departure, although of course being amendable to cognitive refinement during the development of the hypothesis, are largely withdrawn from systematic scrutiny and are hence usually assumed to be 'self-evident' and/or 'indubitable' (Pepper 1935a: 369).[78] It follows that the core 'facts' and intuited key categories of a world hypothesis are largely *immune to revision* (cf. *ibid*.: 366)[79] – the hypothesis would in fact collapse if they would be abandoned and/or substantially revised. A certain degree of dogmatic security is therefore a necessary ingredient of any world hypothesis. This leads us to a somewhat paradoxical situation since dogmatism, in general, appears to be detrimental to cognitive advancement because it terminates debate and critical refinement (cf. Pepper 1942: Chapter II); yet, a residual 'dogmatic core,' as we have seen, is nonetheless required for making credible sense of the world as a whole; dogmatism thus seems to inhibit and enable insight at the same time – a curious feature of Pepper's world hypotheses theory to which I will return again to at the end of this chapter.

How do root metaphors give birth to their world hypothesis? The principal mechanism to do so is 'metaphorical conjecture.' The concept enables a basic understanding of how metaphors help to mediate the expansion of analysed facts, concepts, and categories from the context of their initial discovery to other 'foreign' contexts. What has been learned from the initial domain of observation and its hypothetical explanation can in this manner be transposed and/or extrapolated into a new domain of observation, which in turn can be re-interpreted through the lenses of the mediating root metaphor, and so forth until unrestricted scope and great adequacy is reached – it is in this sense that metaphors use one part of experience to illuminate another (cf. Efron 1980: 22). 'Metaphorical conjectures' thereby trigger a recurrent systematisation and cognitive codification of the original metaphor by testing its performance and monitoring its internal consistency in the face of hitherto un-encountered facts – the ultimate result of which is the formulation of an unrestricted hypotheses and its development (Pepper 1942: 328). 'Cognitive refinement' is nothing else than the process of gradually enhancing the capacity of a root metaphor to corroborate the evidence it generates during such an expansion (*ibid*.: 75). We may hence speak of a 'root metaphor' when the hypothetical systematisation of a locally retrieved metaphor has resulted in a field of application that is identical with the world as a whole.

How and to what effect such a root metaphor can be 'enhanced' relies entirely on the metaphor itself – on its *metaphorical* and *associative space* and the general proficiency of this space to devise concepts and categories that are able to secure and to improve the cognitive adequacy of its world hypothesis – root metaphors are hence primarily developed internally. The relative strength of a root

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the 'dual adjustment between definition and usage' so that the usage informs the definition and the definition guides future usages and/or the expansion of usage.

[76] In Pepper's (1935a: 369) own terms, this can be understood in the following way: "[The selected facts] are cognitively digested and analyzed. Their structure is usually found capable of rather wide extension through uncriticized facts not at first supposed to be of their nature. This structure is then elevated into an hypothesis for the explanation of other uncriticised facts, as a result of which these become critically interpreted in terms of the root metaphor. In the course of this interpretation, the root metaphor itself may undergo critical analysis and refinement which reciprocally increases its range and power of interpretation. When it assumes unlimited range, or world-wide scope, then it is a metaphysical hypothesis, and a catalogue of its principal descriptive concepts is a set of metaphysical categories."

[77] Needless to say, it is likely that something of importance is lost in this process – it is in fact likely that the core intuitions witness a gradual 'alienation' and thereby lose part of their initial cognitive appeal.

[78] It follows that concepts such as 'undeniable intuition,' 'self-evident,' 'indubitable,' and even 'observation' always represent *internal categories* of a given world hypothesis – they form, in other words, all *part* of the cognitive canon that a world hypothesis delineates (cf. Pepper 1935a: 366). Consequently, they cannot be criticised by the cognitive standards effectuated by other world hypotheses – an issue that has important consequences for how world hypotheses may interact (see Chapter 6). Some of these considerations anticipate the insights of Quine (1951a) and Wittgenstein (1958), making a huge splash in philosophy of science after their dissemination.

[79] Cf. "The symptom of dogmatism is the refusal to permit certain materials to be doubted." (Pepper 1935: 366)

metaphor lies in its ability to make successful 'metaphorical leaps' – that is, to adapt its conceptual repertoire to conflicting or hitherto undiscovered facts – for instance to a newly discovered domain of reality – in such a way that the mobilised world hypothesis remains intact and is further corroborated.[80] To make a 'metaphorical leap' hence simply means to re-interpret available facts in light of the utilised root metaphor so that the overall degree of structural corroboration provided by the metaphor's world hypothesis is increased. It is in this sense that we can hold that both the 'shape' and 'boundary' of each cognitive landscape surrounding a world hypothesis fundamentally depend on metaphorical insight (cf. Mattice 2014: ix).[81]

> "In developing a world hypothesis, the cognitive appeal must accordingly be always to the evidence available, and none of this evidence should be offered as certain. There will in this way develop a give and take between the evidence and the categories of the hypothesis ordering the evidence. The more the evidence corroborates the hypothesis the more it also corroborates itself in the interpretation it receives through the hypothesis. The root metaphor method is the regular empirical method of hypothesis supported by the evidence to the degree that the evidence corroborates the hypothesis and renders it relatively adequate. A world hypothesis, as we said earlier, differs from other empirical hypothesis only in its characteristic of being unrestricted in its subject matter." (Pepper 1966: 5)

Pepper's own stance towards metaphor is rather pragmatic; in his early work he already states: "[i]t is pedantic to object to metaphor. Every philosophical theory is a far-flung metaphor" (Pepper 1928: 130). For Pepper, this role of metaphor to cognitively 'guide' and 'give shape' is not limited to philosophical speculation but also holds true for scientific reasoning. Science is to a large degree understood as a process of bringing metaphors to bear, to refine and systematise them, and to recursively test their epistemic value. This, however, does not imply that Pepper reduces science to a mere 'language game' or defines it primarily as a linguistic phenomenon; to the contrary, he argues that metaphors, because they are initially found in intuition and therefore take stock of concrete experience, are able to bridge the 'abstract terms' on which science relies and the 'concrete objects' which it studies – metaphor, according to Pepper (*ibid*:: 131), can hence be recognised as a basic means to deflect thorny mind-matter issues. With Pepper we can say that metaphors help to 'dapple' the world (cf. Teller 2004), but they do not help to construct it; the status of metaphors is thus intermediate: they regulate the *contact* between the world and any hypotheses put forth to capture the world.[82] This conception is generally consistent with semantic field theories which hold that metaphors greatly facilitate and channel 'epistemic access' by utilising a set of given ties to form a new set of ties or extend already given sets (e.g., Feder Kittay 1987).[83] Metaphors thereby establish the 'rules of interaction' between cognition and world. This modulating role of metaphorical reasoning is generally difficult, if not impossible, to question (see e.g., Lakoff and Johnson 1980a, 1980b).[84]

It is through this 'guided' interaction between the world and the hypothesis put forth to make sense of it that root metaphors furnish a specific set of *structural categories* – structural categories which define the nature of the world hypothesis they anchor.[85] They are nothing else than the product

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[80] Naturally, there is no criterion available to decide *a priori* which root metaphors are more likely to be 'successful' in this regard. A root metaphor can only be shown to be relatively adequate to deal with the totality of its evidence, by means of its own *creative potential* – which, again, can only be discovered in the process of its refinement. There is also no guarantee that the most promising root metaphors have already been found, since the relative effectiveness of a given root metaphor also depends on how it is cognitively harnessed by particular people. It is therefore generally possible that the cognitive value of some basic metaphors has not been recognised yet.

[81] For the general importance of metaphor for philosophical and, by extension, scientific thought, see also Mattice (2014: Chapter 1).

[82] It needs to be said here that the reliance of a cognitive system on a single root metaphor does of course not preclude that other metaphors also play a role in digesting the evidence; yet, these metaphors must be 'derived' metaphors insofar as they are interpretable through the root metaphor and can be placed without any problems in the 'semantic field' of the original root metaphor – we then can say that it is the root metaphor which links and/or holds together distinct fields of metaphorical significance brought into existence by its 'derived' metaphors. There is thus room for a hierarchy of metaphors but metaphors which are not interpretable through the root metaphor inevitably introduce an 'eclecticistic' element to the world theory in question.

[83] Similar positions have also been developed in (meta-)archaeological theory. Especially the idea that archaeological practice and theory are driven to a large extent by metaphorical reasoning and conjecture is not new at all (cf. Shanks 1992). It is interesting to note in this context that in *Experiencing the Past*, Michael Shanks (1992: 42, 50, 166) explicitly utilises the same term – "root metaphor" – to describe different modes of archaeological engagement with the past.

[84] The role of metaphor was of course also recognised and theorised in cognitive linguistics, where, incentivised by the 'linguistic turn' which gained moment from about the 1960s onwards (cf. Rorty 1967), metaphor became widely viewed as a key mechanism for grounding cognitive systems and domains and to enable the transition between them.

[85] In the context of world hypotheses only *structural corroboration* is thus possible. Note that this insight anticipates key arguments of Quine's seminal *Two Dogmas of Empiricism* (1951a), in which the latter criticised the dominant 'analytic' dogma of his

of analysing, systematising, and refining a root metaphor in the course of its expansion. These 'structural categories' consequently specify how a world hypothesis orders and corroborates its evidence (cf. Pepper 1942: 329). Sweeping differences between world theories can therefore profitably be understood as disparities in the sets of 'structural categories' they mobilise. We can even say that each canon of 'structural categories' is only intelligible – in terms of its overall functioning and the interplay of individual categories – if interpreted through the lens of its original root metaphor. This brings us back to the starting point of this section and helps to clarify why an analysis of world hypotheses must be based on the careful exposition of root metaphors and why one cannot look at the categories in isolation.

Having said all of this, it remains important to stress that Pepper's root metaphor theory – even though it relies on 'metaphorical conjecture' – offers a clear rejection of the arbitrariness of root metaphors and their corresponding world hypotheses (cf. Efron 1980: 22). While Pepper gladly admits that metaphorical reasoning affords a great deal of intellectual freedom, root metaphors are always judged by their relative cognitive appeal and thus by the cognitive adequacy they can legislate about; this, in turn, is not simply a matter of convention but rather a question of interacting with the world and reaching high degrees of 'structural corroboration' as a result. Which metaphors are capable to provide the conceptual resources to achieve this is an open question and can only be answered empirically. The theory therefore resists falling prey to 'relativism' since the *selection* of potent – or 'pregnant' (Pepper 1935a: 132) – metaphors is key and not every metaphor is as good as any other. Pepper's key manoeuvre is his insistence on selective historical forces to reveal the relative success of different metaphors in refining themselves and corroborating the world hypothesis they embody. This historical conversion of a local hypothesis into a unrestricted hypothesis of world-wide scope always effectuates a test for the ability of the underlying root metaphor to work towards increasing cognitive adequacy – even if this cognitive adequacy can only be evaluated comparatively and thus always remains 'relative' in nature (cf. Pepper 1942: 120).

From the perspective of root metaphor theory, the history of Western intellectual thought can then be understood as a history of developing the relatively successful and promising metaphors – largely unsuccessful metaphors, by contrast, are typically discarded in the process but may re-appear from time to time to be tested again.[86] If we seek to understand the general structure of scholarly cognition we are thus well served with concentrating on the few root metaphors that have demonstrated this former capacity (Pepper 1942: 331, 340). This deflects the spectre of 'relativism' – two additional criteria must be satisfied when metaphors and the world meet: the motivated hypothesis must possess (a) the *scope* to capture the world as a whole (unrestrictedness) and it must maintain (b) a high degree of *adequacy* ('structural corroboration') (cf. Pepper 1935a: 370).[87]

According to Pepper (1942: 96-114), all of these considerations allow us to identify four maxims that regulate the development and cognitive refinement of world hypotheses – maxims that therefore capture the basic claims of Pepper's root metaphor theory: (i) *a world hypothesis is determined by its root metaphor*; (ii) *each world hypothesis is autonomous*; (iii) *eclecticism is confusing*; and (iv) *concepts which have lost contact with their root metaphors are empty abstractions*. Maxims (iii) and (iv) are particularly important since they represent a plea for 'purity' of metaphor (cf. Pepper 1942: 98, 104, 330). For Pepper (1928: 131f.), conceptual clarity is often obscured by the use of 'mixed metaphors.'[88] The reason is of course that they tend to undermine a world theory's internal consistency and may easily motivate conflicting readings of the same fact (Pepper 1935a: 373). What is perhaps more dangerous, however, is that a mixing of metaphor typically distorts and/or dilates its reliable corrobo-

time that synthetic sentences can always be tested empirically in isolation. In fact, what is today known as 'Duhem-Quine-Thesis' forcefully maintains that individual sentences (or any other 'atomistic' bearers of knowledge) can never be tested *eo ipso*, but only as parts of larger 'webs of meaning,' e.g., of 'theories' and the like.

[86] For Pepper (1946: 604), some of these patterns of resurge can be explained by historically and socioculturally specific cognitive interests: "[c]ultural interests, I believe, account for the emphasis placed upon certain types of thinking at certain times, and for the kinds of eclecticism most appealing at certain times, and even perhaps for the emergence of certain root metaphors at certain times, but I cannot see how they have anything to do with the corroborative powers of certain types of thought."

[87] Pepper (1928) maintains already from early on that "[…] making the best of metaphors means selecting the most pregnant, that is to say, those that will stretch over the widest range of experience with the least amount of straining."

[88] Pepper (1942: 330) explicitly opts for "rational clarity in theory and reasonable eclecticism' in practice" and characterises the dangers of 'eclecticism' as follows: "That an eclecticism should be excluded from within world theories is obvious in the interests of clarity; otherwise, how can one see just where the maximum of structural corroboration lies? If a world theory partly developed in one set of categories is broken in upon by a foreign set of categories, the structure of corroboration is broken up and we cannot see clearly how the evidence lies. For intellectual clarity, therefore, we want our world theories pure and not eclectic."

ration (cf. Pepper 1942: 341); 'eclectic' theories have therefore typically difficulties with upholding the degree of cognitive adequacy required. Maxim (ii) is, if you will, a consequence of this general difficulty to combine root metaphors. It not only explains why world hypotheses tend to be vastly different, but also provides an argument for why world hypotheses cannot be reduced to one another (cf. *ibid.*: 341); doing so would require to interpret one root metaphor in light of another, which would completely collapse the former's world hypothesis and thereby eliminate all of its specifics, including its unique cognitive capacity (*ibid.*: 106).

The interplay of all of the five maxims, finally, is capable of explaining, first of all, why systematic and relatively adequate attempts to make sense of the world necessarily cluster into several *distinct groups* – i.e. 'schools of thought' – and why, secondly, there are only a *limited number* of such groups (Pepper 1942: 340f.).[89] The significance of this assessment lies in the acceptance of the necessary horizontal diversity of all human inquiry based on strictly alternative world theories and the simultaneous repudiation of the idea that this diversity is without any shackles (cf. Pepper 1935a: 370). Because scientific reasoning is merely a special variant of human inquiry, it follows that science is generally subjected to the same constraints. Thus, scientific reasoning also clusters into irreducible and fully autonomous families of 'world-making,' anchored in distinct root metaphors and leading to alternative interpretations of the facts discovered.

To conclude, Pepper's root metaphor theory rests on rather uncontroversial premises – namely, that metaphor shapes scientific thought and thereby influences how we make sense of the world – but draws some intriguing conclusions for what this means for the overall structure and progression of scientific thought – implications which have, as I aim to show in this dissertation, important consequences for how one can hope to navigate difficulties that arise when vastly different approaches to science clash in practice. Pepper's root metaphor theory also provides some interesting and hitherto largely untapped opportunities to explore the interrelationship of the historical development of scientific projects on the one hand and the general character of their social and cognitive landscapes on the other. Central to the present purpose, however, is a closer understanding of the general structure of Western thought and the most potent root metaphors that have been developed and refined in the course of its history. The following section gives a general overview of this structure and elaborates the 'structural categories' of the four relatively adequate theories which have been identified up to now.

2.4 **Four distinct ways of marshalling evidence**

2.4.1 ***The general structure of world hypotheses***

The two general cognitive criteria to establish the significance of world hypotheses – what Pepper (1935a: 368) has called the "factuality of fact" or the "truth of hypothesis" – are *scope* and *adequacy*. Both criteria mutually support each other; they are both necessary conditions for a world hypothesis but become sufficient only in pair.

'Adequacy' explicates the power of the hypothesis to provide satisfactory descriptions of matching facts or groupings thereof. Following the maxim of autonomy, what such 'fitting' accounts for and which 'mode of fitting' is looked for is, as Pepper says (*idem*), "at the discretion" of each world hypothesis and therefore part of the assertive claim of the hypothesis itself – nonetheless, the 'fit' must obviously be a 'good fit'. For this reason alone, each world hypothesis brings forth distinct standards of knowledge evaluation, distinct methods of knowledge corroboration and therefore establishes distinct truth conditions – each theory, in other words, favours its own 'theory of cognitive criticism' (cf. Pepper 1942: 150).

'Scope' explicates the *range* of consistent descriptions that the hypothesis is able to provide. In fact, "[t]he greater the range of consistent descriptions the greater the assurance as to the adequacy of

[89] For Pepper (1942: 328), root metaphor theory is therefore also a tool to *reduce* the number of credible world hypotheses by means of unearthing their standards of cognition and knowledge formation. He (*idem*) explicitly declares: "The root metaphor theory is simply the recognition of the fact that there are schools of philosophy, and an attempt to get at the roots of these schools. We argued that the philosophic imagination is not nearly as prolific as many have believed. We showed grounds for believing that there are only seven or eight distinct ways in which men have seriously undertaken to build up unrestricted hypotheses. The appearance of a great number of different world theories arises simply from the great number of combinations that can be made out of the parts of seven or eight complex objects – the world hypotheses we have discussed."

any given description" (Pepper 1935a: 368). 'Scope' thereby also theorises whether all available and recognised 'facts' are taken *positively* and are used to support knowledge claims or whether they are instead 'explained away.'[90] For world hypotheses are unrestricted hypotheses, Pepper maintains that no fact can be ignored by them (*idem*) – world hypotheses can maintain their all-encompassing status only if they include the entirety of available evidence into their field and seek to organise it (cf. Pepper 1943: 602). Explaining away must therefore be understood as part of the substantial *explanatory work* that a world hypothesis does – it is part of the hypothesis' ability to specify what is relevant in the world and what is not.[91]

This capacity of world hypotheses to handle facts *negatively* leads to a situation in which 'scope' often turns out to be inversely related to 'precision.' Optimising the 'precision' of a hypothesis, that is, amplifying the resolution of the factual interlinkages and the discriminability of facts (cf. Pepper 1942: 76), typically requires to explain away a lot – the chief example being 'mechanistic' explanations which only encompass those facts which are considered to be causally related. This enters into a state of affairs in which cognitive resources can either be invested to develop the 'scope' of a hypothesis or its 'precision' (cf. *idem*) – al-though developing either tends to enhance a hypothesis' capacity to also refine the other (*ibid*. 76f.).[92]

As mentioned earlier, Pepper (1942: 141, 151-314) recognises four relatively adequate world hypotheses: 'formism,' 'mechanism,' 'contextualism,' and 'organicism.' These theories are labelled rather unusually compared to the classic metaphysical positions or 'schools of thought' in order to avoid confusion, but the residual terminological affinities are deliberate and yield some wider significance. As detailed before, each of these four world hypotheses is firmly grounded in its respective root metaphor and is able to gather multiple theoretical positions under its banner. Since the structural organisation of world hypotheses ushers a higher-level taxonomy to talk about differences in scientific 'world-making,' no simple or one-to-one correlation between the classic positions and world hypotheses is possible.[93] World hypotheses are foremost historical entities and their links, if any, to the theoretical or social entities of the science of a given timeframe must be demonstrated rather than presumed.

The four relatively adequate world hypotheses organise themselves into two groups of two each (Pepper 1942: 141-150; **Fig. 1**). The first distinction is to be drawn between 'analytic' and 'synthetic' world theories.[94] This is not to say that the former group does not acknowledge *synthesis* and the latter *analysis*, but merely points to the fact that 'synthesis' and 'analysis' have a different status in two groups (cf. Pepper 1942: 142). While the first group presumes that particulars are basic and that the given 'facts' primarily consist of 'elements' or 'factors,' the second group only acknowledges the basic factuality of 'complexes,' 'contexts,' and/or 'structures' and therefore presupposes the primacy of wholes. For the 'analytic' world hypotheses, therefore, parts are basic and wholes are derived; for the 'synthetic' world hypotheses, to the contrary, wholes are basic and parts are derived (*idem*.). This reverted organisational logic leads to the identification of 'formism' and 'mechanism' as 'analytic' world theories and of 'contextualism' and 'organicism' as 'synthetic' world theories (cf. *ibid*.: 146). The former set of two is predisposed to adopt variants of 'methodological individualism,' whereas the latter gravitates towards 'methodological holism' when analysing its evidence (see **Box 5**).

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[90] In general, to increase the 'scope' of a hypothesis of course means to find more 'corroborative facts' for it – that is, to increase the number of facts that support its claims (Pepper 1942: 76).

[91] In practice, of course, there is often no difference between specifying what is of relevance and specifying what is 'real' and what is 'unreal' (cf. Pepper 1942: 143f.).

[92] This outcome, however, is surely not guaranteed since the enrichment of either of the two may have some constraining effects on the other as we have seen – how 'scope' and 'precision' interact within a given world theory is fore and foremost a question of empirical examination and may well differ from research context to research context.

[93] This is one of the main advantages of using world hypotheses theory to understand the structure of particular sciences. World hypotheses-based taxonomy allows for a rough reorganisation of perspectives and approaches with a focus on root metaphor rather than theoretical contents, contents which are often opaque and difficult to evaluate with respect to their ability to determine how evidence is marshalled and interpreted.

[94] The distinction between 'analytic' and 'synthetic' is one of the recurrent spectres of contemporary philosophy. The distinction dates back at least to Immanuel Kant and haunts human inquiry in the West since then. Pepper's point, however, is not to insist on the soundness of the distinction, but rather to show that it provides such a powerful heuristic that major threads in Western thinking can be profitably reconstructed based on it. The perspective taken is thus pragmatic and the surge of criticism on the validity of the distinction that has emerged in the later part of the 20th century must not bother us much. In fact, the conceptual weaknesses and inconsistencies of the four relatively adequate world theories can be interpreted as difficulties to convincingly navigate the 'analytic'-'synthetic' divide (compare **Appendix II;** for some of the historical reasons for this decomposition of the Kantian architectonic in an 'analytic' and a 'synthetic' strand, see Friedman 2000: 145-159).

The second disparity in world hypotheses is between what Pepper (1942: 142) has baptised 'dispersive' and 'integrative' theories. Here, the polarity can be found between the members of each group. 'Formism' and 'contextualism' are 'dispersive' world theories and 'mechanism' and 'organicism' represent 'integrative' theories (*idem*). This designation simply amounts to the fact that "analysis is treated dispersively by formism and integratively by mechanism, and synthesis is treated dispersively by contextualism and integratively by organicism" (*idem*); it implies that 'facts' in dispersive theories, independently from where they originate, tend to be taken "as they come and so are left" (*idem*) and are interpreted as 'multitudes.' The result is the *proliferation* of facts. The 'structural categories' tied to these theories envision the world as only loosely held together and thus as a relatively *weakly determined* place (cf. *ibid*.: 142f.). The 'structural categories' of the 'integrative' hypotheses, by contrast, sketch the world as tightly held together and hence as a relatively *strongly determined* place (cf. *ibid*.: 153). The latter leaves little leeway for 'chance' and emphasises the strict systematicity of worldly phenomena. The implication is that 'integrative' world hypotheses try to develop 'precision' and therefore tend to explain away or further decompose many of the facts they discover; these theories are hence more than prepared to face the *negativity of fact*, whereas the 'dispersive' world theories attempt to develop their faculty of 'scope' by drawing together a broad latitude of *positive evidence* in the hope to multiply their corroborative power.

The opposition between 'integrativity' and 'dispersivity' is therefore directly tied to the polarity between 'scope' and 'precision' in world hypotheses. The types of *cognitive inadequacies* which are characteristic for each of the four theories are strongly tied to this general configuration (cf. Pepper 1942: 143; see **Appendix II.2** for a detailed exploration of these inadequacies). World hypotheses that tend to 'freely' incorporate all facts and are not so much concerned with the appropriateness of these facts – 'dispersive' theories – are "chiefly threatened" to suffer in 'precision' while having little trouble with improving their 'scope' (*ibid*.: 143f.). Complementarily, world hypotheses that tend to carefully select their facts or to limit them *a posteriori* – 'integrative' theories – usually excel in 'precision' yet tend to lack in 'scope' (*ibid*.: 145) This overall structure of world theories has profound implications for how evidence can be gathered and interpreted; the 'integrative'-'dispersive' polarity can hence be expected to severely affect how scholars are able to make sense of their object matters in the various theatres of scientific practice.

Moreover, it can be noted that due to the natural arrangement of world hypotheses into two groups of two, eclecticisms are greatly encouraged precisely at the resulting junctures (cf. Pepper 1942: 146-150). As a consequence, 'formism' and 'mechanism,' since they share an 'analytic' conviction, exhibit a strong tendency to combine in practice (cf. *ibid*.: 146-148, 184f.); the same can be said for 'contextualism' and 'organicism,' which often seek cognitive alliance and tend to merge in practiced research since they both rely on 'synthetic' imperatives (cf. *ibid*.: 147, 280).[95] For the same reason, 'analyticity' and 'syntheticity' tend to exclude one another – their relationship tends to be of an 'antithetical' nature. The members of these two groups are inclined to reject each other's basic premises, sparking mutual hostilities which may or may not be consolidated in the course of cognitive history.

However, the relationship between 'integrativity' and 'dispersivity' is more ambiguous. Cooperation between these two groups is often favoured because the two appear to perfectly complement each other, so that 'scope' and 'precision' can be developed *in parallel* because both can help each other where they are weak. The consequence is a structural predisposition to join the two and to draw on them in pairs. This is why there generally exists a strong tendency among eclecticists to mix 'formism' with 'mechanism' (cf. Pepper 1942: 184f., 220) and to amalgamate 'contextualism' with 'organicism' (cf. e.g., *ibid*.: 278f., 280).[96] It is more than likely, however, that these gravitational forces play out differently in different disciplinary settings and with respect to different scientific problems – a situation which should not obscure the view for the sensitive role of these dynamics in organising basic cognitive conflict and allegiance yet shows that careful case-by-case assessment is always necessary.

Before we turn to the exposition of each world hypothesis' detailed cognitive structure and its unique canon of concepts, it seems important to shortly pause and to utter a note of caution first. Not

[95] In fact, Pepper (1942: 280) even finds it tempting to consider 'contextualism' and 'organicism' as a "species of the same theory, one being dispersive the other integrative."

[96] Other fusions are of course also possible, although less likely, and Pepper notably discusses the option of combining 'mechanism' and 'contextualism' (Pepper 1942: 147). He, however, ultimately rejects this kind of eclecticism as a viable solution, and I would argue that the main reason is the structural inability of scholars to satisfactorily bridge the 'analytic'-'synthetic' divide.

all science is necessarily 'good' science, and the structure of world hypotheses does not change this situation. The perspective opened up by Pepper's world hypotheses theory is therefore not a cheap way of rendering 'bad' science immune to critique, nor all of science for that matter. 'Analytic' world theories can of course do a poor job in the analysis of their parts, 'integrative' theories can do an insufficient job in specifying and integrating relevant facts, and so forth. Just because the scientific interpretation of facts is always driven by at least one hypothesis of world-wide scope does not mean that this interpretation automatically does justice to the hypothesis – that is, to 'tap' into its full interpretive potential. Having said this, we can begin now with the stepwise development of the four relatively adequate world theories and their distinct cognitive space.

2.4.2 ***Formism***

The root metaphor of formism is 'similarity' or 'form and matter,' depending on the variant of formism that is conjured (cf. Pepper 1935a, 1942: 151).[97] Formism is an 'analytic' world theory and consequently considers parts as fundamental and wholes as derivative. Formists typically identify these parts as 'particulars,' i.e., entities which can be distinguished from other entities on the basis of qualities, properties, traits, attributes, and other part-based characteristics (Pepper 1942: 152-154; see **Box 6**). These part features may be regarded as parts themselves. In general, 'particulars' and their features are said to populate the 'observable' world.[98] 'Characters' specify the qualities of 'particulars' and the relationships that exist between them (*ibid.*: 154f.). Any entity may have an infinite number of 'characters.' 'Ties' capture the specific combinations of 'particulars' and 'characters' that can be observed in reality (*ibid.*: 155). Formism is all about mapping out parts in terms of these categories and to analyse whether and how they help to delineate wholes. The investigation of reality therefore amounts to the assessment of *similarities* and *differences* among 'particulars,' 'characters,' and 'ties.' The kind of similarity that is usually looked for is the recurrence of recognisable forms (cf. Hayes et al. 1988: 99). These inter-part relations are examined in terms of 'participation,' that is, the regular associations of 'particulars' and part-based features (*ibid.*: 154, 170). Different 'particulars' may for example participate in similar 'characters' and varying 'characters' may participate in higher-level 'regularities,' 'norms,' or 'laws.' This participatory structure of reality creates *patterns*. These patterns, conversely, are regarded to be informative about the *deep fabric* of the world and its observable phenomena. Hence, the determination of 'laws of association,' patterned regularities, and other pattern-generating principles constitutes the prime objective of formistic analysis. 'Attribute-analytical' approaches and trait-based statistical analyses represent a hallmark of this cognitive endeavour.

As a 'dispersive' world theory, formism is interested in the *proliferation* of fact and tends to invest a lot into *ordering* the evidence which is available to it. Since formists study relationships among 'particulars,' 'characters,' and 'ties,' they effectively chart their overlap and non-overlap. Formism, in other words, is often motivated by a general 'theory of sets.' Overlapping sets of parts and their features, according to formism, indicate correlated aspects of reality. Most formists also draw on the 'Theory of Types' (Pepper 1942: 156-159). This theory is foremost a logical conception and states that "the concepts employed in the analysis of other concepts cannot themselves be included among the concepts analysed" (*ibid.*: 156). The theory systematises the formistic distinction between 'ties' and relations and helps to group 'particulars' in terms of similarity. A 'type' is nothing else than a set of 'particulars' that share certain 'characters'; 'types' may capture varying degrees of similarity between 'particulars' and may therefore be more or less complex. When the type concept is utilised to describe the structure of evidence in a systematic and comprehensive way, the result is the development of 'typologies,' 'taxonomies' and 'classifications' (*ibid.*: 159-162). These are logical constructions which organise the relationship among 'particulars,' 'characters,' and 'ties' in terms of participation, from the

[97] As a matter of fact, Pepper (1935, 1942) associates 'similarity' with what he terms 'immanent formism' and regards 'form and matter' as the core heuristic of what he calls 'transcendent formism'.

[98] I am somewhat careful with the notion "observable" here since observability in world hypotheses is also judged via internalised standards. Moreover, there is an extensive debate on 'scientific observation' and what it amounts to in philosophy of science. The problem of *direct* vs. *indirect observation*, as well as *natural observation* (i.e., observation via the naked eye) vs. *technical observation* (i.e., observation that is only made possible by technological aids) are all at stake here. The problem of observation is typically radicalised in the historical sciences since it remains largely unclear to what effect the past can actually be observed (cf. e.g., Turner 2007).

more general to the less general. While the total sum of a given set of 'particulars' tends to share not a single 'character,' only a single 'particular' typically answers to a whole range of different 'characters' (*ibid.*: 160). As a general rule one can thus conclude: the fewer 'characters' are shared, the more general the respective *class* of 'particulars.' *Classification*, i.e., the hierarchical organisation of classes, is a formistic key operation to determine order and the categorical interrelationships that govern reality (*ibid.*: 159f.). Classes or types supply the complex entities that formists may employ for further analysis – they may themselves be recast as 'particulars' to be examined in terms of their participation in patterns.

The 'Theory of Types' motivates the explanation of less inclusive categories by more inclusive ones (cf. Pepper 1942: 160). A 'class,' in other words, may simply be explained by placing it into another, more general 'class.'[99] The use of classification in this sense is not only heuristic but helps to delineate the determinative structure of reality. Explanation thereby focusses on the 'web of ties'; it tends to be externalistic and subsumptive. The formist generally believes that climbing up the 'ladder of participation' is a first and necessary step towards knowledge about the operative principles of reality. Describing the structure of co-variation thereby facilitates the recognition of regulatory relationships, i.e., which parts regulate other parts and in what way.

Formistic logic suggests that 'matter' takes specific 'forms' because of reasons not rooted in matter itself.[100] 'Form' is 'shaped matter' and there must be something in the world that has given or imposed shape on this matter. The ancient Greek notion of 'hylomorphism' – i.e., that 'form' is different from 'matter' and reality basically a configuration of the two – resonates with this conception. Since observable patterns are expressive of particular matter-states, there must be something essentially non-observable explaining them. Plato has identified these non-observables as 'ideal' categories or *eternal ideas* underpinning the patterns of reality. Patterns may similarly be explained by abstract or invariable concepts. 'Particulars' can then be said to *instantiate* or *exemplify* these non-observables. Conversely, the respective non-observables are the precondition for the presence of specific 'particulars' and that one can observe them under certain conditions. This *conditional* interpretation of 'particulars,' 'characters,' and 'ties' indicates that the materialisation of the observable parts of reality is mediated by well-defined 'principles of exemplification' (Pepper 1942: 163; cf. **Box 6**). Formism traditionally distinguishes between 'norms' and 'laws' as the relevant non-observable determinants (*ibid.*: 164-166). 'Norms' and 'laws' have two characteristics: (i) they regulate the materialisation of parts and (ii) resist complete materialisation. They can never be fully materialised because logic forbids that they are identical with the objects and patterns they purportedly explain.[101] 'Laws' are often defined as the principles or 'rules' that explain or bridge the correlated patterns of two sets of 'particulars,' 'characters,' or 'ties.' 'Norms' describe conditions of *normality* (i.e., trends, averages) that administer patterns of variability (*ibid.*: 164f.).

This particular understanding of 'norms' and 'laws' forces formism to make a categorical distinction between the realm of 'existence' and the realm of 'subsistence' (Pepper 1942: 167f.; cf. **Box 6**). The realm of existence is populated by the categories of observation, that is, 'particulars,' 'characters,' and 'ties.' The realm of 'subsistence,' by contrast, is populated by those entities which resist complete materialisation but remain necessary to explain the categories of 'existence.' While the categories of 'existence' are *concrete* – one may speak of 'concrete existence' here – the categories of 'subsistence' remain *abstract*. Both can be said to 'exist,' but in a different sense of the word. A 'law' usually *subsists* because it resists complete materialisation and is primarily defined by its *form*, that is, by a set of 'particulars' having certain 'characters' participating in the 'law' (cf. *ibid.*: 176):

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[99] An implicit 'theory of sets' is sometimes also used to make sense of 'laws' or other 'regularities.' In 'formism,' these are often interpreted as a bridge between one set of basic particulars and another set, thereby determining the defining characters of one set by those of another set (cf. Pepper 1942: 177).

[100] Clearly, this tendency marks the irreversible point of divergence between 'formism' and 'organicism' since the distinction between 'form' and 'matter' does not allow for the possibility that change in a given object is ultimately induced by the object itself – a classic doctrine of 'organicistic' logic. The rejection of this doctrine is perhaps the strongest common denominator uniting the 'analytic' world theories under a single banner.

[101] Plato's allegory of the cave is the prototypical example of this formistic conceptualisation: what we perceive and observe in reality is merely a "shadow" of more basic entities whose existence we can only infer. These are, however, the precondition for the "shadows" we observe. These "shadows" can further be said to reflect some aspects of the 'ideal' categories that "stand behind" them. In order to explain the "shadows" we thus need to come to an understanding of the categories that condition the existence of each single "shadow." In other words, we need to understand the 'norms' and 'laws' that regulate the occurrence of specific "shadows" under particular conditions.

> "According to a Platonist, a law *subsists* even though it were never exemplified in concrete existence. An Aristotelian would be less bold, would agree that a law subsists by the definition of form as opposed to particular, but would declare that a law has no being outside of its exemplifications. It is, however, very important to notice that in formism a law is not to be identified with a concrete existent structure. Whether Platonist nor Aristotelian, for formist a law is a form. This is one of the fundamental distinctions between formism and mechanism. These two world views contradict on this issue. And the question is whether an Aristotelian is not hedging so as to avoid the full import of his contradiction. If one wishes to get the sense of formism in clearest relief, he does better to take the view in bold Platonic terms. Later he can consider whether an Aristotelian can hold his more moderate position without self-contradiction." (Pepper 1942: 177; original emphasis)

Since formism seeks to 'get to the bottom of things,' the patterns that are created by the participation of observable parts in non-observable 'forms' are ultimately to be explained by reference to at least one 'subsistent' category.[102] The 'form' concept therefore has a double significance in formism: it not only describes particular matter-states ('shaped matter'), but also the regulatory ensemble of observables and non-observables which is responsible for patterns of participation. A 'form' in the latter sense is a complex correlation between the relevant categories of explanation. In formism, different categories may therefore take part in different 'forms' at the same time and the potential *interference* of counteracting 'laws' and 'norms' must always be taken into account (Pepper 1942: 178). This constant possibility of 'interferences' is another reason why formism remains preoccupied with isolating 'normal' data-behaviour and 'normal states' of existence in general.

Although formism assumes that the categories of 'existence' are systematically *correlated* with the categories of 'subsistence,' the transition between the two is always problematic and requires heightened epistemological attention. Because explanation consists of a 'form,' the relationship between 'existence' and 'subsistence' tends to conceptualised as being relatively symmetric, so that a substantial change in one realm seems to imply a substantial change in the other or, alternatively, indicates an entirely different form. A natural way of elucidating the connection between 'concrete' and 'abstract' reality is by invoking the concept of *supervenience* (cf. Davidson 1970; Kim 1984, 2002; Bader 2013; McLaughlin and Bennett 2018). 'Supervenience' strikes a balance between correlatedness and categorical autonomy by asserting that different 'levels of existence' need to be acknowledged in their discreteness, but nonetheless appear to be *structurally interlinked*. Alterations on one 'level of existence' are therefore necessarily bound to adjustments on another level. What level is more basic does not matter in this regard.[103] This perspective showcases the categorical looseness of formism insofar as contingency and chance are granted and determinative relationships tend to be conceptualised in fairly generic terms.

In formism, the problem of *equifinality* is less serious than in other world theories. The reason is that formism has no trouble with accepting that particular matter-states may exemplify different 'norms' and/or 'laws' at the same time. Observable forms of 'particulars,' 'characters,' and 'ties' may simply be the *co-production* of different 'subsistent' categories. Nevertheless, forms still need to be specific to a certain degree. Only then is it possible to meaningfully discriminate between distinct 'laws,' 'norms,' and other 'subsistents.' A popular strategy to mitigate this problem is to enlist a range of competing 'subsistent' categories and narrow it down by means of exclusion. This procedure typically entails an 'abductive' argument specifying why particular 'subsistent' categories are better candidates of explanation (*sensu* Harman 1965, cf. Lipton 2001; Queiroz and Merell 2005). In general, formism interprets 'equifinality' as the problem of different forms being responsible for similar patterns of participation. 'Equifinality' is therefore the problem of finding the relevant or matching 'subsistent' categories. Issues of 'equifinality' are thus difficult to overcome by means of analysis and/or inference alone and formists rely on explicit non-formal argumentation here ('This category is likely to be more relevant because of X and Y'). 'Equifinality' is generally described as *multiple realisability*, i.e., the fact that more foundational categories of existence may be *realised* in rather different ways in

[102] Whether such 'subsistent' categories are dependent on the entities they "particularise" and if so to what degree is a lively debate among formistic thinkers – a debate which historically led to the separation between Platonists and Aristotelians (cf. Pepper 1942: 168).

[103] This is the basic difference to 'mechanism,' which conceptualises the link between different levels or domains of existence in terms of directed causality. There is thus a basic asymmetry between 'cause' and 'effect.' This is why in 'mechanism' the problem of *equifinality* is typically mitigated by exploiting the 'specifity of response' principle, for example by juxtaposing theoretical deductions and empirical patterns.

the more 'concrete' layers of existence (cf. Kim 1992; Bickle 2016). One therefore needs to identify the 'principles of exemplification' to gauge the spectrum of observable correlates of a given 'subsistent' category. Understanding the mediating principles that link 'existence' and 'subsistence' is of course a critical requirement to adequately interpret 'supervenience' (see *supra*).

Since formism is centred on the determination of patterns in 'concrete' reality and strives to identify regularities and 'normality conditions' that drive the behaviour of parts, it lends itself to quantitative approaches and statistical methods. Due to its 'dispersive' character, it is generally susceptible to 'big data' approaches. Statistical analogy-building, for example, is also a classic formistic manoeuvre since such a procedure isolates 'ideal' features of comparative data sets, i.e., trends and averages, to illuminate the analysed data sets in terms of these features. 'Analogy,' 'identity,' and 'correspondence' are simply manifestations of the formistic root metaphor of 'similarity.'

The guiding philosophical school of formistic reasoning is *realism*. The historical progenitor of formism, according to Pepper (1942: 141), is 'Platonic idealism' or 'Aristotelian naturalism.' Formists often pay particular attention to shape-based object properties – 'morphometrics,' for instance, may be viewed as the 'perfect' approach to assess 'shaped matter' – formists suspect that similarities and differences in this domain are likely to inform us about the corresponding 'subsistent' features of reality. Formism is generally straightforward in how it operates and makes sense of what it observes. This conforms to the strength and epistemic appeal of the similarity metaphor. Formism is often said to be 'unexciting' yet extremely 'reliable.' Among the four world hypotheses, formism tends to be the strongest believer of the explanatory power of data *as such*. Formism generally regards 'existence' as the gateway to 'subsistence,' and not the other way around.

2.4.3 ***Mechanism***

The root metaphor of mechanism is the 'machine' as a species of functioning (cf. Pepper 1935a, 1942: 186). According to the mechanist, any whole can be understood as a machinery in which the parts are related to one another in some systematic way. Every part of the machine has a *functional* role to play. Since mechanism is an 'analytic' world theory and thus presumes the primacy of parts, the 'effective' parts of a larger machinery are discrete and do not change when relationship among them are formed; the parts, in other words, exist independently of their relationships or the wholes they propel (cf. Hayes et al. 1988: 99). As Hayes et al. (*idem*) correctly point out: "in any common-sense machine, some sort of force or energy is exerted or transmitted through the system to produce predictable outcomes." This is because the machinery is held together by some kind of *mechanism* specifying which parts effect which other parts and in what way(s) (cf. Bunge 2004, 2013). This principle can typically be captured by the 'push-and-pull' metaphor or the concept of 'cause-and-effect.' The point is that these inter-part relationships are highly *specific*, so that it becomes possible to foresee what a part will do given particular conditions. Following Bunge (2013: 590), any working machinery can therefore be recognised as an ordered quadruple of *composition-environment-structure-mechanism*. The machine is composed of 'effective' parts, operates in an environment and inaugurates its own mechanistic environment (parts are external to other parts), possesses a specific spatiotemporal structure defining the role and consequence of varying parts, and is governed by at least one mechanism integrating the whole and defining the latter's global functionality or effectiveness (cf. Pepper 1942: 191-195, 226). The working principles and organisational structure of the machine of course differ from case to case.

Mechanism distinguishes between 'primary' and 'secondary' categories (Pepper 1942: 192f., 201, 215-217; cf. **Box 7**). The 'primary' or 'effective' qualities of parts are the features, traits, and attributes which are necessary to explain how a given machine works. The 'secondary' or 'ineffective' categories, by contrast, refer to the qualities of parts which are dispensable for grasping the workings of the machine. They are regarded as 'derived' features of the world and to be the result of the specific configuration of 'primary' categories associated with them. Mechanism seeks to describe the *compositional* structure of reality, but unlike 'formism,' which often targets 'agglomerates' since order is not presumed to be categorical there, mechanism aims to isolate *systems*, i.e., structured configurations of parts. Facts are assumed to externally match because order is categorical (*ibid.*: 143). This is the 'integrative' side of mechanism. The goal is to incorporate the parts of reality in order to clear the view for a single functional whole.

Mechanism often embraces implicit 'field theories' (cf. e.g., Martin 2003). The structure of the sought-after compositional entities comes into view as a 'field of locations' (Pepper 1942: 197-200; cf. **Box 7**). This field defines the exact spatiotemporal position of each part in the machine. The relationships between parts can thus be understood as a function of the exact 'location' of their 'primary' qualities (*ibid.*: 191). Importantly, each spatiotemporal position can only be occupied once. In mechanism, it is quite common to capture this 'field of locations' in mathematical equations and to express the work of parts in precise quantitative terms. The 'primary' qualities tied to two or more 'locations' are directly responsible for the type of 'action' observed between these 'locations.' In this way, each machine can be defined in terms of a 'primary law' (*ibid.*: 193, 207). This 'law' accounts for the specific configuration of 'effective' qualities in a given 'field of locations.' Because of the well-defined and largely fixed spatiotemporal structure of such a machinery, different 'locations' may also be identified as distinct *events* following up on each other in a *sequential* manner. The respective mechanisms at play render this chain reaction of parts (stimulus-response principle) largely *inevitable* (cf. *ibid.*: 226f.). Inevitability is thus a property of relationships between 'primary' qualities, whereas 'accidental' outcomes may be generated only by the 'secondary' qualities (*ibid.*: 196f.; cf. **Box 7**). Depending on the type of mechanism embraced, accidentality may be granted to some degree or denied altogether.

In 'consolidated' variants of mechanism, the 'field of locations' describes a *fully integrated* and *determined* field structure, so that almost no discreteness is left (cf. Pepper 1942: 212-215). This notion of the 'field structure' simply expresses the mechanistic conviction that a single underlying entity furnishes a highly consolidated structure of space-time particulars, so that everything in the field obeys to the 'laws' and 'principles' tied to this structure. The field structure consequently emerges as the only genuine 'effective' category and everything that populates it is recast as 'secondary.' Completely integrated field structures thus define space-time *singularities*. They give witness to the mechanistic intuition that, ultimately, only a single highly consolidated particular 'exists' (*ibid.*: 214). Causally integrated field structures shed light on the 'geometry' of the world (*ibid.*: 212).

A key feature of mechanism is that explanation is typically equated with the ability to *predict* (see 2.6.2). For mechanists, prediction is the consequence of having pinned down the relevant 'primary' qualities, the 'field of locations,' and the 'laws' and 'principles' regulating observable 'action' in the field. Since mechanism usually explains in terms of causes, i.e., factors that regularly precede or coincide with whatever is to be explained, a large part of the observable outcome is highly specific and inevitable. It is a necessary consequence of the configuration – or *modus operandi* – of the machine. The respective observations, in other words, turn out to be 'unsurprising.' Therefore, one effectively explains a feature of reality if one can show that this feature was a necessary and largely unsurprising outcome of the responsible machinery. Explanation therefore tends to revolve around principles of determination – explanation can only be 'subsumptive' if particulars are shown to be systematically linked to more general aspects of realty by means of a specific mechanism – and knowledge is secured by matching predictions and observations.[104] Mechanists are the champions of fine-grained and mechanism-specific *hypotheses-testing* and often employ *hypothetico-deductive* modes of reasoning (cf. Hayes et al. 1988: 99).[105] This not only mirrors the 'integrative' quality of mechanism, but also takes up the idea that most observable features are 'derived'; mimicking (or re-enacting) the process of generating them in theory should consequently provide primary insight(s) into their 'existence.'

Mechanism sharply distinguishes between 'pattern' and 'process' and interprets the relationship between the two as a one-sided dependence (cf. **Box 7**). Patterns describe observable regularities, co-associations, and correlations, whereas processes stand for the underlying structure of reality giving rise to particular patterns. Similar processes, therefore, bring forth similar patterns, but similar patterns do not necessarily indicate similar processes. This introduces the problem of *equifinality* which

[104] Bunge (2013: 591) is very clear about this general 'mechanistic' orientation when he asserts: "No law, no possible mechanism; and no mechanism, no explanation. No wonder then that the hallmark of modern science is the search for the mechanisms behind the facts, rather than the mindless search for data and the statistical correlations among them.

[105] The key difference to 'formism' is that the latter employs hypothesis-testing to assess the *structural congruity* between the hypothesis and the empirical observations. The mobilised hypotheses therefore tend to be rather general and fairly generic. They reflect the 'formistic' search for explanatory 'subsistent' categories. Exact and fine-grained consequences of particular mechanisms are rarely incorporated or do not constitute the main thrust of the analysis. Whereas 'formism' subsumes the particular under the general because 'laws,' 'regularities,' and 'norms' are seen as *forms* of participation, 'mechanism' seeks to connect 'primary' qualities and to analyse their correlated 'derivatives'; for a 'mechanist' a 'law' is not a form but a concrete structure of existence, i.e., the specific configuration of 'primary' and 'secondary' categories in a working machinery.

mechanism interprets as different processes producing similar patterns (cf. Beven and Freer 2001; Mayhew 2015). The difficulty is thus to bridge the gap between the 'primary' and 'secondary' categories and to effectively negotiate the problem of *Appearance and Reality*. Typically, 'reality' is only granted to the 'effective' categories of mechanism and the 'ineffective' categories are thought to describe mere 'appearances.' Appearances are 'derived' in the sense that they can hardly claim independent existence. What one can directly observe, that is, without any technological aids, is usually a mix of 'primary' and 'secondary' qualities, the latter often outnumbering the former. A field structure, however, is an example of an unobservable compositional entity which needs to be postulated in order to explain the organisation and behaviour of its parts. Observability is thus often used as a proxy for the relative 'derived-ness' of the elements of reality, the golden rule being "the easier to observe, the more derived the phenomenon appears to be."

This epistemological configuration greatly predisposes mechanism, especially in its radical guises, to explain away the 'ineffective' categories of reality and to deny their actual existence – these qualities are then simply viewed as *epiphenomenal*.[106] This brings up the old issue of *reduction*, and mechanism struggles with it since its inception. If the 'secondary' categories turn out to be entirely 'ineffective' or can be completely reduced to their correlated 'primary' categories, they do not explain anything in the world. Part of the 'integrative' task that a mechanist has to do is thus to discriminate between the 'effective' and 'ineffective' features of a machine – a task that simply amounts to the evaluation of explanatory relevance. Mechanism holds that a recurrent obstacle of successful explanation is our inability to distinguish between 'effective' and 'ineffective' categories of reality. Much of what we observe is much more 'ineffective' than we like to believe – it represents the 'noise' generated by a highly interconnected world. In general, this situation has prompted many mechanists to populate 'dualistic' positions and to police categorical dichotomies such as 'body-mind' and 'nature-culture' in the hope to explain one category in light of the other (cf. Pepper 1942: 217-221). The central strategy is to *externally relate* these categories in order to demonstrate direct inter-category constitution or the 'non-reality' of one of involved categories. The 'mind,' for instance, is often recast as an 'ineffective' category of physical brain states representing varying circuits of 'active' and 'passive' neurons. Different domains of reality may similarly be analysed in terms of their status as 'effective' or 'ineffective' categories. The issue of *Appearance and Reality* generally provokes the *problem of transition* and insinuates the idea of a hierarchy of movers, with a 'first mover' on its foundation. As a result, mechanists strongly gravitate towards 'foundationalist' positions (cf. Schlick 1959; Triplett 1990; Bergmann 2004). If the world would be a chariot, mechanism would focus on the horses and *proximately* explain the movement of the chariot as a consequence of them pulling the wagon, while *ultimately* referring to a person sitting on the chariot and instructing the horses.

A crucial precondition of mechanistic knowledge formation is the explanatory stability of the determinative principles and causal relationships that it seeks to unveil. These provide integration to an otherwise chaotic reality. Mechanism is therefore typically committed to the doctrines of 'actualism'/'presentism' and 'uniformitarianism' (cf. Hoykaas 1963; Gould 1965, 1987; Cameron 1993; Henningson 2009). Historical contingency is therefore either explained in terms of the general variability of patterns related to the same processes or discarded as an 'ineffective' category altogether; there is no place for 'chance' or even 'sparks of eventuality' in a the world of a 'consolidated' mechanist. That determination is thereby increasingly conceptualised in terms of *statistical* effects and processes does not change this situation (cf. Pepper 1942: 143). Modern mechanists draw on computational methods and mathematical descriptions in order to tackle to 'integrated' nature of reality.

The guiding science for mechanism is mechanics or Newtonian physics. Mechanistic reasoning has sometimes been qualified as the thinking of the 'experimental scientist' (Bartlett 1958; Harris et al. 1977: 538). Reproduction/replication is thereby just another side of 'prediction' and re-creating patterns and original observations under laboratory conditions is both a preferred mode of corroboration and a promising exploratory strategy. The 'experimental mode of reasoning,' including the branch of computational modelling,[107] enables the precise specification of test implications and the assessment

[106] For the tenets of 'epiphenomenalism,' see e.g. Jackson (1982) and Bieri (1992). Generally speaking, an *epiphenomenon* is an entity that has been caused by another entity but itself has no causal efficacy anymore.

[107] Computational modelling may simply be defined as *virtual experimentation* since it recreates a systemic machinery including its environment, so that multiple variables can be adjusted in a virtual reality in order to assess the differential effects of these variables on the performance and outcome of the artificial machine.

of particular 'cause-and-effect' relationships (cf. Shadish et al. 2002); experimental approaches greatly facilitate the *causal adjustment* of the various components of reality under scrutinisation. In other words, experimental research helps mechanists to reconstruct the inner workings of real-world machineries by emulating them in a controlled setting.

The leading school of philosophy for mechanism is *naturalism* and *materialism*. As Pepper (1942: 141) points out, the development of mechanism is historically related to the work of Descartes, Hume, Locke, and Reichenbach. Mechanism regularly draws from 'behaviourism' and 'adaptationism' and is generally consistent with 'hard ecology' views, classic Darwinian evolutionary theory, most of the behavioural sciences (including classic ethology in the wake of Lorentz and Tinbergen), sociobiology, evolutionary economics, evolutionary psychology, and so forth.[108] Mechanism is the arch-enemy of what it perceives as 'naïve empiricism' and typically counters 'inductivism' by insisting on the *a priori* significance of general theory. According to hard-nosed mechanists, only general theory, through its predictive capacity, is able to provide convincing justification for the unobservable entities of the world's 'inner structure.' Mechanism thereby also defends the idea that the 'context of discovery' must not be conflated with the 'context of justification' (*sensu* Reichenbach 1938; cf. Nickles 2013). When the four world hypotheses are compared, mechanism is probably the strongest defender of the concept that *data ought to be tailored according to theory*.

Mechanism is appealing because it provides a simple and intuitive explanation for why certain facts are observable in the world: they are caused by other facts, typically by more 'basic' ones. According to mechanism, the world is not only a fully determined place, but also a vertically and horizontally structured one. The vertical structure of reality is particularly important in mechanism since it elucidates the *layered* logic of reality-constitution. Reality can be collapsed into a hierarchy of 'effective' and 'ineffective' categories – the former are basic the latter are derived.[109]

2.4.4 ***Contextualism***

The root metaphor of contextualism is the 'ongoing act in context' (Pepper 1935a, 1942: 232; cf. Hayes et al. 1988: 100) or, more appropriately, 'situationality' (Pepper 1945; cf. Efron 1980: 31)[110]. Contextualists are widely known as 'relational thinkers' (cf. Harris et al. 1977: 538) insofar as their main targets of analysis are *relations* of various kinds (see **Box 8**). Contextualism seeks to explain in terms of the interplay between what is to be explained and its larger context. The key intuition that perpetuates the contextualistic project is the *context-dependency* or 'relationality' of any encountered fact. This enunciation stresses the inherent fluidity and flexibility of contextual articulations, so that nothing in the world can be taken for granted (Pepper 1942: 233f.). Contextualists, therefore, often applaud criticism of *a priori* categories and typically doubt that such categories exist, can be known, or are valuable assets in understanding reality. For contextualists, there are no "absolute truths or standards" (Harris et al. 1977: 539) – the only certainty is that there is no certainty (Pepper 1942: 234f., 249); any entity or category of reality, in other words, is assumed to fundamentally *depend* on other entities or categories. By rejecting the 'objectivist' and 'absolutist' dogma, contextualism posits that any distinguishable feature of reality assumes its significance or meaning only by virtue of its contextual framing, i.e., the interconnections with other features of reality that share the same context of significance. Contextualism is a 'synthetic' world hypothesis to this effect. Parts are derived entities whose quality and existence rely entirely upon the wholes in which they occur. Moreover, since contextualistic inquiry tends to be 'dispersive' – that is, it promotes the *proliferation* of fact and the exploitation of the latitudinal margins of evidence – the same elements of reality may constitute parts of different wholes at the same time (cf. Harris et al. 1977: 539). Another consequence of contextualism's 'dispersive' quality is that

[108] See Bunge (2013: 590) for a list of mechanisms identified in the natural and life sciences, including Darwinian evolutionary biology.

[109] This general 'stratigraphic' vision of worldly order predisposes mechanists to embrace what Hahn (2013: 33f.) has prospectively called *layer-cake model* of cultural realities [*Schichtortenmodell*] (cf. **Appendix II.3: Fig. II.1**).

[110] In *World Hypotheses* (1942), Pepper referred to 'historic event' as the root metaphor of 'contextualism.' On another occasion, he also spoke of 'temporal process' as a good candidate for the 'contextualistic' root metaphor (Pepper 1935a). In *The Basis of Criticism in the Arts* (1945), however, he drew attention to the concept of *situation*, borrowed from Otis Lee (1944), as the perhaps more appropriate conjectural intuition (cf. Efron 1980: 31). Yet, in light of Pepper's own writings and what the present author identifies as the basic logic of 'contextualism,' it seems that the concept of 'situationality' most appropriately captures what Peppers 'contextualism' actually stands for.

there exists, at least in principle, an unlimited supply of parts since parts are derived features of reality and, as such, may be 'derived' in many different ways (Pepper 1942: 237; cf. Hayes et al. 1988: 101).[111] The derivation of facts, parts, or categories appears as arbitrary as in no other of the four relatively adequate world theories (Pepper 1942: 235f.). The reason lies in the contextualistic root metaphor itself. Any 'historic' or 'ongoing event,' the meeting point of past and present, represents a 'rich,' 'intrinsically complex,' and highly 'interconnected' incident of life (*ibid.*: 233) in which the parts by definition *interpenetrate*, so that they remain difficult to identify, name, or isolate (cf. **Box 8**). In contextualism, uncovering whole-specific relationships thus typically implicates to describe particular modes of 'interpenetration.'

The principle that nothing can be denied provides justification for 'novelty' and 'change' to assume categorical status, rather than being merely derivatives (Pepper 1942: 234-236; cf. **Box 8**). For this reason, no category may be assumed to register a universal feature of reality. Conversely, any context potentially carries the threads of freshness insofar as it may possess 'predominant or permeating structural features that other contexts lack' (*ibid.*: 234). Therefore, each contextual whole potentially fortifies a number of idiosyncrasies which may be critical for comprehending it. 'Particularity' and 'uniqueness' are thus typically assumed to be key features of reality. Whereas other world theories emphasise the world's orderliness (i.e., straightforward distinction between categories and their subcategories), contextualists tend to approve the possibility for disorder, alternatives, and the 'alien.' As a result, each context can be expected to articulate some kind of 'otherness' or 'alterity' and it is this quality that differentiates it from other contexts. A systematisation of this consideration leads contextualists to believe that the past was fundamentally different from the present; deep-history perspectives further radicalise this *problem of alterity*.[112] Contextualists are consequently sceptical of deploying direct analogies or pushing 'actualistic' inference too far, especially in historical research. 'Changeability' is also granted to seemingly foundational categories such as 'rationality' or 'optimality' – to the extent that, strictly speaking, there are no foundational categories in contextualism anymore. The theory is 'anti-foundational' to this effect and leans towards the methodological symmetrisation of the various features of reality it investigates.

Wholes are described in terms of 'quality' and 'texture' (Pepper 1942: 235, 237f., 246-252; cf. **Box 8**). Both categories can only properly be understood in their mutual interdependency and in relation to the other contextualistic categories that make up either of them (*ibid.*: 236, 238). The 'quality' of a context, for instance, may be defined in terms of 'spread' and 'fusion'; 'texture,' on the other hand, can be determined by referring to 'strands' and 'references' (cf. Hayes et al. 1988: 100). None of these categories, however, has an absolute meaning and all of them remain open to change and revision. In general, 'quality' denotes what one may term the 'total meaning' of a whole, while 'texture' designates the internal 'infrastructure' of the same, that is, the various grammatical interconnections that hold the whole together (cf. Pepper 1942: 238).[113] The 'quality' of a whole, in others words, denotes the full 'synthetic' quality of part-whole relations, insofar as the whole is substantially 'more than the sum of its parts'; 'quality' captures this total character (*idem*). From a contextualistic perspective, a whole is an *immanent* feature of reality. 'Texture' specifies the intra-whole structure which distinguishes the whole from other wholes and defines its specific internal heterogeneity and organisation; it portrays the part-interconnections representing the whole's 'domestic' details (*idem*). The fact that 'quality' and 'texture' are practically indivisible – one may only say that one is more prominent or relevant in one context than in another – showcases the 'cyclic' part-whole dynamics characteristic of contextualism and the

[111] That facts can be derived in many different ways and depend on their context, including that any number of facts may be 'derived' in a given context, resonates with the 'contextualistic' theory of cognitive criticism centred on the notion of 'operationality.' In 'contextualism,' cognitive 'veracity' is established rather pragmatically – by satisfying the needs and goal of a particular inquiry (cf. Pepper 1942: 268-278; see Section 2.6). Since explanation essentially amounts to 'successful working,' determining the effective parts out of the spectrum of possible parts is an essential part of the explanatory endeavour. Although 'contextualism' endorses the relativism of parts, it is therefore inconsistent with 'anything goes' approaches. The criterion of successful working itself is not negotiable.

[112] In its radical interpretation, the alterity principle establishes the exact antithesis to the 'mechanistic' doctrines of 'uniformitarianism' and 'actualism.'

[113] The example that Pepper provides here is the purposive act of writing a sentence: "[n]ow what is quality and what is texture in this event? Its quality is roughly its total meaning, its texture roughly the words and grammatical relations making it up. Generalizing, the quality of a given event is its intuited wholeness or total character; the texture is the details and relations which make up that character or quality." (Pepper 1942: 238)

latter's rejection of 'absolutisms' of any sort. Contextualism subscribes to the doctrine that parts are not separable from wholes:

> "[…] There is no such thing as a textureless quality or a qualityless texture. It follows that contextualism denies that these are absolute elements. It denies that a whole is nothing but the sum of its parts. It even denies that a whole is a sort of added part like a clamp that holds together a number of blocks. A whole is something immanent in an event and is so intuited, intuited as the quality of that very event." (Pepper 1942: 238)

Contextualism is the only world theory that takes 'fusion' seriously – all other theories marginalise it or explain it away as 'vagueness' (Pepper 1942: 245). 'Fusion' is the integration of the textural details of the whole; it explains why the different ingredients of a whole are so difficult to analyse separately (cf. Hayes et al. 1988: 100). The 'fusion' of parts, in other words, paves the way for the 'quality' of the whole in which all parts become one (cf. **Box 8**). With Pepper (1942: 245f.), one may add that 'fusion' exerts "an agency of qualitative simplification and organisation." The category of 'fusion' also elucidates why contextualism tends to conceive of the boundaries of different compartments of reality as 'permeable,' 'flexible,' 'expensive,' 'covering,' and/or 'overlapping': the 'total quality' of reality is simply regarded as a 'fusion' of all of its anchoring elements. This inclination to regard the borders between different domains of reality as generally 'blurred' and to interpret inter-domain relationships through the lens of 'interpenetration,' 'embeddedness,' or 'co-implication' leads to the recognition of reality as a 'blended,' 'mingled,' and ultimately 'messy' place. Reality, in this view, is always inherently complex and the distinction between its varying parts (e.g., the 'social,' 'economic,' 'symbolic,' 'cognitive,' or 'environmental') becomes somewhat arbitrary. Contextualism, therefore, engenders a strong 'anti-Cartesian' conviction and tends to pitch 'Cartesian' charges against other world theories. Its vision of cultural reality conforms to Hahn's (2013: 33f.) *pound-cake model* [*Rührkuchenmodell*] of world-making (cf. **Appendix II.3: Fig. II.1**). Again, contextualists insists that any 'fixation,' 'predefinition,' or 'stipulation' of categories and parts amounts to an epistemological declaration of bankruptcy.

'Spread' refers to the extended present of an act or a part in its wider context; it captures the spatiotemporal distribution of the whole's anchoring parts and the whole's spatial and temporal consistency (cf. **Box 8**). An individual 'act' or 'event' in context can be said to 'spread forward and back' (Pepper 1942: 239, 242) – it is 'ongoing.' In contextualism, 'spread' grants every whole an important *historicity* insofar as its parts derive from past agencies of various sorts. But any feature of the whole – its effective parts, acts, or events – also point forward in time, each offering a distinct "feeling of futurity" (*idem*). Wholes can therefore be said to 'develop' in the sense that they retain their overall 'quality,' yet continuously reorganise their 'texture' it in space and time. A whole, accordingly, has temporal 'duration' and geographic 'reach.' This contextualistic reading typically results in the emphasis of *qualitative time* and *temporality*, rather than dimensional or absolute time (cf. *ibid.*: 240). The reason is that time too is considered to describe a relational feature – put differently, each whole may possess a specific relationship with time.

The triplet 'quality'-'spread'-'fusion' clarifies why contextualism privileges *qualitative approaches* to the available evidence: its goal is to grasp and comprehend wholes and these are preconceived as fundamentally qualitative entities, as 'fusions' of spatiotemporally spread out but interconnected elements. 'Quality' in this sense implies *strong emergence* (cf. Hodgson 2000; Laughlin 2005; Chalmers 2006): wholes are expected to possess qualities and features which are not present in and not even necessarily implicated by the anchoring parts. Consequently, to close the gap between 'texture' and 'quality' usually requires *interpretive* and *holistic methodologies* that allow researchers to pinpoint wholes, 'to discern and differentiate their specific modes and, from these, arriving at more general forms' (Tomlinson 2018: 3). These "more general forms" represent nothing less than the varying 'qualities' of these wholes.

The 'grammatical' relations that determine the textual details of a whole can be characterised by two interrelated categories: 'strands' and 'references' (cf. **Box 8**). A whole's 'texture' is made up by 'strands' and these are located in a 'context' (Pepper 1942: 246). As Pepper himself (*idem*) remarks, discriminating between the two is difficult because the connection of the 'strands' determines the 'context' and the 'context,' in turn, largely determines the quality and character of the 'strands.' This reiterates the regulative idea of contextualism, that is, *co-determination*. Contextualistic determination

tends to be 'multilinear,' 'multidirectional,' and 'multipolar'; it emphasises the 'co-formatting' of parts with *a priori* flattened hierarchies.[114] It is also 'cyclic' because parts determine other parts but are also determined by their whole(s). Determination is thus 'weak' and often 'distributed' but appears nonetheless to be 'thick.' In general, contextualism assumes radical 'elasticity' insofar as everything in the world is potentially shaped by everything else. A 'strand' is defined as anything that *directly* contributes to the quality of a 'texture,' while a 'context' is anything that *indirectly* contributes to it (*idem*). The general idea is that 'strands' constitute relevant details of a 'texture' but also reach out to their whole by resonating with a least one 'context,' thereby bringing some of the 'quality' of the whole to the 'texture' (*ibid.*: 247). 'Strands' are thus the building blocks of a whole's 'infrastructure' whose significance, however, crucially depends on the whole's 'quality.' An important implication of the construal is that there is an indefinite number of possible 'contexts' and contextualism is quick in delineating a whole range of significant 'contexts' and 'sub-contexts' (or 'macro-' and 'micro-contexts'), each bringing in its own 'quality' and 'texture' (*ibid.*: 249). Pepper (*idem*) refers to this as the "sheering effect" of contextualistic inquiry. 'References' reinforce this effect since they "simply consist of the strands more intimately considered" (*ibid.*: 252; cf. **Box 8**); they delineate aspects or features of 'strands' that help to determine the latter's position and role in bringing a 'texture' about. All of this reveals that *interaction* is a core category of contextualism – everything in reality, including the structural categories of the theory themselves, are considered as products of interactive relationships.

As contextualism capitalises the analysis of relationships and recognises change in its most radical form, it takes the potential *heterogeneity* and *difference* of relations extremely serious. Contextualists regularly caution against what they regard as 'naïve correlationism' demanding the admission and incorporation of other types of interconnections, some of which may contradict basic similarity assessments. Contextualism for example seeks to chart relationships that can be characterised as 'nested,' 'asymmetric,' 'transitive,' 'supplementary,' 'subsidiary,' 'complementary,' 'synergistic,' 'recursive,' and so forth. These relationships express constellations of 'strands' and 'references'; 'references' can be instance be 'linear,' 'convergent,' and 'instrumental,' or they can 'block' each other (Pepper 1942: ; cf. **Box 8**). In contextualism, similarity is merely one of many possible relationships and it holds no privileged position in analysis or explanation. Similarities are relevant either as a 'convergence' of 'strands' and 'references' or as a rough approximation of the 'quality' or 'texture' of two or more wholes (Pepper 1942: 254; cf. Hayes et al. 1988: 101). Since contextualism accepts radical 'novelty,' however, no two wholes can be strictly identical. This is why similarity postulates are always problematic for the contextualist. Contextualism's relational epistemology requires the arrangement and sorting or various, often dissimilar relationships. Understanding the configurations of 'strands' and 'references' in order to retrace the 'texture' of a whole and from there grasp its 'quality' is never a self-evident undertaking. This is the point where contextualists need to 'dis-level' reality; they, for example, need to establish relational 'prominence,' 'weight,' 'significance,' and 'hierarchy in order to make sense of the respective links between relationships. This not only presumes an interpretive import in organising relationships, but also clarifies why *qualitative-rational argumentation* ranks among the primary analytic operations in contextualism.

The root metaphor 'situationality' simply gives voice to the contextualistic certainty that nothing can be presumed and is 'fixable' (cf. Pepper 1942: 235; see *supra*); according to contextualism, every fact is *situational*. Each fact depends on its factual surroundings and the total orchestration of facts in its context(s) of significance. The concept of 'situationality' calls attention to this pervasive interconnectedness and relativity of individualisable elements; it highlights that *everything is always framed by something else* through mutual reference, reinforcement, or sometimes even through sheer ignorance. A 'situation,' according to Pepper ([1970]; cited in Efron 1980: 32) consists of a multitude of "purposive strands so far as they tangle and stick together" and is by virtue of the contextualistic categories 'novelty' and 'change' *unique* to this effect. Pepper's 'selectivism,' which he initially proposed as a fifth world hypothesis in *Concept and Quality* (1966), is generally consistent with this characterisation and is taken here simply as a variant of the contextualistic root metaphor. The 'purposive

[114] Cf. "Contextualism is accordingly sometimes said to have a horizontal cosmology in contrast to other views, which have a vertical cosmology. There is no top or bottom to the contextualistic world. In formism or mechanism or organicism one has only to analyse in certain specified ways and one is bound, so it is believed, ultimately to get to the bottom of things or to the top of things. Contextualism justifies no such faith." (Pepper 1942: 251)

act' can be understood as a special case of contextual framing, in which 'intentionality' and 'purposefulness' emerge as key qualities of a whole's 'texture.' Put differently, particular configurations of 'strands' and 'references,' especially if they turn out to be 'instrumental,' may reveal the directedness and implied intentionality in building up a whole's 'quality.'

Due to its critical elasticity and 'anti-foundationalism,' contextualism is perhaps most sensitive among the four world theories to issues of *equifinality*; contextualists are generally sceptical about isolated observations, independent of whether they pertain to form or relationships. Because each part or fact and even each relationship may take part in multiple contexts and different such contexts, conversely, may host similar parts or relationships, only a 'synthetic' examination of 'texture' and 'quality' may shield against misinterpretation. 'Equifinality' is usually conveyed as 'polyvalency,' 'ambiguity,' or 'equivocality.' Whereas 'formism' and 'mechanism' typically consider 'equifinality' as an inferential problem, contextualism recognises it primarily as a *problem of interpretation*. 'Equifinality' is not least a consequence of the 'dispersive' nature of contextualism, according to which an almost infinite number of parts may be derived from each whole – similar parts may consequently be derived from different wholes.

The leading philosophical school for contextualism is *pragmatism*. Its historical development is related to the American 'pragmatist school' with thinkers such as Pierce, James, and Dewey, but also to some influential strands in European 'philosophy of life' and 'existential philosophy' with authors such as Bergson and Sartre. It often heavily draws on 'phenomenology,' 'structuralism,' and 'symbolic interactionism.' Within the empirical sciences, contextualism holds for example strong bastions in 'interpretive ethnology' and 'historical anthropology.' Contextualistic inquiry is consistent with 'soft ecology' positions, and has produced various theoretical frameworks to describe and interpret interdependencies and webs of relationships in lifeworld contexts.

Contextualism is appealing because it is not easily satisfied with simple answers and because it recognises that anything in reality has its proper context. The theory thereby responds to the intuition that there is 'more to the world then first meets the eye.' Yet, the complexity of interpretation that it affords is also viewed as its most detrimental weakness. Non-contextualists typically reject contextualistic approaches because of their analytical complexity, often denounced as 'cognitively confusing' at best. Contextualistic investigation is regularly considered to be 'messed up,' decisively 'in-transparent,' 'muddled,' and overly 'subjective' by its adversaries (cf. Pepper 1942: 245). Contextualists counter by positing that 'simple,' unambiguously 'lucid,' and overly 'concise' scientific expositions are suspicious in themselves and represent over-confident projections since we cannot presume anything about the world before we have encountered it, including the circumstance that the world is 'well-ordered' and governed by some kind of organisational 'simplicity' itself.

2.4.5 ***Organicism***

The root metaphor of organicism is the 'living being,' 'organic integration,' or 'becoming' as processual individuation (Pepper 1935a, 1942: 280; cf. **Box 9**). The key category in organicism is *time* and its primary concern is with historicity, temporality, and evolution. Organicists in particular oppose the 'mechanistic' tendency to spatialise time and to interpret its categories from the vantage point of their spatial correlatedness, despite the common talk of 'spatiotemporal' existence. The epoch-making controversy between Einstein and Bergson about the relativity of time, which they both accepted, illustrates this clash between prototypical 'mechanistic' and organicistic modes of analysing time (cf. Canales 2015).[115] Organicism is all about accepting time as a basic category and to approach everything

[115] The clash between Bergsonian philosophy and Einsteinian physics marks a watershed event in the history of thought and anticipated some of the central divisions that would characterise modernity. This today largely forgotten 'Einstein-Bergson debate' can be understood as a prelude to the rise of science as the dominating intellectual force of the twenty-first century and the gradual decline of philosophy as an authoritative voice in society (cf. esp. Bergson 1922). Canales' *The Physicist & the Philosopher* (2015) offers an in-depth exploration of the intellectual, social, and historical context of this fascinating and potent controversy and interested readers are advised to consult his illuminating investigation. Canales (*ibid*.: 15; original emphasis) notes that "[t]he years that followed [Einstein and Bergson's] encounter in Paris can be compared to those of the religious wars – with one major difference: instead of debating about how to read the Bible, thinkers across a wide variety of disciplines debated about how to read the complex *unfolding of nature through time*." Even though Canales explicitly warns against oversimplification of the debate and the tendency to recast it in fixed dichotomies (*ibid*.: 36f.), the controversy between the "two giants" certainly illustrates some of the irreconcilable differences between 'analytic' and 'synthetic' thought, and especially between 'mechanistic'

else from a temporal point of view (cf. Pepper 1942: 308). Organicism, for this reason alone, furnishes the exact antithesis to 'presentism' and always theorises the *extended* existence of phenomena, escaping the grasp of momentary observation or 'static' snapshots. Organicists maintain that much interpretive confusion and difficulty derives from the fact that human observation is temporally limited and thus often misses the 'true' nature of whatever is observed. Pepper himself (*ibid.*: 280) notes that the 'contextualistic' root metaphor of the 'historic event' offers a good approximation of organicistic reasoning because of its emphasis on the *ongoing process*; for Pepper, the difference between the two theories simply lies in the circumstance that organicism interprets reality 'integratively' and insists on processual 'integration' when phenomena navigate their temporal existence. Organicism is essentially a 'contextualism' that recognises the 'absolute' or 'ideal' (*idem*). The paradox is that organicism – while holding on to the temporal perspective – seeks to explain away time (*ibid.*: 280f.). The reason is that phenomena, according to organicists, appear to be 'distributed' on the temporal plane and their *integration* thus consequently leads to the ultimate disappearance of the temporal factor (*ibid.*: 281). We must therefore specify what has been said previously: organicism takes time seriously only as a 'phenomenal' category, but not as an 'explanatory' one – explanation consists of *extracting* time from whatever is to be explained.

The core of the organicistic world theory is the tension between the 'phenomenal' and the 'ideal' (Pepper 1942: 281f.; cf. **Box 9**). The polarity between the two demarcates the distinct approach pursed by organicist to bridge the gulf between *Appearance and Reality*. The categorical dualism that comes with this approach reassures us that organicism constitutes an 'integrative' theory and as such is 'constantly tempted to throw out facts into the unreal' (*ibid.*: 145). The die-hard organicist believes that the 'phenomenal' or 'progressive' categories of reality are somewhat 'illusionary' and do not delineate concrete existence in the strict sense (*ibid.*: 282); they are, however, required to trace the corresponding 'ideal' categories and can thus not completely be abandoned (*ibid.*: 145). At the very least, the 'progressive' categories serve therefore an instrumental purpose. Organicism seeks to 'get to the top of things' and its goal is to integrate the 'progressive' categories in such a way that the 'ideal' they point to can come clearly into view. Organicism furnishes a 'synthetic' perspective to the evidence and the wholes it endeavours to describe and explain are thought to be *prima facie* withdrawn from direct observation. These wholes are regarded to be *internally heterogeneous* and difficult to pinpoint because of this. According to organicism, any phenomenal aspect of reality is underpinned by one or more 'concealed' organic process(es) which realise one or more 'organic structures'; the totality of an 'organic structure,' in turn, is nothing but the *achievement* of the 'progressive' categories striving towards their 'ideal.' Consequently, the organicist simply believes that any careful scrutinisation of reality reveals its underlying organic processes and that the associated organic wholes can be illuminated by, first, noting the successive 'steps' they pass through and, second, expounding the principal structural features which are realised in the process (*ibid.*: 281). Organic processes are therefore always 'directed' and 'irreversible' – organicists typically embrace a teleological perspective (cf. Hayes et al. 1988: 100). A proper understanding of the target processes does not only explain the phenomena under consideration, but also elucidates the general *logic* that guides the succession of and interrelation between the 'progressive' categories (cf. *idem*). It is through this mutual 'implicatedness' that organicism hopes to disclose the 'ideal' – even though each organicist knows that the 'absolute' can never fully be grasped because of its 'ideal' nature.[116]

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and 'organicistic' interpretations of time. Whereas Einstein famously proclaimed that the time of the philosophers 'does not exist' (cf. *ibid.*: 15, 19), Bergson insisted on the fact that science can never hope to deliver a complete account of time since the latter entails aspects which cannot be entirely grasped by numbers or captured by instruments and mathematical formulae alone (*ibid.*: 10). For Bergson and his followers, time – epitomised in the concept of *duration* (*durée*) – involves irreducible *qualitative* aspects (*ibid.*: 24). Bergson's theory of time made space for memories, premonitions, expectations, and anticipations, while Einstein's theory of relativity focussed on 'objective' events and a theoretical understanding in which humans are principally dispensable. Einstein stressed the duality between *physical* and *psychological* time (object-subject dichotomy) (*ibid.*: 5f.), believed in the unity of the universe and the existence of immutable laws, and searched for consistency and simplicity. Bergson, in contrast, promoted an 'anti-absolutist' perspective in which relationality was foregrounded and radical change predicated; his universe is characterised by never-ending novelty and creativity – a view encapsulated in his notion of the *élan vital* (*ibid.*: 7). This Bergsonian point of departure naturally capitalises inconsistency and complexity (*ibid.*: 21). Einstein, however, sought to discriminate his theory from all sorts of cultural or artistic relativisms (*ibid.*: 33). Bergson, on the contrary, deliberately embraced a relativistic approach and maintained that determining time remains a complex operation 'necessitating the assessment of the overall meaning of a moment or event' (cf. *ibid.*: 36). Both thinkers accepted the centrality of time yet conceptualised its role in understanding the world in fundamentally opposing ways.

[116] Cf. **Appendix II.2** for a more detailed discussion.

There are three basic 'progressive' categories of organicism (cf. **Box 9**). The first category comprises what organicists identify as 'fragments of reality' (Pepper 1942: 290f.). These 'fragments' are the bounded units of observation, what the organicist would recognise as the 'appearances' of reality; these are necessarily 'incomplete,' 'isolated,' and 'scattered' and seduce the analyst to underrate the world's processual interconnectedness. For the organicist, engaging with the 'fragments' is both dangerous and necessary at the same time. It is dangerous because one might lose sight for what transcends the 'fragments' yet conditions their existence, namely wholes held together by organic processes; to engage intimately with the 'fragments,' however, proves necessary because they are the only reliable evidence for what organic processes aim for. 'Fragments of reality' are negatively defined: they 'acquire significance according to the degree of integration not achieved' (*ibid.*: 290). They represent, in other words, the material for integration – the *target* of organic integration. For this reason, 'fragments' can never be defined absolutely, but gain importance relative to integrations already achieved (*idem*). This point is important since it explains the inherent complexity of organicistic inquiry in which 'fragments' need to be integrated in order to clear the view for new 'fragments' to be integrated, and so forth. The result is a dynamic and potentially *deeply nested* interplay between parts and wholes. The concept of the 'fragment' thereby indicates that the parts are not arbitrary, but remain defined by their 'effectiveness' in facilitating integration. This conception bespeaks of the 'integrative' nature of organicistic thought. A 'fragment' is a component of reality that 'has no relevance away from the whole it is a part of, and once embedded in that whole it contributes to the totality without any separate status or meaning' (Harris et al. 1977: 538). The 'fragments' have the status of puzzle pieces; the crux of organicism is that the theory maintains that in order to know the pieces one must also develop a grasp of the total puzzle. This conception leads organicists to reject the idea of prediction since neither wholes nor parts unambiguously point to each other; rather, they co-determine one another in intricate ways and these ways can only be *diagnosed* in retrospect. For the organicist, the world consists of complex constellations of parts governed by implicit principles of unification (cf. *idem*).

The second 'progressive' category is represented by the organic 'nexus' (Pepper 1942: 291f.). 'Nexuses' specify the positive faculty of the 'fragments.' Each 'fragment' contains the internal propensity for completion, and it is this propensity that defines the *possibility* and *potentiality* to join different 'fragments' on the way towards organic integration. Thus, 'nexuses' delineate the space of positive interaction with other 'fragments.' According to Pepper (*ibid.*: 291), it is through their 'internal drive' towards integration that 'fragments' reveal the existence of organising 'nexuses.' As he contends (*idem*), organicists do not believe that facts are 'organised from without;' rather, facts are thought to "organise themselves." The structural category of the organic 'nexus' carries the tension between the 'possible' and the 'actual.' Both poles are co-constitutive because in order to know the actual, one needs to analyse the 'possible' and search for meeting points between 'nexuses.' The organic 'nexus' is thus a relational category and it practically makes no sense to speak of an isolated organic 'nexus.' The meeting point of different 'nexuses' can be conceptualised as a convergence or overlay between spaces of possibility. It is in this way that 'fragments' can be said to suggest their whole. 'Nexuses' are the mediating factors connecting parts and wholes. It is characteristic of organicism to approach actuality from the perspective of possibilities and potentialities – no other theory takes these aspects as seriously as organicism. The progressive triplet 'fragments'-'nexuses'-'integration' presupposes that particular constellations of 'fragments' and 'nexuses' can only be integrated in one particular fashion – they can only form a single organic whole. This is what is variously referred to as the fixed nature of wholes in organicism (cf. Harris et al. 1977: 538). Only then is it conceivable, for example, to meaningfully state that some pieces of the intricate organic puzzle are 'missing'; in the same manner as the parts suggest what is possible, the whole must be able to suggest what is lacking. The possible connections between the 'fragments' are invariant because organicism regards the world as a highly determinate place:

> "Newton's great insight was the transparency of vision which perceived the implications of the data as they were. Had he seen less clearly or tampered with the materials, the synthesis would not have been made: that is, not through him; but it would inevitably have been made soon. This inevitability of connections among fragments, this implication of wholeness contained in them, is what the organicist means by nexus. Every fragment, appearance, datum, fact, he believes, has nexuses. These are immediately discoverable in observation, he thinks, to anyone who looks for them. But better evidence still, perhaps, is the signs of their presence and action in the cumulative integrative process observable in the history of knowledge." (Pepper 1942: 292)

The third 'progressive' category is 'contradiction' or 'conflict' (Pepper 1942: 292-294). According to organicism, the world is made up by many counteracting forces and perceptual heterogeneity is regarded to be a genuine feature of the realm of 'appearances.' 'Conflict' among 'fragments' accounts for the circumstance that not all 'nexuses' are compatible and organic integration requires overcoming obstacles. There is a certain categorical 'resistance' to integration, at least when reality is approached from a static, momentary perspective. In other words, a basic imbalance between phenomenal categories is viewed to be the precondition for organic, time-consuming integration. For instance, 'fragments' that do not match initially may be transformed over the course of time so that they can finally be integrated. That "nexuses reach out from fragments like tentacles and encounter contradictions for the fragments" (*ibid*.: 292) thus reflects the organicistic certainty that there can only be one way of "puzzling" the 'fragments' together. The important point is that organicism thereby engenders an 'anti-correlationist' attitude: what appears to be inconsistent at first may become consistent at another point in time.[117] Understanding the nature of conflict, counteraction, and tension is therefore necessary to understand 'wholeness'; the latter is simply recognised as the outcome of a process surmounting or removing any remaining 'contradictions' among the 'fragments of reality.'[118]

Crucially, 'conflict' is thus also considered a key feature of many inter-whole relationships. Organic wholes, according to organicists, represent nothing less than higher-level 'fragments' currently resisting integration. This conceptualisation is key since it justifies the recognition of *domain-specific* behaviours and *rules of development* unique to prospective wholes. The organic process that facilitates the 'coalescence' of these quasi-autonomous wholes establishing an organic 'super-whole' is typically a lengthy and 'adversarial' movement – each whole promotes its own 'agenda' and integration consequently becomes a question of *coordination*. As a result, organicism often prioritises the perspective of the *longue durée* and insists on radical differences in how entities travel through time. For organicists, integration turns out to have been inevitable in retrospect, but the path towards it is always "stony" and resembles a drama full of tragedy (cf. *ibid*.: 293). In this view, reality consists of a continuous movement between 'thesis' and 'antithesis,' both co-implying yet also exerting hostility towards each other (*idem*). Organic 'synthesis,' as Pepper (*idem*) notes, consist of the higher-level acknowledgement of the respective claims of each 'fragment.' Unsurprisingly, organicistic approaches thus regularly deploy 'dialectical' methodologies.[119]

Because the "fragments cannot be regimented or restricted in number" nor is "the order of contradictions predetermined" (Pepper 1942: 295), organicists recognise the determinate nature of the outcome of organic processes, which is regarded to have always been implicit in the structure of 'frag-

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[117] The rejection of what Quentin Meillassoux (2008 [2006]) has baptised *correlationism* is not identical with this 'anti-correlationist' attitude. Meillassoux's *After finitude* represents a potent critique of what, in the wake of Kant, has come to be known as the dogma that the external world cannot be known *outside* of its relationship with knowing subjects. Meillassoux (*ibid*.: Chapter 1, esp. 4) attacks this notion and argues that thought can actually discriminate between the 'phenomenal' – which always contains the input of subjects – and the 'absolute' which is subject-independent. Tentatively, *After finitude* can thus nonetheless be interpreted as a radical incarnation of 'organicism' insofar as its author rejects the 'analytic' insistence on the necessity of natural laws and of correlation as an methodological point of departure, but similarly repudiates the 'contextualistic,' especially hermeneutic, tendency to regard the human subject an ineluctable factor of knowledge formation. *After finitude* presents an attempt to salvage the organicistic 'ideal' and with it the 'dual' constitution of the world, without falling into 'mechanistic' necessities. This becomes most obvious when Meillassoux (*ibid*.: esp. Chapter 3) suggests an 'object-orientated' ontology to grasp the fabric of reality. This ontology stresses *object-alterity* and the *particularity* and *specificity* of subject-independent objects, classic themes of refined 'organicistic' thought (see *infra*). With Pepper (1942: 303), we can say that this Meillassouxian possibility to grasp the 'absolute' stems from the fact that 'organicism,' in theory, allows one to recognise the claims of the facts themselves, otherwise the 'fragments' simply resist their resolution (see *infra*).

[118] This constitutes a major difference between 'organicism' and all other world theories, especially 'formism' and 'mechanism.' For the latter, parts that do not 'match' or 'correlate' are typically regarded to reflect non-compositional relationships, that is, relationships that do not matter much for inferring or explaining wholes. 'Contradiction' and 'conflict' demarcate the terrain of negative knowledge for these theories; the field of positive knowledge, by contrast, only depends on them as it defined by conflict-free relationships.

[119] Dialectics is sometimes opposed to the 'scientific method' (cf. Dybicz and Pyles 2011) and clearly draws on a different epistemological basis. Dialectic thought has its roots in Continental European philosophy and is still widely applied in some branches of the humanities and social sciences. It plays almost no role in Anglo-American philosophy, especially its 'analytic' outposts. Popper's (1945, 1968) recurrent criticism of dialectics illustrates this situation. Popper (1968: 312) specifically lamented the dialectic willingness to 'put up' with contradictions, that is, to acknowledge their role as positive elements of knowledge (see also Bunge 1981, 2012: 84f. for a critique on dialectics; for the debate between Popper and Adorno on the status of dialectics, see Law 2015: 178). The European legacy of dialectic-critical thought is for example apprehended in Sartre's *Critique de la raison dialectique* (1960). Quite symptomatically, Scruton (1985: 186) – a conservative Anglophone philosopher – has accused Sartre's *Critique* to reveal a "total rejection of the rules of intellectual inquiry." From the foregoing, it should be apparent that this accusation is short-sighted at best and overlooks the simple fact that there is no single set of rules for intellectual inquiry, but at least four different cognitive frameworks delivering such orientation.

ments,' yet assert the particularity of the taken pathway. At the extreme, organicists maintain that evolution, or any other developmental process, follows a universal pattern (e.g., growth-consolidation-decline), but this pattern is realised in a myriad of different ways. In contrast to 'contextualism,' which interprets particularity as context-specificity, organicism thus re-casts particularity as the *specificity of developmental trajectories*. Notions such as 'cyclicity,' 'rhythmicity,' and 'modus of change' consequently anchor many organicistic approaches.[120] From this perspective, 'alterity' and 'otherness' emerge as potential features of long-term evolutionary pathways. Having said this, organicists may grant the possibility of epistemic anticipation, but only with regards to the general patterns of evolution. The specific trajectories themselves, by contrast, can never be predicted – they always have to be retrodicted and diagnosed.[121] Since organicism acknowledges change and conflict as the *status quo* of reality, the theory further shifts the burden of argument and explanation: change and contradictions can be assumed, while stability and stasis need to be explained (cf. Hayes et al. 1988: 100). This configuration is decisive since it remains largely incompatible with the 'mechanistic' proclivity to search for 'equilibrium conditions.'

Most organicists are 'stage-theorists' and this has to do with the specific link between the 'progressive' categories and the 'organic whole' they lead to. To recall, the 'organic whole' is nothing but the resolution of all relevant 'fragments of reality' in a coherent, yet typically extended system (cf. **Box 9**). Since 'integration' is conceived of as processual itself, the line of progression moves from one level to the next (Pepper 1942: 298): some 'fragments' become partially integrated and thereby form new 'fragments' which, in turn, may gradually be consolidated with both old and new 'fragments,' and so forth. This process is punctuated: gradual change culminates in *qualitative steps* of re-organisation. Each of these 'steps' or 'stages' increases the overall degree of inclusiveness, determinateness, and organicity of the whole under construction (*ibid.*: 298f.). The 'ideal' at which the process aims but never fully reaches is consequently characterised by the eradication of any trail of 'fragmentariness' since each systemic element then ultimately implies any other element and one cannot talk consistently about 'fragments' anymore.[122] In this vein, organic processes foster the gradual emergence of new levels of integration; 'novelty' – a 'contextualistic' category – is thus re-interpreted processually. For the organicist, gradualism and novelty are only contradictory categories if one adopts an overly static perspective on reality or relies on an untenable bivalent logic. In actual fact, however, the two can be considered to co-condition each other and to represent complementary extremities of the world.

The 'ideal' categories of organicism are simply the features of the 'organic whole' rendering it an outcome of aspiring the 'absolute' (cf. Pepper 1942: 304), that is, concrete and full-blown organicity. The 'ideal' categories methodologically threaten the 'progressive' categories since their purpose is to show that the 'progressive' categories are ultimately features of the realm of mere 'appearances' (*idem*; see *supra*). The whole point of organicistic inquiry is to pinpoint and resolve them since otherwise the 'ideal' remains hidden and is ultimately unknowable – to this effect, organicistic inquiry is itself cumulative and processual. The three 'ideal' categories of organicism are 'implicitness,' 'transcendence,' and 'economy' (cf. *ibid.*: 304-308; cf. **Box 9**).

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[120] The very idea that (evolutionary) change follows a certain 'rhythm' is anti-mechanistic and a classic 'organicistic' figure of thought. The classics of this line of reasoning are, for instance, Bachelard (1932, 1936), Klages (1934; cf. Müller 2007), and, more recently, Lefebvre (1968, 1991, 2004) – all subscribing to a form of 'rhythm analysis.' It is notable that 'organicism' also hosts a range of theories that seek to consolidate radical developmental novelty with the idea of incremental evolutionary change. In palaeontology for example, a noteworthy but largely forgotten figure in this regard was Otto Schindewolf (1950) who advocated a theory of 'mutationism' (cf. also Allen 1969; Bowler 1978) – an approach that is often also referred to as 'typostrophism' (cf. Reif 1986: 117-120). A modern interpretation of this theory would hold that long-term evolution entails the possibility of the sudden emergence of new levels of organisation that are, strictly speaking, not predictable from their evolutionary starting conditions, yet are fully intelligible in retrospect (see the entry for 'strong emergence' in **Box 9**). More generally speaking, all of these views of evolution stress the 'creative' element of evolutionary processes.

[121] This is why 'organicism' and 'mechanism' disagree so blatantly on almost every issue – even though, ironically, both represent 'integrative' theories. For 'mechanism,' explanation and prediction are so intimately connected that an 'organicistic' explanation – which rejects the idea of detailed prediction – effectively amounts to no explanation at all. For 'organicism,' conversely, 'mechanism' fundamentally misconstrues the relationship between universality and particularity and overemphasises the importance of predictive faculties.

[122] Complete 'organicity' constitutes a dead end for organic processes. A condition in which each system-element implies any other leads to system-states in which the alteration or modification of their elements either changes the entire system or destroys it altogether (cf. Pepper 1942: 300). The organicist may interpret this theoretical end point as the natural point of breakdown of a given evolutionary trajectory. According to organicism, the termination of an entire evolutionary trajectory, in other words, may be explained on the basis of *internal categories* alone and does not require the postulation of an environmental trigger.

'Implicitness' refers to the fact that after discovering the organic whole, all 'fragments' can be shown to have always been a detail of this whole, occupying a well-defined spatiotemporal place in it, so that their apparent 'fragmentariness' turns out to be, strictly speaking, an error or illusion (Pepper 1942: 304). The mistake consists in the *prima facie* acceptance of discreteness where there was in fact an initially 'concealed' processual unity. Reciprocally, the whole can then be shown to have always be organised by its 'fragments.' In other words, to recognise the 'implicitness' of a 'fragment' means to understand where it 'belongs' to (*ibid.*: 305). The goal of organicistic inquiry is therefore to arrange 'fragments' in such a way that their nexuses connect and each fragment's proper place can be grasped. 'Transcendence' is merely the other side of 'implicitness.' The whole can be said to *transcend* its internal contradictions rendering them 'appearances' too (*idem*). As soon as the whole is achieved, any contradictions either vanish completely (idem) or can be shown to be *local* contradictions only whereas the whole retains *global* unity. The general point that emerges from this is that the 'texture' of 'contextualism' (see previous sub-section) is itself subjected to change and transformation and a whole is thus typically invested with multiple 'textures,' each associated with a particular level of organic integration.

'Economy' pertains to organicistic interpretation insofar as each 'fragment,' although debunked as an 'appearance,' is nonetheless *saved* so that "nothing is lost in the absolute" (Pepper 1942: 306). Organicism is 'anti-reductionist' to this effect and endeavours to acknowledge reality of many layers of structural complexity (cf. **Box 9**).[123] Pepper (*idem*) remarks that "[n]othing positive is lost, and all contradictions vanish in the realisation of how these facts are connected." 'Economy,' i.e., the preservation of all initial observations, is important in organicism because the theory seeks to respect reality *on its own terms* – as it 'comes to us.'[124] The category of 'economy' gives rise to the organicistic credo of 'unity in diversity' and accounts for organicistic *unification* – that is, finding a whole-substitute for a group of distinct and at first sight counteracting parts. It represents nothing else than the refinement of the regulative idea that 'fragments organise themselves':

> "[…] The real strength in [the organicistic] argument comes from [the] analysis of evidence and the cumulative force of this analysis. A datum is a fragment with a nexus which leads to a contradiction that is resolved by an integration. This process comes spontaneously out of the fragment as the very activity of the nexus. Evidence progressively criticises itself and exhibits its own degree of reliability and points of itself to the ultimate structural organization of the world." (Pepper 1942: 303).

In general, many organicists adopt 'orthogenetic' or 'autogenetic' perspectives on evolution and tend to reject the tenet of 'heteronomy' (cf. e.g., Varela 1979; Grehan and Ainsworth 1985; Csányi and Kampis 1985; Jonas 2001; Levit and Olsson 2006). Their justification is the supposed prevalence of 'conflict' and 'contradiction' and the conviction that the processes delineating organic wholes install critical whole-particularities and 'object-specificities.' 'Orthogenesis' is the idea that the evolution of wholes is guided by *intrinsic forces*, but contrary to common belief these forces are not mysterious at all;[125] positing such forces simply takes up the idea that wholes possess the capacity for *self-regulation*, *self-organisation* (*autopoiesis*), *self-assembly*, and, ultimately, *self-determination* (cf. Juarrero 1999; Deacon 2016). From a moderate point of view, this idea breaks down to the (much less controversial) assertion that the evolution of wholes is *mediated* by the (changing) structure of the respective wholes (cf. e.g., DeLanda 2015: 19).[126] This assertion, in turn, merely states that evolution can only 'select,'

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[123] The analytical focus of 'organicism' is *organisation* rather than composition: "[…] [w]e cannot explain organisms mechanistically because their organised forms are contingent, not necessary […]. Whereas a machine can be explained by analysing it into its parts, to explain an organism we need to grasp it as a unified whole that reciprocally determines the form and combination of every one of its parts" (Thompson 2007: 132, 136).

[124] Pepper (1942: 303) is correct to identify this is as a major strength of 'organicism.' The only way to meet this argument (that evidence has to be allowed to criticise itself) is to "deny the legitimacy of the organicistic critique of evidence", and this is very difficult in the face of the cumulative corroborations of the evidence itself (*idem*). Pepper (*ibid.*: 304) goes on to assert that "for all other theories, their internal contradictions only confirm the organicist's critique of evidence, and he would be triumphant if a basic contradiction did not break out in his own theory."

[125] See for example Deacon's (2011) proposal of 'causality' in terms of his complementary concepts of 'orthograde' (internal causation) and 'contragrade' (external causation).

[126] DeLanda (2015), for example, offers a demystified" approach to the 'actual' and the 'virtual' as complementary poles of reality. In classic 'organicistic' fashion, the 'actual' is thought to describe a state of 'being' observable in a given moment, whereas the 'virtual' designates the tendencies and capacities of particular matter configurations to change their 'being' – 'virtual' is this recast as a category of 'becoming,' opening what DeLanda terms a 'possibility space.' For an intuitive explanation of the 'virtual' in terms of tendencies and capacities, see *ibid.*: 19f.

'foster,' or 'develop' what is already in place. 'Autogenesis' is often used to refer to *emergent evolution*, that is, the possibility that synergetic and other whole-internal relationships bring forth novel whole-level properties in the course of evolution (e.g., Huttunen 2012).[127] At the extreme, both perspectives reject externalist accounts of evolution (including 'selectionist' and 'adaptationist' explanations), which in the view of many organicists effectively overlook the importance of the developmental claims and *potentialities* of varying wholes. Both 'orthogenetic' and 'autogenetic' interpretations typically recognise evolutionary *path-dependencies* and dynamic feed-back effects altering or reinforcing pre-existing pathways. Organicism, to the extent of no other world theory, acknowledges the *ontological autonomy* of wholes – it explains in terms of the *unfolding nature* of whatever is to be explained.[128] The key for explanation, in other words, resides in the phenomena to be explained *themselves*.[129] The employment of terms such as 'individuation' or 'concretisation' bespeaks of this processual and integrative logic of organicistic world-making.

The prototypical organicistic account of evolution is grounded in 'dynamic systems theory' in the wake of Ludwig von Bertalanffy (1950, 1973) and Gregory Bateson (1972, 1979), among others – organicism promotes 'systems thinking' (cf. Harris et al. 1977: 538). This thinking is *dynamic* because systems are not conceptualised as 'fixed' or 'static' entities, but as *plastic configurations* that develop and re-configure themselves (or are re-arranged) over the course of their life-history. Systemic developments, in this view, typically lead through a number of successive system-states before an 'ideal' state is reached – which, of course, rarely happens in reality. 'Systems' are not seen as atemporal, abstract skeletons, but rather as quasi-living, organic structures. This interpretation of 'systems' is different from 'mechanistic' readings where systems integrate the entirety of parts within a single quasi-atemporal field; the 'mechanistic' system has spatial and temporal coordinates but no temporality itself. Organicism, by contrast, sharply distinguishes between the 'being' or 'existence' of a whole – terms that simply describe the condition and state of a whole at a given temporal unit of observation – and the 'genesis' or 'becoming' of the same whole – the process that leads in a directed manner through a number of such conditions/states and thereby *connects* them. The 'life-metaphor' is strictly metaphorical here: organicism happily admits that not all wholes are 'alive' in the same sense. The theory exhibits a critical openness to all forms and kinds of 'living'; these different 'ways of living,' in turn, make room for much existential and developmental 'alterity' – the prime type of 'otherness' that organicists are sensitive for.

As a consequence of all of this, organicism seeks to shield its representatives from two different variants of *equifinality*: on the level of 'being,' 'equifinality' comes close to 'contextualitistic' polyvalency and concerns the circumstance that similar 'fragments' may occupy different spatiotemporal positions in an organic structure; on the level of 'becoming,' 'equifinality' comes close to the 'mechanistic' reading of the same by professing that similar parts or part-configurations may be the generated at different stages of the developmental chain. While the former pertains to particular system-states, the latter bears on the total evolution of a system. The distinction between these senses of 'equifinality' is

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[127] In *Incomplete Nature*, Deacon (2011) discriminates between three nested levels of dynamic systemic organisation which he terms 'homeodynamics,' 'morphodynamics,' and 'teleodynamics' respectively. 'Autogenesis' primarily occurs in 'teleodynamic' systems and refers to the fact that these systems typically trend towards synergetic self-stabilisation; the road towards a stable system-state thereby depends on previous system-states. This is what Deacon refers to as 'reciprocal catalysis' and *self-catalytic* functions are indeed critical to most 'autogenetic' accounts.

[128] 'Organicism' and 'mechanism' trend towards opposing extremes here: whereas 'organicists' usually gravitate towards the idea that wholes are, to a large extent at least, *self-movers*, 'mechanists,' at least representatives of 'consolidated' variants of the theory, regularly presume that the world contains entities that serve as "movers" and such that 'are moved' and that an ultimate explanation requires to specify *first-mover(s)*. This juxtaposition of 'self-mover' and 'first-mover' elucidates much of the interpretive friction between the two 'integrative' world theories.

[129] It may be helpful to distinguish here between 'inner structure' as a category of 'mechanism' (and to a certain degree of 'formism') and 'deep structure' as a category of 'organicism.' While the concept of 'inner structure' conjures an *ontological dependency*, that is, the circumstance that most worldly entities need to be explained by more basic, yet distinct entities, proponents of 'deep structure' regard this construal as an unnecessary complication of factuality bespeaking of a problematic interpretive leap. Advocates of 'deep structure' typically hold that most worldly entities have to be explained by illuminating their existential and developmental logic, i.e., by revealing the co-constraining nature of the entities' various layers of organisation – the paradigm here is *ontological auto-nomy*. 'Inner structure' propositions thus focus on the structure of the world at large and promote the investigation of *external relatedness*, whereas 'deep structure' assertions concentrate on the structure of particular objects/phenomena and the examination of *internal relatedness*. Ultimately, this is the main difference between 'getting to the bottom of things' ('mechanism'/'formism') and 'getting to the top of things' ('organicism'). From the perspective of the practice of research, the analysis of 'deep structure' is often facilitated by the 'ideal-type method' (cf. Gerhard 2001) and, consequently, makes regular use of *idealisation* and *abstraction* as interpretive operations. Needless to say, this predisposition provides some of the reasons why 'non-organicists' are quick to qualify 'organicism' as a 'speculative' and ultimately 'subjective' research endeavour.

crucial for many organicistic approaches and further contributes to the perceived complexity of organicistic reasoning.

The guiding schools of thought for organicism are *objective idealism*, *process philosophy,* and some branches of *philosophy of life*. As Pepper himself (1942: 141f.) posits, organicism's historical progenitors are 'German' and 'British idealism' with type-scholars such as Hegel, Schelling, Bosanquet, and Bradley. Arguably, this list has to be extended to acknowledge the influence of eminent figures such as von Uexküll, Whitehead, and Bergson, and of intellectual movements such as French 'vitalism' and 'spiritualism.'[130] Organicism has further roots in non-positivistic branches of natural philosophy and notably draws on 'semiotics,' 'phenomenology,' 'structuralism,' 'dialectic materialism' ('Marxism'), and 'post-anthropological philosophy.' The latter represents a coalescence of various influential strands in French philosophy which – via Canguilhem, Bachelard, Souriau, Simondon, Deleuze, and others – have contributed to the proliferation of *radical ontological theorising* in the wake of Descola, Latour, and Stengers. This relatively recent current of thought emphasises radical differences in how distinct kinds of phenomena *behave* in time. Another associated ideational source for organicism is 'cybernetics' in the wake of Wiener, von Bertalanffy, von Neumann, von Foerster, and Bateson, to name only some of the key players.[131] Similarly, the legacy of French socio-ethnology in the wake of Durkheim, Mauss, and Testart – exemplified by the concept of « *morphologie sociale* » – has profoundly shaped some organicistic concepts and ideas.[132]

Organicism naturally promotes 'holistic' theories of evolution, often grounded in 'non-genecentric' perspectives, tends to retain 'Neo-Lamarckian' elements, and stresses the need to endorse the 'creative' moment of evolutionary processes – processes that are regarded to be only imperfectly captured by the dominant 'Neo-Darwinian' paradigm.[133] Organicistic theories of evolution typically do not foreground 'competition,' which organicism takes for granted (as an exemplification of 'conflict' and 'contradiciton'), but instead place primary emphasis on *cooperation* and the *horizontal coordination* among the objects of evolution. Partly for these reasons, organicism turns out to be rather insignificant for modern evolutionary biology and the life sciences at large. Most of these disciplines perpetuate 'mechanistic' understandings of both evolution and life (cf. Allen 2005).

Organicism is appealing because it responds to the intuition that objects, when they travel through time, transform in a rule-based, i.e., non-randomised manner, and that later stages of this transformation can be explained by earlier stages. In addition, organicistic explanations are *economic* in an important sense: they have great potential for *unification* which is often regarded to be an important explanatory virtue (cf. e.g., Kitcher 1981; Schurz 1999). Complementarily, organicism promises to reveal and describe kinds of relationships that are otherwise quickly overlooked – mainly structure-giving linkages that are 'distributed' on the temporal plane but nonetheless appear to modulate the 'genesis' of observable phenomena (i.e., emergent properties, developmental schemata, and domain-specific rule-sets).

Yet, organicistic thought is often seen as potentially self-contradictory in its attempt to resolve the relationship between the 'absolute' and its 'fragments' (cf. Pepper 1942: 314). Moreover, 'non-organicists' typically reject what they perceive as organicism's latent 'essentialism.' Organicism is also often regarded to be inconsistent with modern evolutionary theory, in particular Darwinian evolution as it has been formulated after the 'Modern-' and 'Extended Synthesis.' Organcistic evolution, as we have seen, is often imbued with Bergsonian 'creativity;' this Bergsonian impetus entails the idea that time is *qualitative* and *subjective* (i.e., object-specific) in non-trivial ways – a view that clashes with the 'dimensional' interpretation of time favoured by both 'formism' and 'mechanism.' In fact, organicism's specific treatment of time is one of the central reasons why it is often so fiercely combatted. The organicistic conception of time, for instance, threatens to undermine the 'actualistic' conviction that the present provides a viable frame of reference for knowing both past and future: in the view of organicists, the present can never be 'more than a sampler of the present order.' Another reason why organi-

[130] Some of these cognitive trends are now being amalgamated under the label 'panpsychism' (cf. e.g., Skrbina 2005; Goff et al. 2017).
[131] See Johnson (2014) for the specific and highly systematic discourse on 'cybernetics' in French intellectual culture.
[132] Cf. e.g., Barberies (2003) and Dunn (2016: 11-31).
[133] A recent example of this genre of approaches is Corning's *Holistic Darwinism: Synergy, Cybernetics, and the Bioeconomics of Evolution* (2005). This alternative perspective on evolution is explicitly presented as an attack on 'Neo-Darwinism' and highlights the 'multi-level nature' of evolution, 'group selection,' 'symbiosis,' 'cooperation,' 'developmental dynamics,' 'genotype-phenotype interdependencies,' 'hierarchy theory,' 'systems biology,' and 'autocatalysis' (cf. *ibid.*: 1-7).

cism is looked upon sceptically is because it fosters theories of *directed evolution* clashing with the received view that evolutionary processes are non-directed.[134] 'Non-organicists' regularly lament organicism's supposed inability to deflect what is known as the 'teleological fallacy.'

2.5 **Affinities and trade-offs between world hypotheses**

The general exposition of the structure of the four relatively adequate world hypotheses has already demonstrated that they organise themselves into two groups of two. The elucidation has shown that important affinities and trade-offs between these hypotheses are observable and that these can be clarified relative to the structural polarities 'analytic'-'synthetic' and 'dispersive'-'integrative.' I have suggested that the first polarity is typically interpreted 'antithetically,' whereas the second polarity tends to support cognitive complementarity fostering eclectic tendencies. As we have seen, from this general architecture of world hypotheses it follows that there should be a strong trend for 'formism' and 'mechanism' to mingle, to borrow from each other, and to share similar discursive spaces; and the same should apply for 'contextualism' and 'organicism.' What I will show in this section is that from this general organisation of world theories four other interpretive polarities result: (i) the gap between *Appearance and Reality*; (ii) the rift between 'externalism' and 'internalism'; (iii) the clash between 'dialectic-dialogical' and 'formal-logical' schemes of argumentation; and (iv) the disparity between 'qualitative-conceptual' and 'quantitative-statistical' strategies of data visualisation. I argue that these polarities help illuminating some of the more tangible research consequences of world hypotheses – consequences which clearly leave their mark on lithic research in Palaeolithic archaeology and should prove useful for understanding the stakes of the French-Anglophone divide.

The problem of *Appearance and Reality* is only acknowledged by the 'integrative' world theories since only these are primarily concerned with advancing 'precision' and thus constantly strive to explain away or unify the facts they register (cf. Pepper 1942: 145). The mere idea that there is a 'phenomenal' layer of reality that only shows the surface of what actually is embodies a prototypical conviction of world hypotheses that champion strong determinacy – 'mechanism' and 'organicism.' To negotiate the 'appearance'-'reality' gap is a structural feature only of world theories that conceive of 'order' as *categorical*. These 'integrative' theories regard the directly perceivable layers of reality as potentially 'misleading;' in their own words, they are interested primarily in how the world truly *is* rather than how it is *perceived*.[135] Although adherents of this view openly debate how one can precede from what merely 'appears' to be to what actually 'is,' they would generally agree that there must be 'more' to the world than can be experienced – there must be something, in other words, that explains why one perceives what one perceives.[136]

The 'appearance'-'reality' gap has its origin in this general scepticism about the cognitive value of unfiltered direct perception, which is proper to the 'integrative' theories. Its systematisation typically leads to the distinction between 'observables' and 'unobservables' and the latter's theorisation and characterisation.[137] Because 'integrative' world theories presume that 'reality' is not easily accessible and therefore conceive of it as partly 'unobservable' or at least as 'difficult-to-observe,' they face great

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[134] It has to be stressed here, however, that this issue is often confused in popular culture and popular science alike. The 'teleological' inclination of 'organicism' (see *supra*) must not be confused with the idea that evolution is necessarily goal-directed, let alone that this goal is pre-fixed or pre-determined in any way. Organicism is merely inclined to posit that evolution creates 'directed' pathways of becoming – a much less controversial claim. This 'directedness' of evolution is to be distinguished from 'goal-directed' evolution. Organicistic evolution, in other words, can be 'directed' without being 'goal-directed'; organicistic 'teleology' is often misrepresented by 'non-organicists' to this particular effect.

[135] The point here is that this distinction is systematised and consequentially developed only in the 'integrative' theories; in 'contextualism,' for example, the distinction between 'appearance' and 'reality' makes only little sense since the question is not what is 'real' and what is not, but rather what are the relevant contexts of reality that arrange and give shape to reality in its totality.

[136] The distinction between 'reality' and 'appearance' can therefore lead to 'objectivist' or 'subjectivist' systematisations: the 'objectivist' interpretation claims that perception is constituted by structural features of the outside world which exist independently of the subjects perceiving them; the 'subjectivist' reading posits that perception is brought into existence by structural features of the perceiving subjects and can therefore never reach out entirely to an outside subject-independent world. Needless to say, in practice we often encounter a mixture of both positions but in specific articulations. 'Mechanists,' for example, would typically defend the 'objectivist' reading and content that some perception is indeed 'subjective' and researchers must therefore strive to identify and eliminate such 'biases' – as one can easily see, this entire talk makes only sense if one accepts the 'reality'-'appearance' gap as a structural feature of the world.

[137] A classic example for a 'mechanistic' conception of key 'unobservables' is 'atoms.'

difficulties of convincing each other about the most promising 'unobservables.' This core question – what makes up 'reality' – is therefore a structural divider among 'integrative' world theories; they combat and reject each other mainly because of this question. Whereas 'mechanists' tend to believe that all phenomena are caused or constituted by the core features of the world's 'inner structure,' 'organicists' typically hold that there can be no such structure independently of the phenomena under consideration; according to them, it is the 'deep structure' of the phenomena themselves which consequently helps to explain their 'appearances.'[138] This issue is largely irresolvable. Shared 'integrativity' therefore turns out to be a locus of conceptual disparity rather than solidarity.

'Dispersive' world theories, conversely, are not committed to the idea that the world can be broken down into 'appearance' and 'reality;' they are not so much interested in providing ultimate and ideally singular reasons for why certain phenomena can be found in the world, but rather try to take these phenomena seriously and to understand how the totality of facts is organised in relation to them. The recourse to something beyond the 'phenomenal' world thus appears almost 'mystical' to them – this is even true for 'formistic' theories since their category of 'subsistence' denotes, strictly speaking, merely the 'flip side' of what is defined as 'existence,' the point is not, therefore, to reduce 'existence' to 'subsistence.'[139] The 'dispersive' theories combat each other with similar stubbornness as the 'integrative' theories but their conflict is about how to tackle and not to get lost in the latitudinal richness of evidence. Shared 'dispersivity' hence also tends to be a locus of conceptual divergence rather than convergence.

The second polarity is between 'internalism' and 'externalism,' understood as regulative ideas of knowledge formation.[140] This polarity is another result of how evidence tends to be marshalled and explained by the four relatively adequate world hypotheses. It turns out that 'formism' and 'mechanism' enact a gravitational pull towards interpretive 'externalism,' whereas 'contextualism' and 'organicism' generally favour interpretive 'internalism.' The division hence reproduces the 'analytic'-'synthetic' antagonism but is not an inevitable consequence of it. On a general level, however, the polarity is indeed foreshadowed by the fact that 'analytic' theories carve out parts and analyse their composition, which in practice usually means to study how parts are *externally* related. 'Synthetic' theories concentrate on the delineation of wholes and analyse the effects of the latter on the constitution of parts, which typically implies that parts need to be examined in terms of their framing through other parts of the same whole (i.e., the whole is studied in terms of its *internal* relatedness). This contrast is important and resonates with the types of cognitive criticism promoted by the two groups of world theories (see *infra*).

In 'formism,' facts are classified and arranged according to 'characters,' 'traits' and/or 'types' before they are ultimately examined in light of *other* classes of 'characters,' 'traits' and/or 'types;' providing an explanatory account thus typically means to invoke one or more part-categories of the world that are *external* to the category under consideration but share relevant features with it.[141] 'Mechanistic' world theories generally radicalise this 'externalist' strategy of explanation by wrestling with the 'problem of transition.' This problem is, as we have seen, a consequence of 'mechanism's' dualistic architecture made up by its 'primary' and 'secondary' categories. Since the 'primary' categories are typically identified as the features of the world that 'constitute' or 'cause' the features of the world encapsulated by the 'secondary' categories, 'mechanism' also tends to explain by means of a categorical 'else.' This becomes perhaps clearest when the theory compartmentalises reality into dif-

[138] This is the irony of 'integrative' world hypotheses: even though they agree that the 'phenomenal' can be misleading and that *unobservables* are the key for understanding the world, they treat each other with hostility because of that; the fact that they have to face such unobservables and to specify them regularly leads the two theories to heavily disagree on what the relevant unobservables are.

[139] In fact, the whole point is precisely that 'subsistence' cannot be reduced without loss to the realm of 'concrete existence' – according to 'formism,' whatever *subsists* cannot fully be particularised.

[140] I am adopting a rather unconventional understanding of the polarity between 'internalism' and 'externalism' here. Usually these terms are employed to indicate whether knowledge is thought to depend primarily on factors internal or external to the knowing subject (cf. Pappas 2017). In contrast, I am not concerned with subjects, but with the entities/phenomena to be explained or understood. Interpretive 'internalism,' then, is the view that in order to elucidate any such entity, one needs to relate its parts to some aspects external to the entity; interpretive 'externalism,' by contrast, would posit that understanding the entity mainly depends on our ability to reconstruct how the entity is internally constructed.

[141] Needless to say, 'externalism' here is often interpreted according to the 'theory of sets' and therefore not always involves a transition from one object of analysis to another one – a characteristic of a particular woman might for example indeed by explained by another characteristic of the same woman. The *problem of transition* – defining for 'mechanism' – is a non-problem in 'formism' but the general explanatory strategy of the latter is nevertheless 'externalist.'

ferent layers or domains; the 'chains of causality' which are then typically conjured to derive the characteristics of each layer or domain from another layer or domain give a strong voice to this general predisposition – a predisposition which is already echoed in the basic 'push-and-pull' intuition of 'mechanism.'

'Contextualists,' conversely, try to *internally* relate the facts they hope to explain by arranging them into their wider context; each fact is made sense of by determining its position relative to the 'quality' and 'texture' of its context. Since each context remains peerless insofar as the categories of 'novelty' and 'change' apply, 'contextualistic' theories cannot, by definition, externally relate different contexts to expound them; 'contextualism' therefore relies primarily on identifying and mapping *context-internal relationships*, especially 'interpenetrations' – and only these are considered the key bearers of refined knowledge. 'Organicism,' by entrusting much of its explanatory work to the conception of *self-moving* spatiotemporal structures, naturally mirrors the same 'internalist' preoccupation. Although 'organicistic' theories are also fed by a dualistic structure of categories, both the 'progressive' and 'ideal' categories reference the *same* object matter, a unified structural whole distributed in time and space – the identification and interpretation of the 'progressive' categories in light of the 'ideal' categories, and *vice versa*, thus helps to order isolated facts *internally*, to connect them 'genetically' (temporally), and to discard those that cannot be considered internal to the phenomenon in question – a classic 'internalist' manoeuvre.

The third polarity concerns the commonly favoured mode of argumentation. A distinction is to be made here between two grand families of argument: 'dialectic-dialogical' and 'formal-logical' modes of argumentation. This distinction not only touches upon the type of argument considered to be useful in order to advance inquiry or to reject knowledge claims, but also on how these arguments are to be related and mobilised. It obviously cannot be overrated how important argumentation in science is. If differences in world theory commitment can be shown to animate basic differences in how scientific arguments are construed, the actual consequences for varying realities of research and their fruits of knowledge can be expected to be tremendous. Generally speaking, the two basic views of argument that are relevant here broadly map onto the dichotomy between 'analytic' and 'synthetic' world theories and appear to be the result of how the respective theories police part-whole relations.[142]

The first view, drawing on a 'dialectic-dialogical' notion of argument, regards argumentation as an 'intricate,' 'complex,' and 'multi-layered' exchange of *pros* and *cons* for evaluating a given state of affairs (cf. Stutt and Shennan 1990: 768). This view explicitly opposes the idea that argument is nothing more than a "one-shot demonstration that settles the questions once and for all" (cf. Blair and Johnson 1987: 51). Stutt and Shennan (1990) have called this stance 'interactionist' since nothing is regarded to be 'fixed' or 'secure.' Arguments are essentially shifting discursive formations, constantly in need of revision and re-adjustment. The structure of argument-making and -progression is thus typically 'multi-stranded' and even 'multi-directional,' often appears to be 'cyclical,' and tends to take 'conversational' shape.[143] This also means that insight is not only generated by argumentative outcomes, but emerges from the 'dialogical' process of argumentation itself.[144] The archetype for this type of argument are the *Platonic Dialogues*.

The second view, drawing on a 'formal-logical' notion of argument, envisions argumentation mainly as a 'structured body of propositions' with predefined rule-sets for how to precede from one step to the next; this essentially conforms to what Stutt and Shennan (1990: 768) have called the 'prescriptive' stance of argument. This stance tends to rely on the formalised languages of symbolic logic and mathematics as structure-giving elements – argument is primarily defined as 'logic in use' (cf. Toulmin 1958). Therefore, argument ought to be a maximally 'transparent' and unidirectional process, in which the premises and the operations to elevate the premises into a hypothesis that can be plainly accepted or rejected are clearly laid out.[145] The regulative idea is that of the *automaton* – given a defined rule set and a specified argumentative input, the argumentative conclusion should be a some-

[142] For archaeology, readers are referred to Stutt and Shennan's treatment of the topic in *The Nature of Archaeological Arguments* (1990).
[143] This does not mean that argument is necessarily 'circular' in the logical sense, as some of its opponents want to have it.
[144] This implies, in other words, that one cannot tell before one delves into an argument which aspect of the argumentation will be most illuminating – in fact, the main point is that the result of the argument might be rather un-sensational, but part of the *exchange* leading to this point may be extremely illuminating.
[145] They are indeed often explicitly *defined* at the start of inquiry – this can translate into the organisational structure of a study, so that there is a specific section devoted to this task.

what 'automatic' outcome.[146] Argument strives to be as 'demonstrative' as possible and is primarily oriented towards its achievements. The archetype for this mode of argumentation is the *modus ponens* – argument is typically modelled on 'syllogistic' reasoning.

Pepper's world hypotheses theory enables us to explain why it is so difficult, if not impossible, to combine these two visions of argument. The reason seems to be that the two grand families of argument are well-adapted to respond to the preconceived structure of the world advocated by the 'analytic' and 'synthetic' world theories: 'formal-logical' modes of argument take it for granted that the world is an 'incremental' and 'compositional' entity and therefore ought to be studied as such; 'dialectic-dialogical' modes of argument, by contrast, tackle the world primarily as a 'configurational' entity equipped with a residual 'wholeness' never to be fully resolved in its parts and therefore to be studied as such. This is another example for how structuring the totality of evidence feeds into the normativity of inquiry. It is at least not surprising from this perspective that 'formism' and 'mechanism' share the same general conception of argument, and that 'contextualism' and 'organicism' do the same. We will see in the next section that these modes of argumentation also neatly articulate with the promoted theories of 'cognitive criticism' (conditions of truth).

The fourth polarity brings into focus a somewhat peculiar domain of scientific cognition – 'visualisation.' In general terms, all research of course faces the basic problem of 'making visible' what it finds, proposes, and/or ponders upon. Apart from strictly 'textual' strategies of explicating knowledge contents, scientific inquiry can also draw on 'pictorial' strategies of explication. These are cognitive instruments in their own right and can be used to bolster knowledge claims, to persuade peers of their significance, and/or to motivate entirely novel interpretations – non-textual visualisation thus certainly play an important role in the rhetorics of science. It is more than likely that there is a give and take between certain 'textual' strategies and certain 'pictorial' strategies in processes of knowledge formation.[147] Moreover, the images and pictures mobilised during research should reflect the needs and strengths of the guiding world theories. How each world theory organises its evidence and cognitively 'digests' it is therefore expected to have a strong bearing on the types of visualisation it promotes and develops.[148]

The visual needs and potentials of the four relatively adequate world hypotheses can be theorised relative to the primary structural polarities 'analytic'-'synthetic' and 'dispersive'-'integrative.' The resulting visual signatures are not surprising given what has already been said before. For the divide between 'analytic' and 'synthetic' theories it is again the differential emphasis on parts and wholes that turns out to be cognitively decisive. Whereas the 'analytic' theories – 'formism' and 'mechanism' – focus on depicting parts and how they compare to other parts, the 'synthetic' theories – 'contextualism' and 'organicism' – attempt to visually 'mould' the wholes they seek to reconstruct and understand. 'Synthetic' visualisation entails the specification of which parts belong to which wholes and in what way(s). The former, in comparison, encourages the mobilisation of visual techniques of 'atomistic' pattern-recognition and correlative comparison. Quantitative graphs with two or more axes of juxtaposition are consequently a hallmark of 'analytic' visualisation. 'Synthetic' visualisation strategies, by contrast, generally tend to focus on the more qualitative aspects of part-whole articulations; the images and graphs they encourage favour more 'abstract' and 'conceptual' depictions – the visualised links between parts and between parts and wholes are often of an 'idealised' and highly 'orchestrated' nature. Thus, 'schematic' reasoning, often supported by ideal-typical practices of making visible, is expected to form a hallmark of 'synthetic' visualisation.

The differences between 'dispersive' and 'integrative' theories are slightly more subtle. 'Dispersive' visualisation strategies seem to gravitate towards two extremes: either they motivate a in comparison to 'integrative' strategies disproportionally high number of graphs, tables, and/or drawings, or

[146] In the view of many proponents of 'formal-logical' argumentation, this is why this mode supports an 'objectivist' conception of science. The idea is that arguments are only convincing, firstly, if their authority can be uphold independently of the subjects who advance them and, secondly, if they can be safely and reliably reproduced by different subjects. What is interesting about this is that 'mechanists' will have natural advantage here because they can simply draw on their root metaphor to refine the directed and quasi-automatic enchainment of arguments to reach the inevitable conclusion.

[147] We can therefore say that each 'style of reasoning' includes one or more 'style of visualisation;' whether and how these (also in numerical terms) relate to one another, however, remains an open question and can only be answered empirically, by examining their relationship in concrete case studies.

[148] If correct, this would be a good example for the *enabling* propensity of world hypotheses, their ability to literally render the world *portrayable* in particular ways.

they try to condense the richness of their account into a single exceptionally 'dense' or 'complicated' diagram which illustrates how different facts and categories of reality relate to each other. The goal of these depictions is to visually 'secure' this richness rather than to break it down or to resolve it. 'Integrative' visualisation also gravitates towards 'essentialisation' and 'reduction' in order to highlight those features which are seen as key to explain the examined phenomena. These 'condensed' graphs typically emphasise *directionalities of determination* – a classic example is a flowchart. Another regular symptom of 'integrativity' in visual cognition is 'generalisation,' which typically results in rather generic representations of items and processes, with only minimal resemblance to the actual objects of study (e.g., artefacts).

2.6 **The problem of corroborating knowledge claims**

World hypotheses involve propositions about how to corroborate – that is, to confirm, validate, and/or reject – dispositional knowledge claims (Pepper 1942: 150). Since world hypotheses are unrestricted hypotheses about the world, criteria for scientific 'validity,' 'truth,' and 'plausibility' turn out to be a part of the hypotheses themselves. In fact, world hypotheses tend to be somewhat dogmatic in how they criticise and secure the knowledge they advance. Because world hypotheses are strictly autonomous, it follows that each hypothesis is obligated to a particular *conception of truth* – each theory supports its own 'theory of cognitive criticism' (*ibid.*: 149). In other words: each of the theories solves the problem of corroborating knowledge claims differently and in relation to its own categorical architecture. The theory of cognitive criticism respectively supported is hence an upshot of the accepted root metaphor and specifies how cognitive adequacy can be maintained and monitored. From the perspective of Pepper's world hypotheses theory, it is thus no surprise that 'truth' and 'knowledge corroboration' remain to be perennial problems for philosophy and science alike; these question can simply not be decided upon without pre-casting the world into coherent and relatively adequate world hypotheses. Accordingly, the 'classic' theories of truth are simply reflections of the cognitive tendencies defined by the most potent world theories.

The specific theory of cognitive criticism vindicated by each world theory is hence a prominent marker of the theory and its cognitive peculiarity. In Pepper's (1942: 150) own words, "the logic of each [world] theory […] follows from its theory of truth." It is for this reason that problems of scientific 'veracity' and 'certainty' deserve special attention here. Diverging conceptions of truth allow us to retrace diverging conceptions of 'objectivity' and thereby help to clarify that *each* theory is generally capable of enacting 'intersubjective' standards of knowledge corroboration. Each theory nonetheless seeks to ensure the *relative objectivity* of its claims according to its own terms; 'non-objectivity' allegations by other theories are therefore typically normatively incrusted and merely confirm that world theories tend to be built on diverging notions of 'objectivity.'[149] This interlocking of concepts of 'truth' and 'objectivity' also elucidates why even definitions of 'argument' and/or 'data' usually differ between world theories. We can in fact say that different theories of cognitive criticism *depend* on different ways of devising data and constructing arguments in order to safeguard the cognitive value of their world hypotheses.

In what follows, I will shortly expose the four general theories of truth that correspond to the four relatively adequate world theories. I will concentrate on the relative differences between these theories in order to clarify their cognitive significance; these differences have a direct bearing on how empirical evidence can be handled, how data is generally interpreted, and what types of knowledge claims are typically supported. The exposition will help to derive a clearer understanding of the cognitive distinctiveness of each of the four world hypotheses. I begin with the 'analytic' theories and show that 'formism' relies on a correspondence theory of truth, whereas 'mechanism' places its confidence in a causal-adjustment theory of truth; I then turn to the 'synthetic' theories and demonstrate that 'contextualism' harbours an operational theory of truth, whereas 'organicism' turns out to be the prime advocate of a coherence theory of truth. The point is not so much that proponents of the different world theories are forced to accept the appropriate theories of cognitive criticism, but rather that they

[149] It cannot be overemphasised here that *objectivity*, as a consequence, also belongs to the 'internal' categories of world hypotheses can therefore not be invoked to reject any other competing hypothesis.

will be naturally attracted by these theories if they wish to advance and refine their cognitive enterprise.[150]

2.6.1 ***Correspondence as the truthmaker in formism***

The basic principle of knowledge corroboration in formism is *correspondence* and formists, as a consequence, strongly gravitate towards correspondence theories of truth (cf. e.g., Fumerton 2002). These theories generally posit that in order to secure scientific veracity one must ensure that knowledge claims correspond to the facts in the world that they address (cf. Sher 2013). This, of course, is an archaic idea in philosophy. A classic formulation can for example be found in the work of Bertrand Russell (1971 [1912]: 129) who advocated the notion that "[…] a belief is true when there is a corresponding fact and is false if there is no corresponding fact." The basic intuition is that there ought to be a structural similarity between the knowledge claim and its facts – an intuition that derives from the formistic root metaphor of 'similarity' (cf. Pepper 1942: 180). The crux of correspondence conceptions of truth is to determine what the relevant type of similarity is and how the relation of correspondence between knowledge and facts can be guaranteed (e.g., David 1994).

This leads to a distinction between 'truthmakers' and 'truthbearers:' the former define the linkage between knowledge claims and the facts they concern, while the latter specify the features of the world which can legislate about the weight and cognitive significance of these relations (cf. e.g., Armstrong 2004; Marian 2016). The truthbearers of correspondence theories are parts of the world – what formism identifies as 'particulars,' 'characters,' and/or 'ties' (cf. **Box 6**) – and these, in turn, have variously been signified as facts, traits, attributes, states of affaires, conditions, situations, events, objects, sequences of objects, sets, properties and/or tropes (Marian 2016). Acclaimed formistic truthmakers that establish how these truthbearers ought to compare to knowledge claims are for example conformity, congruence, agreement, accordance, copying, picturing, signification, representation, reference and/or satisfaction (*idem*). To find the most pregnant truthbearers and their most promising truthmakers keeps formism busy and constitutes an ongoing area of debate and refinement. What cannot be disputed by formists, however, is that scientific truth essentially consists of a bipartite relation and it is this relation that needs to be evaluated in order to judge knowledge claims.

That this bivalent relation is interpreted through the root metaphor of 'similarity' has important consequences for how the 'veracity' of knowledge candidates can practically be assessed. The basic strategy of comparing truthbearers with knowledge claims and to analyse the relation between the two through the lens of the envisaged truthmakers predisposes this theory of cognitive criticism to scrutinise the *relative strength* of correspondence relations, which, in turn, lends credence to methodological procedures which enable an 'analytic' assessment of *degrees* of (dis-)similarity (cf. Pepper 1942: 180f.); this greatly animates correspondence theories of truth to make use of quantitative-statistical methods to reliably measure 'truth-making' and to compare its strength across competing knowledge claims. This is the meaning of operational hypothesis-testing in formism – it is nothing less than an attempt to establish the relative (dis-)similarity between the hypothesis and the facts it covers. As a general corroborative strategy, it also explains why formists often ground their examination of evidence on continuous variables – continuous variables help to analyse similarity and correlation and hence to untangle 'truth-making' correspondences.

Another consequence of the bipartite nature of knowledge corroboration in formism is that knowledge claims tend to be 'descriptive.' A hypothesis said to be 'valid' or 'applicable' is a hypothesis whose assertive content resembles what it talks about. As Pepper (1942: 181) himself admits: "[…] we may very simply define truth as the degree of similarity which a description has to its object of reference." Formistic explanations therefore often aim to reproduce the factual characteristics of their object matter (*idem*). This typically requires the transfer of evidence into an independent data format, so that the form-based characteristics – 'characters' and 'ties' – of the examined parts can be more effectively analysed, compared, and described. The construction of 'classes' and/or 'types' and their locali-

[150] We can therefore say that cognitive inadequacies may arise when scholars indulge into a cognitive project defined by a world theory but deploy an inconsistent theory of 'cognitive criticism' to advance it. The resulting inconsistencies threaten to collapse the accepted world hypotheses and thereby endanger the 'adequacy' of its knowledge claims. Nonetheless, practiced science may be stuffed with cognitive confusions of this sort.

sation in patterns may thus already count as a good description. In this way, correspondence can effectively be monitored by analysing the participation of truthbearers in the 'relations' defined by the truthmakers – e.g., 'regularities,' 'norms,' and/or 'laws' – so that searching for correlations and covariations emerges as a key operation in formistic knowledge corroboration;[151] taxonomies, systematics, and form-based typologies are important cognitive instruments precisely because they facilitate the organisation of the totality of evidence, which is often a crucial precondition to check for factual correspondence(s). The resulting groups, sets, and/or clusters of facts can then simply be compared to the available knowledge claims in order to determine whether there is a structural match or not.

Since formism prioritises the analysis of 'participation' – that is, how its truthbearers contribute to patterns – 'induction' tends to be the central method of cognitive criticism. According to Pepper (1942: 182), formists typically recognise two types of induction: (i) inductions that yield descriptions of 'empirical uniformities,' and (ii) inductions that yield descriptions of 'laws.' The former concern patterns in 'concrete reality' that do not exist by necessity – patterns which are contingent but nonetheless reliable truth indicators. The second type concerns patterns that are necessary – patterns that exemplify a general 'law.' This general discrimination leads to the formistic distinction between 'historic' and 'scientific' –between historic truth and scientific truth (*ibid.*: 182f.).[152] Hence, empirical uniformities are typically identified as being merely of historical significance; yet, in the spirit of formism's inherent 'dispersivity,' they are nevertheless regarded to be 'real' and informative about the world. Having said this, since empirical uniformities derive from contingent facts, they are often considered to be sources of 'half-truths.' According to formistic logic, notwithstanding, the cumulative force of these 'half-truths' allows for the approximation of scientific truth and the necessary structure of the world in the long run (*ibid.*: 183f.). This 'graduation' of varying truth values is anticipated by the work of Francis Bacon, who conceptualised science as an ongoing process of climbing the ladder of knowledge: starting from all of the available facts, one would first have to reach the 'middle-principles' before ultimately proceeding to the highest and 'purest' ones (cf. Carrier 2016: 16). The interesting issue here is that formism apparently has to counterbalance the relative 'sameness' of its evidence – a result of its 'dispersivity' – with a pronounced hierarchy of knowledge.[153]

2.6.2 ***Causality as the truthmaker in mechanism***

The basic principle of knowledge corroboration in mechanism is *causal-adjustment*; mechanists, therefore, are typically proponents of what Pepper (1942: 228) terms 'causal-adjustment theory of truth.' The key concept of the theory is 'causality' broadly defined, i.e. including weaker principles of determination such as 'constitution' (cf. Williamson 2011). More generally, causality is interpreted as a determinative process distinguished by its 'specifity of response' (*ibid.*: 226).[154] There must always be a *reason* for why a particular phenomenon or behaviour can be observed – that is, there must be some-

[151] We can adopt Nancy Cartwright's (2004) differentiation between two types of scientifically relevant laws here: 'laws of association' and 'causal laws.' The former are defined by what Pepper would call 'participation.' Moreover, these 'laws' are causally neutral – although this doesn't mean that the authors who advance them reject causality as an important principle to shape reality – and typically tell us how often and under which conditions the quantities and qualities of parts are 'co-associated' (*ibid.*: 419). Following Cartwright (*idem*), one might say that 'laws of association,' in contrast to 'causal laws,' mainly target the structure of co-occurrence(s) itself and try to capture this structure, but they rarely provide a comprehensive account of what 'makes it happen.' The 'laws' of 'formism' can thus be said to primarily consist of such 'laws of association.'

[152] The important point here is that 'formism' requires both historic and scientific truth in order to picture the world comprehensively and adequately; the two types of knowledge thus complement each other, even though they may of course interfere at times. This is why the rejection of historic truth as a basis for science threatens to collapse the theory, and often marks the transition to 'mechanism' and its causal-adjustment theory of truth (see *infra*). The perhaps best example from the younger history of archaeology for such a process is the well-known critique of Lewis Binford and his followers on what they perceived as American 'Historical' Archaeology – a type of archaeology they wanted to supplant with their own 'New' Archaeology, built on more robust 'scientific' foundations (cf. Binford and Sabloff 1982; Clark 2002: Table 1). The rhetoric and conceptual importance of Binford's (1968) distinction between 'history' and 'science' is a clear indication for his attack on formistic logic and his determination to usher a more 'mechanistic' type of research in American archaeology (cf. Trigger 2007: 400f.).

[153] We will see in the following that this is a trade-off proper to 'formism' and that the other credible world theories make other 'deals' in this regard. ['sameness of evidence' simply means that there is no structural incentive for the theory to rank and/or weight its evidence before processing it]

[154] The principle of 'cause-and-effect' has been systematised by David Hume [1711-1776] ('theory of regularity') and was subsequently refined by John Stuart Mill [1806-1873], who proposed three cognitive strategies to avoid falling prey to causal fallacies (cf. Carrier 2006: 27-35).

thing in the world which has 'triggered' it.[155] Any grounds offered, moreover, must be *specific* enough to apply to what one seeks to explain (e.g., Clark 1963).[156] For causal theories of truth this requirement of 'specifity' ushers an important response to the so-called 'Gettier problem,' according to which knowledge about the world is constantly threatened to be only accidentally true (cf. Sturgeon 1992);[157] this general difficulty prompts us to reconsider how knowledge can be *secured* and thereby shifts the attention to the *relevance* of the offered explanations.[158] In order to avoid the 'Gettier problem,' causal theories typically assert that knowledge claims are only approvable if one can demonstrate that a claim specifies the result(s) of the relevant causal connections which necessarily make it true. The concept of *necessity* is central here for it counters the possibility that knowledge becomes a mere question of 'lucky guessing' (cf. Pritchard 2015).[159] A now classic version of such a causal account of knowing has been offered by Alvin Goldman (1976: 361, original emphasis) who pioneered the idea that "[a] necessary condition of *S*'s knowing *p* is that [her/]his believing *p* be connected with *p* by a causal chain."[160] This notion of temporally well-structured 'chains of causation' is commonplace in mechanism and serves to devise the structure of reality (cf. Pepper 1942: 227);[161] it also incentivises mechanists to acknowledge a *ladder of causality* and to reject the 'formistic' ladder of knowledge as a symptom of superficial insight.

The 'specifity of response' principle, grounded in the mechanistic intuition of 'integrative' necessity,[162] gives rise to the recognition that 'prediction' must be a part of explanation itself. Prediction is cognitively esteemed because of the way causality is interpreted in mechanism – namely, as a consolidated field structure acting in highly specific and largely inevitable ways. It is for this reason that mechanism's causal adjustment-theory regards cognitive anticipation as a key epistemic virtue. Already Moritz Schlick (1932/33: 44) apodeictically noted: "[w]hat every scientist seeks, and seeks alone, are [...] the rules which govern the connection of experiences, and by which alone they can be predicted." For mechanists, prediction is the most promising tool to unveil the *hidden structure of reality* and to pass the world of 'appearances.' Since one cannot observe the fabric of reality directly, one can only hypothetically devise it and compare its consequences with what one can, after all, observe directly. The analysis of these necessary consequences requires accepting some notion of 'causal laws' (*sensu* Cartwright 2004).[163]

As a note of caution, however, it is important to realise that mechanists are not the only ones who regard 'prediction' as a central aim of science; in 'formism,' too, the concept plays a certain role, but the ability to predict – i.e., to formulate theories and hypotheses entailing (logically or otherwise)

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[155] The very idea that there are 'triggering' and 'non-triggering' facts is proper to 'mechanism' and, in 'consolidated' variants of the theory, typically leads to the identification of 'first movers' and causal 'singularities.'

[156] For more recent theories of causation which, to varying degrees, reflect conceptions of 'veracity' and 'truth' in practiced science, see e.g., Bigelow and Pargetter (1990), Heathcote (1989), Krajewski (1997), and Chakravartty (2005).

[157] The 'Gettier problem' was initially introduced to reveal an important weakness of traditional definitions of knowledge as 'justified true belief.' The problem illustrates that 'justification' and 'truth' are not sufficient to render a belief an item of knowledge; since a belief might be justified and true at the same time but only accidentally so, we need to ask how the belief was formed and whether it explains what it concerns (cf. Gettier 1963). This has provoked the issue of epistemic 'relevancy:' a belief can only be true if and only if the assertive claims it contains are relevant for the explanation of the contents of the belief. Causal theories of truth are consequently theories of knowledge which identify causality as the key 'relevance-maker,' some even hold it is the only reliable one that is available.

[158] In 'mechanistic' theories of cognitive criticism, a key concern is therefore to ensure that knowledge claims are *warranted*; and this, according to many 'mechanists,' can only be assured when some basic causal principles are invoked to show that the existence of the phenomena under consideration inevitably follows from them (cf. Pepper 1943: 363).

[159] 'Casual necessity' has variously been defined by 'mechanists.' Brian Skyrms (1980), for example, tries to capture the concept with his notion of 'invariance,' which he asserts to be a basic feature of a causally structured world.

[160] Although not specifically termed 'causal,' this general principle of determinative adjustment is consistent with Karl Popper's (1968) notion of 'conditional scientific predictions,' which he identified as characteristic for the natural sciences and their success.

[161] The concept of a 'causal chain' hence implies the 'mechanistic' theory of time, according to which time is to be regarded as an 'objective' and thus viewer-independent feature of the world; time is seen as relatively uniform (even though temporal relativity is of course granted under special conditions), well-ordered, and sequential. The classic view is that causes have to precede their effects although feedback effects are sometimes possible (these feedback effects are generally difficult to explain for 'mechanists').

[162] This is simply to say that mechanism of determination must have the capacity *to make a difference* in reality – this is what Jon Williamson (2011: 422) identifies as the classic 'difference-making theories' of causality.

[163] This is the perennial trouble of the 'empiricist' tradition in philosophy of science. Although 'logical empiricists' were generally sceptical about the idea that there is a hidden structure underneath the experiential surface of reality and tried to escape from its grip by an 'operationalist' manoeuvre – they argued that terms such as 'gene' or 'atom' merely help us to pick up complex patterns in reality – they could never uphold their agenda consistently, partly because of their insistence on 'prediction' and partly because of their sharp distinction between 'theory' and 'observation' in science (e.g., Hempel 1958, 1965; Oppenheim and Hempel 1948; cf. Godfrey-Smith 2003: 36f.).

certain observable regularities they were not originally concerned with – is tied there to quasi eternal principles of association – the faculty to 'predict' stems from the 'formistic' discovery of 'laws of association' (see 2.6.1). The world is considered of such an order that certain features turn out to be correlated and it is through the extrapolation of these patterned co-occurrences that 'formists' predict new patterns in *similar* or *analogous* constellations. Predictability, in this view, simply follows from the empirical determination of dependencies between observable phenonema.[164] Therefore, 'formistic' prediction is often about *structural* features of the world.[165] In mechanism, conversely, prediction makes use of the 'causal laws' outlined above. A key difference to 'formistic' prediction is that assertive novelty, an often-claimed necessary feature of valuable predictions, cannot be taken lightly by mechanists. Mechanistic prediction targets specific relationships that cannot be overly generalised, and that are certainly not 'eternal' in some relevant sense (cf. Pepper 1942: 220).[166] This notion of prediction is not grounded in empirical regularities *per se*, but rather exploits the circumstance that observable configurations of reality are affected by well-defined *mechanism(s)* in knowable ways. These 'effects' must not have been observed before, as long as one has understood the general principles of determination embodied by the mechanism(s) in question and the behaviour of the parts that make up the configuration. The mechanistic inevitability of outcomes is not an inevitability of forms but an inevitability of direct or indirect action between parts.

We should recall here that mechanism rests on a dualistic structure of categories and that this polarity motivates much of the work the theory does. The prime objective is to provide an account that links the 'effective' with the 'ineffective' categories, 'unobservables' with 'observables,' 'theory' with 'observation,' and so forth.[167] Cognitive criticism in mechanism is therefore often mediated by cognitive instruments whose 'validity' and 'efficacy' are thought to be independent of experience or perception – for the latter are seen with general scepticism and are accused of being delusional.[168] Mechansim thus typically works in consort with 'deductive logic' or mathematical proof (i.e., systems of axiomisation) to model the specificity of determination. 'Deductivism' is a preferred tool because it preserves truth by necessity; this means that the conclusions of deductive inference can be guaranteed if only the premises are valid. In mechanism, knowledge about the world is therefore typically secured by successfully deducing the exact constellation of observable facts from one's initial premises. The offered explanations are 'basic' in this sense – they target processes of determination concerning the 'primary categories' of reality. To establish truth in mechanism requires the specification of constitutive grounds for something to 'happen in the world' (cf. Salmon 1984; Woodward 2003).

It seems only consequential that mechanists favour strict hypotheses testing as a corroborative method; a hallmark of their mode of hypothetical reasoning is that the test conditions and empirical correlates are defined as granular and as exact as possible (the definition, in other words, reflects an attempt to develop 'precision' and typically includes the discrimination of relevant and irrelevant fea-

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[164] This notion of 'prediction' was for example accepted by Hume and many, if not most, 'logical empiricists' (cf. Barrett and Stanford 2006: 587).

[165] A well-known example of a defence of this view is Carnap's *The Logical Structure of the World* (1967).

[166] Pepper (1942: 220) clearly sees that over-stretched 'repetition' of cosmic geometric threatens to bring down 'mechanism' and to turn it into 'formism.' Ever repeating configurations and correlations would simply call for an explanatory category of 'subsistence.' Radical repetition must therefore by avoided in 'mechanism' and this typically happens by acknowledging some sense of 'boundedness' separating varying 'fields of causality' (which, by the way, sometimes pushes 'mechanism' close the 'contextualism'). In the context of 'mechanistic' Gestalt theory, Pepper explicitly (*idem*) notes: "[…] [t]he formistic threat to mechanism of a catalogue of elementary mental atoms which are identically repeated in multitudes of complex mental states is obvious enough. What are these atoms but the very immanent forms which formism is built up from? […] The difficulty can be avoided only be conceiving of the great machine as a highly structured field that never literally repeats itself in any details and that here, there, and elsewhere exhibits emergent qualities which are also never repeated in detail."

[167] The distinction between 'observational' and 'theoretical' language in 'logical positivism' provides a telling example here (cf. Godfrey-Smith 2003: 28); the distinction can be interpreted as an extension of the categorical difference between 'primary' and 'secondary' qualities in 'mechanism.' 'Red' for instance belongs to the 'observational' part of language and describes a 'secondary' quality of the world, whereas 'electron' belongs to the 'theoretical part of language and describes a 'primary' quality of the world. In order to advance science, one ought to analyse this distinction and make use of it. This is another example that shows that the 'empiricist' tradition in philosophy could often not resist the 'mechanistic' attraction.

[168] Here lies the specificity of 'mechanism' and its mode of cognitive criticism; its theory of truth is inconsistent with unchained empiricism. Empirical facts, according to 'mechanists,' cannot be taken at face value and their cognitive status is always double-edged; this is why one cannot simply compare facts with knowledge claims and thereby establish scientific truth. Yet, 'mechanists' do not deny that empirical evidence is the only reliable road to knowledge. Cognitive criticism in 'mechanism' therefore mirrors the theory's conceptual duality and seeks to satisfy two epistemic needs at once: first, to acknowledge what can empirically be observed; and secondly, to recognise that observation needs to be calibrated by non-empirical means. The specification of causal structures and their empirical consequences is a non-empirical task, while the assessment of these consequences through observation is obviously empirical.

tures in the world). Many mechanists, moreover, gravitate towards *hypothetico-deductive strategies* of cognitive criticism (cf. Hempel 1966)[169] and try to feed them with invariant causal principles and potent considerations from general theory. Alternatively, mechanists attempt to pre-cast the systemic structure of whatever they wish to examine in causal terms (cf. Pepper 1942: 228) – a practice that often results in process- or flowcharts and lays bare the hypothesised links of determination between various parts, so that their causal enchainment can be closely investigated and tested.[170] Mechanistic theories of truth hence generally rely on a convincing operationalisation of two key assumptions: first, that test conditions and empirical consequences can be formulated in such a way that one can ensure their discriminatory power; and secondly, that hypotheses can generally be tested in isolation.[171] In order to achieve this, mechanism tends to introduce and develop specific and often quite elaborate 'theories of testability.'[172]

Mechanism's theory of truth typically paves the way for 'nominalism' (Pepper 1942: 226).[173] Many mechanists are nominalists insofar as they deny that there is room for transcendental entities in the world, or at least for entities that exist outside of space-time locations.[174] Mechanism's 'nominalistic turn' is hence an expression of its general scepticism about the types of universals that 'formism' advocates and defends – in particular 'subsistent' universals. For mechanists, the acceptance of such universals brings us far too close to the ideational world of Platonism, where an ever-changing reality of forms is juxtaposed with its 'eternal' counterpart. Mechanism's attraction for nominalism is therefore simply rooted in its determination to overcome the 'existence'-'reality' opposition that prevails in 'formism' and to reinterpret the form-matter relationship through its own categories (cf. *idem*); some mechanists are thereby prepared to accept that forms are nothing less than an actualisation of particular matrices of material forces – a trail of reasoning which greatly motivates 'materialism' or 'physicalism' (cf. e.g., Ney 2009).

Another important ramification of mechanism's conception of truth is that correlation can no longer be regarded as a potential truthmaker – it can at best hint towards scientific truth. In mechanism, correlation hence becomes no more than a means to grasp relationships between the 'effective'

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[169] It should be noted that some aspects of Carl Hempel's (1965) 'covering-law' conception of explanation are consistent with 'formistic' modes of knowledge corroboration, in particular with the idea that participation in laws should be a reliable truth-indicator. From this perspective, Hempel's 'covering-law' conception can be interpreted as formalisation of 'formistic' principles by means of deductive logic.

[170] This tendency easily gives way to 'externalist' strategies of explanation (see *supra*). 'Causal-adjustment' then simply comprises of distinguishing between phenomena and their environment and to demonstrate that the former was an expected consequence of the causal connections between the phenomenon and its environment (cf. Pepper 1942: 228). As Pepper (*ibid.*: 230f.) emphasises, this strategy often leads to a relapse into the similarity criterion of 'formism' and illustrates how difficult it is for 'mechanism' to bridge the 'observable'-'unobservable' gap.

[171] This relates back to the 'specifity of response' principle. A constant threat for knowledge corroboration in 'mechanism' is illusionary or inconclusive testing. 'Mechanism,' in other words, needs to make sure that negative or positive test-results remain unequivocal. This is more difficult than it appears to be. For instance, a rejected hypothesis might simply tell that part of the premises of the original research question that motivated the hypothesis were flawed; an accepted hypothesis, similarly, might simply tell that the discriminatory power the hypothesis was not sufficient. This is known as the problem of 'holistic testing' (cf. Feigl 1943; Quine 1951a) it follows that 'mechanism' has to ensure that the responses it envisions and analyses are specific enough to circumvent this problem.

[172] Such specific 'theories of testability' are not necessary in 'formism' since this theory interprets 'testing' in terms of its root metaphor of 'similarity;' to test a knowledge claim there simply means to analyse its structural similarity between the proposed knowledge claim and the facts in the world it concerns.

[173] The theory of nominalism, in its original scholastic formulation, holds that general terms and abstract concepts are no more than 'word utterances' and can have no independent existence (cf. Feibleman 1962). As we have seen, this is also the reading of the 'empiricist' tradition in American philosophy and has motivated its distinction between 'observational' and 'theoretical' terms (see *supra*). Everything that is real, according to this theory, must be grounded in some concrete 'particular(s).' *Ockham's Razor* can be interpreted as a pragmatic manoeuvre to secure nominalism in truth-finding and is often introduced in the guise of 'parsimony' considerations (cf. Sober 2015: Chapter 5). Having said this, there are at least two varieties of nominalism to be distinguished and 'mechanists' have not always found it necessary to embrace both of them: nominalists may reject either 'abstract objects' or 'universals' (cf. Rodriguez-Pereyra 2016). The first version denies the existence of Platonic 'ideas' or what some researchers identify as 'non-spatiotemporal' or 'causally inert' objects; the second version denies universals insofar as they are defined as existing outside of space and time or as occupying more than one place in the 'field of locations.' The first variety is more important in the types of 'mechanism' that are relevant for Palaeolithic archaeology and is commonly embraced there to counter 'conceptualistic' and/or 'organicistic' interpretations of past realities. Although many 'mechanists' try to be 'scientific realists,' the 'consolidated' variant of the theory would collapse, or at least relapse into 'formism,' if all of its consequences were embraced.

[174] Since the 'field of locations' belongs to the 'primary' categories of 'mechanism' and since especially 'consolidated' variants of the theory tend to recast it as an integrated spatiotemporal field structure, 'mechanism' cannot except the existence of something beyond or outside of this structure. The attempt to integrate everything that exists into a single consolidated spatiotemporal field inevitably introduces reductionism(s).

and 'ineffective' categories, and to investigate their regular co-occurrence;[175] alternatively, it can be used to tackle the problem of 'equifinality' or to track down similar causes acting upon different aspects of reality. Correlation can thus never be an explanation itself, but instead always requires further explanation.[176] This is because contrary to 'formism' correlation in mechanism is opposed to causation, and the relation between the two is always problematic and rarely symmetric (cf. Pepper 1942: 230) – the types of explanatory regularities mechanism is looking for, in other words, may contain but do not exhaust themselves in 'laws of association' (*sensu* Cartwright 2004).

2.6.3 ***Operationality as the truthmaker in contextualism***

The cognitive criterion for truth in contextualism is *workability*.[177] This conception undermines *bona fide* and/or overly 'substantive' definitions of truth and knowledge (cf. Annis 1978).[178] Since truth is interpreted through the contextualistic root metaphor, what scientific truth amounts to turns out to be *context-dependent* itself.[179] Many contextualistis, in fact, consider it likely that there is no such thing in the world as universal truth conditions. What Pepper (1942: 268) dubs the 'operational theory of truth' expresses this general conviction. The notion of 'operationality' gives thereby credit to the contextualistic belief that concepts such as 'truth,' 'veracity,' 'certainty,' and/or 'knowledge' are primarily the result of an *inquiry* and, consequently, cannot be defined independently of this inquiry. A key intuition here – consistent with the structural categories of 'novelty' and 'change' – is the 'mutability' of truth.[180] It is for this reason that contextualism sometimes gives a voice to 'deflationist' tendencies of cognitive criticism; another consequence is that contextualists typically place much more corroborative weight on 'assertability' or 'acceptability' as cognitive criteria than on 'certitude' or 'reliability.' The idea that knowledge can be certain is often rejected as self-contradictory.

Operational theories of truth author relatively modest standards of epistemic excellence and consider knowledge simply to be a product of successful, persuasive, and/or neoteric inquiry. A knowledge claim can be said to be 'admissible' if the inquiry that yielded it did overcome all interrogative obstacles. According to contextualism, the surmounting of interpretive problems clears the path for a consistent description of the context defined by the inquiry.[181] 'Assertable' knowledge is therefore knowledge that originates from the removal of all relevant knowledge barriers such as interpretive inconsistencies and/or blocked 'strands' or 'references' (Pepper 1942: 269; cf. **Box 8**). Since contextualists tend to focus on relations and relationalities in the accounts they provide, inquiry typically demands to find a way of organising the totality of the observed relations so that the resulting whole makes sense, that is, can come into view in its 'wholeness' (qua its 'quality' and 'texture'). The 'harmonisation' of context-internal relations is a cognitive strategy to secure this 'wholeness,' but the 'hierarchisation' and/or 'dichotomisation' of relations is at least equally important.[182] Because contextual-

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[175] This effectively engenders a test for whether these co-occurrences can be predicted or not; if they can be predicted, 'mechanists' have some reasonable ground to belief that some causal principles are involved.

[176] This is obviously the source of much conceptual confusion and 'mechanism' must uphold the categorical distinction between 'correlation' and 'causation' to be consistent and to make adequate use of its proper root metaphor (see **Appendix II**).

[177] 'Workability' as a cognitive criterion is broadly understood here. Pepper (1942: 270-279) distinguishes three ways of interpreting 'successful working,' only one of which is defined by workability *sensu stricto*. We will return to this issue below.

[178] 'Contextualism,' in other words, remains sceptical about theories which attempt to secure the 'inertness' of truth and recast it as a feature of reality; this scepticism is only consequential since the 'contextualistic' theory is sceptical about 'inertness' and 'staticness' in general (cf. e.g., James 1914: 200; see *infra*).

[179] Explicating and analysing the truth-context itself, has thus historically been a major concern for many 'contextualists.' A well-known example is Charles Sanders Pierce's (1901) 'semiotic' theory of truth, according to which knowledge and human thought in general has to be understood within the context of sign relations. A 'sign' is thereby in classic 'contextualistic' terms: not as an 'absolute,' but as a relational and non-essential entity.

[180] The 'mutability' theorem has caused many troubles for 'contextualism' and its status and bearing are therefore controversially debated (cf. e.g., Putnam 1981: 55; Rorty 1998: 2). More recently, the 'mutability' theorem of truth has been modified into a general principle of 'conceptual relativity' that supports the idea of a multiplicity of concurrent 'conceptual schemes' (e.g., Davidson 1973).

[181] Consistency in contextualism is the *quality of being relatively uniform* – if we take writing an essay as an example, consistency is when the overall style and content of the essay turn out to be relatively uniform. Consistency must thereby be distinguished from 'coherence,' which is a category of truth fully developed only in 'organicism.'

[182] This is a locus of crucial difference between 'contextualism' and 'mechanism' for the latter seeks to determine a maximally limited set of causally highly effective features in order to explain, and typically insists on strict directionalities. 'Contextualism' counters this picture of the world by invoking multiple but in isolation only weakly determinative features, which effect all other features of the same context. One may therefore say that determination appears to be *contextually distributed* and can only be pointed at after the contribution of each part to the whole has been established. 'Contextualism' therefore possesses was William

ism seizes 'articulations' of facts and relations and because the latter, as a consequence, are usually regarded to be multi-directionally effective, meaning can also be extracted by eliminating interpretive difficulties through 'dialectic' logic. The context of explanation is therefore typically defined in extremely dynamic terms.[183]

Contextualism also subscribes to a 'processual' view of knowledge formation and corroboration.[184] The reason is of course that inquiry is defined contextually and often turns out to be a collective endeavour that is temporally ongoing – inquiry, in other words, has 'spread' itself.[185] The basic idea is that knowledge arises when knowledge claims manage to withstand prolonged inquiry and criticism. Contextualism thereby recognises that the removal of cognitive obstacles by one scholar in one research context is most likely insufficient to guarantee the strict 'assertability' of the resulting propositions. Individuals might have overlooked critical cognitive barriers and/or downplayed serious inconsistencies; other difficulties might have been truncated by the definition of the study context itself, and so forth. Moreover, some inquiries may not be completely successful in removing all sources of epistemic obstruction, but may nevertheless furnish readings that are 'more workable' than those previously offered. When contextualism talks about inquiry, it hence typically pluralises it and renders it a time-consuming communal enterprise.[186] Individual knowledge claims in contextualism therefore turn out to be generally 'incomplete' and 'provisional' – knowledge, as a consequence, tends to be conceptualised as a steady *approximation* of truth.[187]

Since contextualism's operational theory of truth preserves the former's 'synthetic' commitment, the assessment of the cognitive status of contextualistic knowledge claims is subjected to the principles of *holism*. This means that 'testing' or 'verification' must also be holistic.[188] Since nothing can be said with absolute certainty in contextualism, the discovery of interpretive problems during inquiry always threatens to tear down the entirety of the provided account, including its driving assumptions, classificatory decisions, terminology, and so forth. Cognitive criticism in contextualism is therefore forced to accept an 'all-or-nothing' logic; either all cognitive obstacles can be overcome or the inquiry must begin anew and potentially from scratch – this also implies that researchers have to constantly test out new interpretive angles and to tinker with new ways of framing their research in order to make sure that no difficulties have been omitted and that no alternative account can bring forth a description that works even better (cf. Pepper 1942: 269). Truth in this sense is only when global *intelligibility* and contextual understanding have been reached – that is, when all references have been 'satisfied' (*ibid.*: 268) The latter requires the specification of the place and role of each research item relative to its context and an exposition of how each of these items shapes other items and is shaped by other items.[189] This general conception of knowledge corroboration has been embraced by a number of classic writers, most of which have been working in the 'pragmatist' tradition. It finds its expression for

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James (1914: 54f.) calls the general "attitude of looking away from first things, principles, 'categories,' supposed necessities; and of looking towards last things, fruits, consequences, facts."

[183] This interrogation yields the idea that truth itself must be amendable to the inherent dynamism of scientific questioning.

[184] This preoccupation expresses the anti-'Cartesian' attitude of 'contextualistic' conceptions of cognitive criticism – an attitude that is particularly hostile towards 'mechanistic' approaches to truth.

[185] For many 'pragmatists,' this has laid the ground for an explicitly 'genetic theory of truth' (cf. e.g., James 1914: 65f.). [the designation 'genetic' refers to 'genesis' here and means something along the lines of 'developmental history']

[186] We can say that truth-getting essentially becomes a 'purposive act' (*sensu* Pepper 1966) and 'knowledge' is therefore never merely 'obtained' but always *made*. 'Contextualism' acknowledges the active and inescapable role of the knower in processes of knowledge formation. 'Hermeneutic' theories of cognitive criticism take up this basic recognition – that the knowing subject cannot be eliminated from the context of knowing (e.g., Olesen 2013). *Hermeneutics* is hence nothing less than the systematic attempt to carry through the 'contextualistic' root metaphor and to analyse the 'situatedness' of all human knowledge as well as to make use of it, that is, to turn it into a cognitive virtue. The 'hermeneutic' concept of a historical *horizon* anchoring all human knowing is perhaps the most obvious reflection of this conception (cf. Hörisch 2010: 156f.). The core tenet of this approach to knowledge, accordingly, is the *rejection of subject-object ontologies*. For the French branch of recent 'hermeneutic' thought, see Ricoeur (1965, 2004); for the German branch, see Gadamer (1960), Habermas (1968, 1981), Apel (1979), and Oevermann (2001); for the Anglo-American branch, see Taylor (1971) and Geertz (1973). Foucault's (1969,1972) 'discourse theory' [*Diskurstheorie*] is also 'contextualistic' insofar as it examines how human knowledge production is necessarily embedded in and regulated by specific but historically plastic 'discursive formations.'

[187] 'Contextualism' does not generally differ here from 'formism' although the two of course disagree about the precise reasons and causes for this state of affairs. Generally speaking, the 'approximative' view of truth is anticipated by a world theory's 'dispersive' character and its resulting preoccupation with organising rather than integrating its evidence.

[188] This implies 'meaning holism' as it has for example been embraced by the 'later' Wittgenstein (1958) in his language philosophy (compare e.g., the notion of 'language games'). The meaning of individual words, according to this view, can only be determined by understanding their functionality in a wider sentence and language environment. This is a 'soft' ecology view of language and similar 'soft' ecology accounts are offered by 'contextualists' on almost all fronts of scientific research.

[189] It is this capacity of 'contextualism' to provide a dense and experience-near 'connectivist' account of our perceptual competences that is often seen as its main cognitive achievement (e.g., Henderson 1994: 647).

example in the well-known Pierceian slogan that 'truth is the end of inquiry' or in William James' (1914: 222) proclamation that "truth is satisfactory to believe."[190]

The interpretation of truth through the lens of contextualism's operational theory leads to three distinct strands of knowledge corroboration. Pepper (1942: 270-279) suggests that these original ways of going about the problem of contextualistic knowledge-capturing are (i) 'successful working' *sensu stricto*, (ii) 'hypothetical verification,' and (iii) 'qualitative confirmation.' The first strand directly captures the initial intuition of 'contextualism' and recasts corroboration as a question of immediate epistemic utility (*ibid*.: 271); this utility concerns the factual findings themselves and does not rely on explicit hypothesis formulation (*ibid*.: 272). Obviously, epistemic utility in this sense can only be assessed relationally and often requires retrospective judgement. The second strand is what Pepper refers to as 'direct verification' by means of hypotheses formation. It represents a complexification of the first strand but hypotheses formation remains dependent on interpretation (cf. *ibid*.: 273f.).[191] The third strand, finally, stresses the importance of a 'thickened' account of whatever one wishes to understand, so that verification consists in carrying through both the 'quality' and 'texture' of the target of interpretation (*ibid*.: 275-278).[192] This often translates into a call for interpretive richness and tends further to complicate the stream of inquiry.

Although contextualists are well aware of the fact that they produce 'situated' knowledge and that each interpretive context might be unique itself, they can nonetheless legitimately mobilise their *interpretive experience* – that is, the insights they have gained from earlier inquiries – to make informed speculative leaps to reach out to new contexts of inquiry (cf. Pepper 1942: 278). These leaps, however, may never usher the final word and rather have the status of pre-analytical hypotheses which help to narrow down the range of promising entry points of inquiry; their function is to define the beginning of a new inquiry, not the end of it.[193] Interpretive experience may also serve to intuit promising strategies for effectively organising the totality of evidence and to come up with suitable tactics to avoid the kinds of interpretive trouble previously encountered. This, together with the recognition that truth is always 'processual' and 'historical,' leads many contextualists to regard first-hand and object-specific experience as a necessary precondition for successful and reliable knowledge formation.[194]

2.6.4 ***Coherence as the truthmaker in organicism***

The basic principle of knowledge corroboration in organicism is *systematic coherence* and most organicists are indeed coherence theorists of truth (Pepper 1942: 310; cf. Joachim 1907: 76).[195] Coherence as a cognitive criterion of scientific 'validity' gives voice to two interrelated pillars of organicistic thought: first, as a goal it signals that the world is accessible only in its fragmented, chaotic, and heterogeneous constitution ('disintegration'); secondly, as a method it signals that the proper nature of worldly phenomena can only be grasped if it is shown that this heterogeneity turns out to be productive and can be arranged into coherent sub-sets ('integration'). For organicists, this account of truth is only incon-

[190] In *Pragmatism: a new name for some old ways to think*, James (1914: 58) adds that "[…] ideas (which themselves are but parts of our experience) become true just in so far as they help us to get into satisfactory relation with other parts of our experience, to summarise them and get about among them by conceptual short-cuts instead of following the interminable succession of particular phenomena; any idea that will carry us prosperously from one part of our experience to any other part, linking things satisfactorily, working securely, simplifying, saving labor […]."

[191] This dependency is critical since it distinguishes verification in 'contextualism' from verificationism in 'formism' or 'mechanism' where the construction of an explicit and maximally transparent hypothesis is principally independent from the analysis of evidence (cf. Ayer 1936; Popper 1968). The formulation of testable hypotheses is sometimes regarded as a 'psychological' business there, strictly distinct from empirical examination. Verification in 'contextualism' seeks to overcome this mind-world duality. Hypothesis in 'contextualism' is imbricated into analysis and turns out to be a means to 'blaze' the cognitive trail.

[192] The resulting interpretive accounts tend to be detailed but *qualitative*. It follows that interpretive accounts speaking about different objects in the world are difficult to compare; comparison is therefore rather generalised and mainly confronts the 'quality' of the examined wholes.

[193] This issue of reaching out to new interpretive contexts and to effectively relate different contexts of inquiry provides the ground for one of the major internal difficulties of the theory (see **Appendix II.2** for a detailed exposition). Nonetheless, this is one of the ways in which 'contextualists' may mobilise prior knowledge to make sense of new contexts and to employ corroborative strategies of 'hypothetical verification.'

[194] Unfortunately, this often wages 'ad hominem' arguments and favours tacit appeals to authority.

[195] Classic coherentist accounts of knowledge such as BonJour's *The Coherence Theory of Empirical Knowledge* (1976) and *The Structure of Empirical Knowledge* (1985) stress their anti-foundational attitude as well as their intent to strengthen the authority of empirical facts (e.g., Elgin 2005). [It has to be noted, however, that BonJour subsequently turned to foundationalist viewpoints again.] A central motivation of this position is to circumvent problematic mind-world dichotomisations (cf. Whitehead 1929; Young 2016).

sistent as long as we conceive of reality as a static (and hence atemporal) entity. The key to the understanding of organicism's proper theory of truth is therefore its conception of time and temporality (*ibid.*: 311f.). The simplest and perhaps most effective way of making use of coherence as a criterion of cognitive criticism is to delineate phenomena as they travel through time and to analyse their itineries (e.g., Thompson 2007: Chapter 7).[196] Cognitive 'veracity' can be reached if this analysis yields a coherent account of the observed temporal behaviour(s) (e.g., Bergson 1907; Simondon 1958).[197] When organicists contend that something is 'coherent,' they hence typically mean to say that its temporal behaviour 'makes sense.'[198] Coherence in organicism is consistency plus: it places emphasis on *locality* and *order*.[199] If we want to say that something is 'true,' this something must occupy a difference-making place in extended spatiotemporal reality – it must be 'bounded' and 'effective' – and has to demonstrate organisational cohesion.[200] Knowledge, according to coherence theories, is thus typically to be defined as the *orderly consistency of a local set of truthbearers* (e.g., Bradley 1914; Young 1995, 2001; cf. Pepper 1942: 310).[201]

It cannot be stressed enough that the detection and delineation of 'effective' local sets, that is, sets of facts which turn out to be arrangeable in an orderly consistent manner, is already a large part of the work that an organicist has to do. Not all possible sets of fact can be ordered in such a manner and it is in this way that organicism remains responsive to the 'objectivity' of fact. To show that coherence among a sub-set of facts can be reached therefore amounts to nothing less than a demonstration that the sub-set has explanatory significance.[202] This is precisely how organicism typically carves out and defines its wholes – as 'effective' (but temporally extended) sub-sets of facts. The corroborative procedure that organicism imposes on its advocates is therefore always 'dialectical' in its core: it consists of a constant reconciliatory movement between the selected parts and their reconstructed wholes in order to ascertain the cognitive significance of them both (cf. Pepper 1942: 312).[203] In order to secure scientific truth, organicism sets forth to isolate a meaningful assembly of 'fragments of reality' and to verify its meaningfulness by resolving these fragments into temporally structured wholes without substantial loss – how the fragments can be resolved is thereby a question of their 'nexuses' (*idem*; cf. **Box 9**).

This corroborative strategy of organicism leads to the temporalisation of truth (Pepper 1942: 311, 313). By temporalising truth, organicism provides substantial grounds for the idea that the 'here and now' can only be an imperfect standard of truth since the present is itself only a fragment in time

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[196] This conception is deeply sedimented in French intellectualism and is reflected in the writings of Canguilhem (1977), Badiou (1988) Derrida (1967, 1993), and Simondon (1964, 2014) – the problem of truth is in fact often described there as the historical tension between the 'objective' or 'concrete' and the 'ideal' in the world, which, in turn, has given credence to the notion of a 'history of truth' (*histoire de la vérité*) (cf. Balibar 2002).

[197] This can be seen as a radical re-interpretation of the 'contextualistic' finding that contexts have 'spread.' A key difference, however, is that 'organicism' introduces a weighty asymmetry – an asymmetry that 'contextualism' is not ready to accept. This asymmetry consists in the conception that time legislates over space and is therefore primary to the latter. The temporal 'spread' of a phenomenon, in other words, is typically larger and more decisive than its spatial 'spread' – the former therefore typically conditions the latter. We can say that 'organicism' is mainly concerned with the analysis of the consequences of this configuration.

[198] This marks a break with 'contextualism' insofar as the categories of 'novelty' and 'change' are re-interpreted sequentially (i.e. as 'stages'), but as 'connectors' rather than as 'separators.' While 'contextualism' aims to provide a rich account of a whole's spatiotemporal situatedness, 'organicism' tries to explain how different whole's follow up on each other so that their succession makes sense and reveals their integratedness (which is to say that in reality, we are dealing with merely a single but ever-transforming whole).

[199] Pepper (1942: 310) tries to capture this specific 'organicistic' preoccupation with coherence in the following way: "[i]n other views coherence may be treated as a gauge of truth but not as its essential nature. In fact, in other views than contextualism coherence is ordinarily confused with consistency, which is, as we know, but the formal shadow of coherence. For consistency is mere formal non-contradiction whereas coherence is the positive organic relatedness of material facts."

[200] 'Difference-making' simply refers to the capacity of the local set to enable an understanding of the part of reality it concerns, which otherwise would be inconceivable.

[201] It has to be admitted that there is a tendency, especially in 'analytic' philosophy, to distinguish between 'theories of truth' and 'theories of epistemic justification.' While the former specify what renders a statement true, the latter try to establish when an assertion is justified – the two issues often go apart. As a result, some scholars have adopted different views in the two domains, for example the previously mentioned BonJour (1985) who accepts 'coherentism' in the domain of justification but not when it comes to the theory of truth. The crucial point is that these cases must not concern us here because the very distinction between these domains is motivated by an 'analytic' conviction in Pepper's sense – 'organicists' would not accept such a compartementalisation of issues of corroboration and the 'organicistic' world theory, consequently, is grounded in a *global* variant of 'coherentism.'

[202] One can say in this way that the phenomenon is 'conceivable' and 'conceivability' can indeed be seen as a preliminary truth-indicator in 'organicism' (cf. Joachim 1906: 66) – a whole that is 'conceivable' is sometimes referred to as a 'significant whole' (*ibid.*: 68, 76).

[203] This is the 'thesis-antithesis-synthesis' structure of all 'organicistic' explanations.

(*ibid.*: 308; cf. e.g., Copleston 1994 [1974]: 188).[204] 'Truth' and 'knowledge,' in other words, can only be recovered if extended time scales are taken into account – in the extreme, organicists regard it hence as entirely pointless to talk about truth in an isolated given moment of time and view it instead as a property of the *longue durée*.[205] This involves the idea that 'conflict' and 'contradiction,' although they belong to the categorical architecture of organicism and are therefore presumed to reflect a structural characteristic of all reality, only persist in the moment or when time is 'mangled' and 'mutilated' (cf. esp. Bergson 1922); to ascertain coherency thus simply means to show that 'conflict' and 'contradiction' disappear when we shift our temporal perspective in proper ways.[206] This is the signification of 'integration' in organicism – the theory stresses the possibility and ultimate inevitability of integration but insists on the fact that such integration *takes time*.[207]

Organicistic knowledge corroboration consequently rests on the ability of scholars to elucidate how the 'progressive' categories of a phenomenon irreversibly remove the remaining structural counteractions and make progressively room for the 'ideal' categories to fulfil themselves.[208] Knowledge is only conclusive if the gap between 'progressive' and 'ideal' categories is closed, so that the two cannot be told apart anymore (cf. *ibid.*: 314).[209]

The general character of coherence-based knowledge results from the organicistic root metaphor of the living being as a unity that 'breathes,' 'struggles,' 'develops,' 'learns,' and 'adapts.'[210] This picture culminates in the view that truth and knowledge can never be evaluated based on a single condensed proposition or a limited number thereof,[211] for there is nothing in the world that could be said to render such a proposition 'true.'[212] Instead, the 'credibility' of an interpretive account must be gauged by apprehending it as an organic whole with many vital parts itself.[213] These parts are typically identified as propositions and sub-propositions, arguments, descriptions, and other instrumental features of the analysis (cf. Joachim 1906: 37); organicism seeks to show that these organically stick together and form a perfectly interdependent whole.[214] The truth conditions of assertive propositions are therefore mainly to be found in *other propositions* (cf. e.g., Williams 1980). It follows that a knowledge claim is definable as a coherent bundle of many such propositions[215] – coherence, in other words, comes into view as the character of a structured mesh of propositions exhibiting a sound organisation-

[204] This realisation has led many 'organicists' to propose that the 'present' is merely an illusion, created by the limitation of human temporal existence and perception; in reality, what we call the 'present' is always pregnant with the future and also encompasses the totality of its effective past. Henri Bergson's (1907) interpretation of time as *duration* provides a classic example here.

[205] Needless to say, this conception is terribly at odds with the 'uniformitarian' agenda of mechanism and the 'eternalist-universalist' preoccupation of 'formism.'

[206] From the perspective of 'contextualism' one may say that 'conflict' and 'contradiction' are thereby shown to be part of the 'texture' of a temporal phenomenon rather than being characteristic of its 'quality.' Of course, heterogeneity thereby not simply 'disappears' or 'vanishes' but is rather shown to be ordered in such a way that it enables the 'homogenisation' and 'crystallisation' of the whole.

[207] Typically, this is simply done by showing how the initial conflicting set of propositions is gradually *integrated* into a relatively coherent set.

[208] Strictly speaking, 'coherence' is itself an 'ideal' category and can thus never fully be realised, so that knowledge corroboration attempts to approximate it; this is another reason why it may be wiser to speak about 'consistency plus' here.

[209] It is very likely that that this condition can in principle never be reached because it would force the theory to resolve its own structural footing which, in turn, would lead to the theory's ultimate collapse (see **Appendix II.2** for a detailed exposition of this difficulty). The consequence is that 'organicism' can only author inconclusive knowledge and must accept that it works towards a goal which it can probably never reach. This, of course, is not necessarily a problem and may in fact explain why scientific inquiry will never become dispensable, but it implies that 'organicisitc' knowledge claims can only be judged in light of other competing 'organicisitc' knowledge claims – in terms of their relative capacity to close the gap between the 'progressive' and 'ideal' categories of a phenomenon.

[210] Cf. Bergson (1907) and Canguilhem (1969) as life-theoretical prototypes (cf. e.g., Exteberria 2018 for a useful overview of these and similar 'organicistic' tropes in philosophy).

[211] The term 'proposition' is not used in a technical sense here but simply refers to whatever might be a possible bearer of truth – what these are typically differs between 'organicists;' in fact – as we see below – to identification of relevant truthbearers is part of the work that the theory does.

[212] For the specific view of 'information' which is tied to this approach, see e.g., Barthélémy (2015: 32-37).

[213] The 'organcisitic' whole is therefore a 'living whole' which is highly dynamic and may continuously transform, but in a self-contained manner (cf. Joachim 1907: 80) – this is the contrast to be drawn to a 'contextualistic' whole which is also structured but not necessarily in temporally coherent fashion.

[214] Knowledge claims are hence interpreted as irreducibly complex living systems can only be judged in their systematicity and self-sustainability.

[215] This conception, almost by definition, predisposes 'organicism' to host *highly complex knowledge claims* which themselves are only intelligible in their propositional and argumentative structure. The resulting type of knowledge is often difficult to comprehend for the 'analytic' world theories since they are conditioned to simple and directly testable 'atomistic' statements.

al *logic*.[216] Harold Joachim (1906: 76) has given a now classic voice to this general conception: "[t]ruth in its essential nature is that systematic coherence which is the character of a significant whole." Many coherentists would indeed posit that any given belief is true *if and only if it is part of a coherent system of beliefs* (cf. Blanshard 1939; Cornelius 1972).[217] Organicistic 'beliefs' are thus typically interpretive verdicts about a fact – with Pepper (1942: 308), we can say that "[e]very fragment [of reality] is a *judgement* referring to a fact, the reference being represented by the nexus" (emphasis added).[218]

Just like in 'contextualism,' knowledge corroboration in organicism is generally 'internalistic.' The strategy, to recall, is to show that the internal heterogeneity of the individuated whole – a temporally extended phenomenon – is a heterogeneity among its parts that makes sense if the whole is examined in its 'development,' 'genesis,' 'growth,' evolutionary 'differentiation,' and/or 'integration' (Pepper 1942: 312f.). Since coherence stresses 'locality' – organicists seek to map localised wholes – it also rejects notions of strong 'catholicity' in knowledge corroboration.[219] Knowledge claims have to take stock of domain- and object-specificities – that is, they have to address how 'modes of being' interact with 'modes of becoming' (e.g., Souriau 2009 [1942]; Simondon 1958; cf. Latour 2011).[220] More often than not, organicistic explanations consist precisely in demonstrating how object-specific capacities, potentials, and behaviours lead to specific realisations of more general or even universal developmental trajectories. This reading of the evidence lends support to the idea that *time itself is object-specific*, so that object-specific temporalities can be invoked to understand how different objects behave in time (e.g., Deleuze 1966, 1968; cf. Smith 2013).[221] Inherent organisational complexities of the examined objects can then be viewed as factors that *enable* insight rather than block it. Moreover, the focus on the object-specificity of behaviours, tendencies, capacities, potentialities, and so forth requires organicists to embark on extensive and often intricate argumentative journeys. Quite regularly, therefore, qualitative argumentation and general considerations about structural constraints and possibilities ('nexuses') emerge as the key instruments to secure the 'organic' coherency of assertive statements.[222]

2.7 **Putting world hypotheses into perspective**

This chapter has shown that Pepper's map of cognitive tendencies provides a readily usable and extremely valuable tool to better understand general differences in how scholars harness evidence and

[216] This notion of 'logic' indeed often features central in 'organicistic' accounts; it gives a general voice to the intuition of organically inter-related parts that resonate with the whole. That these relations exhibit a certain 'logic' is another way of saying that they make sense in an 'orderly consistent' manner. The cognitive appeal to 'logic' is hence structural (it has nothing to do with formal or symbolic logic as it is used by the 'analytic' theories) and often synonymous to appealing to 'coherence' (cf. e.g., Balandier 1974).

[217] 'Organicistic' truth is therefore often localised as a property of what Quine and Ullian (1978) have famously termed the 'Web of Beliefs.'

[218] In the eyes of the 'analytic' world theories, such talk is seen as rather 'esoteric' since these theories typically deny the relevance (and sometimes even existence) of object-intrinsic *potentialities* as shapers of reality.

[219] It has to be said, however, that 'organicism' clearly accepts universal *rules* and somewhat generalisable *patterns of development* (the theory is anti-'nominalistic' in this sense). Yet, 'organicism' suggests that the respective 'rule sets' or 'patterns' are realised in *object-specific ways* and can typically only be shown to apply in *retrospect* – they can, in other words, be 'diagnosed' but not strictly predicted; prediction of developmental patterns is in fact only possible in a very general sense, without stipulating specific behaviours or if-then clauses. In contrast to 'mechanism,' 'organicism' is primarily concerned with the 'inertias' of its objects and focuses on how universal principles *drag* specific objects or phenomena, not how they propel them.

[220] The classic reading is that a single 'mode of becoming' tied to a given object-specific evolutionary lineage gives rise to a multiplicity of different 'modes of being.' In fact, 'organicism' would interpret a unique 'contextualistic' situationality as one such 'mode of being,' as a spatiotemporally specific manifestation of a more general 'mode of becoming.' However, the numerical and logical relationship between 'modes of becoming' and 'modes of being' cannot be determined *a priori* and 'organicists' would generally content that these a precisely the kinds of empirical questions we would have to ask in order to advance of knowledge about the world.

[221] This is another reason why truth in 'organicism' cannot be pinned down in time and why the 'mechanistic' conception of a 'field of locations' existing independently of particulars (i.e. material objects) makes no sense in 'organicistic' world theories; 'organicism' instead supports time-'subjectivism' insofar as we can say that each object-specific developmental trajectory inaugurates its own specific 'field of locations.' 'Organicism' is the world theory that is most radical in openly advocating extreme spatiotemporal relativity (something which is ironic given that Einstein's theory of relativity is typically interpreted in 'mechanistic' terms).

[222] The attentive reader will realise that qualitative 'argumentation' rather than argumentative 'data matching' emerges as the *modus demonstrandum* here. We will come back to this issue in Chapter 3, but it can already be said that the difference is extremely important for characterising the tension between 'analytic' and 'synthetic' world hypotheses. A key aspect is that 'arguments' serve a different purpose in 'synthetic' theories because they need to ensure 'consistency' or 'coherence,' which often requires a cognitive appeal to general principles of human *rationality* (this is exactly why these theories often appear to be overly 'rationalistic' to the 'analytic' world theories).

make sense of the world. Pepper convincingly elucidates that Western intellectual history has hitherto produced four larger families of thought which delineate relatively adequate world theories – 'formism,' 'mechanism,' 'contextualism,' and 'organicism.' Each of these world theories is cognitively potent in its own right, but relies on a unique conceptual architecture and a specific theory of cognitive criticism. This means that these theories not only differ in how they generate and interpret evidence but also in how they make sure that their knowledge claims are resilient. The illumination of the intimate interdependence of a world theory's structural categories and its theory of truth is a major revenue of Pepper's metatheoretical perspective on the human systematic cognition.

The strict autonomy of world hypotheses which arises from this configuration makes it clear that the four relatively adequate world theories vary on almost all levels of inquiry and are not reducible to one another. Moreover, each of the theories is only adequate to the effect that no other world theory has shown greater cognitive adequacy yet. The latter implies that all four world theories are defective to a certain extent and face serious internal inconsistencies. 'Formism,' 'mechanism,' 'contextualism,' and 'organicism' are therefore equally successful *and* equally fallible in rendering the world intelligible. It follows that one cannot retreat from the *plurality* of modes of thought to be taken seriously, and there is no ground for discarding any of them.

The scientific enterprise is of course no exception and remains conditioned by the same structural characteristics; science is simply a highly systematised, critical, and refined mode of mobilising world theories – a view that *en passant* helps to counteract the 'sacralisation' of science as an almost supra-human endeavour. From this perspective, the actual diversity of scientific approaches appears to be a symptom of employing different world theories and combining them in various ways. Moreover, the mere notion of 'science' becomes hollow if not defined in relation to a world theory. Concepts of scientificity consequently rise and fall with the relative cognitive adequacy of their world theories. This not only defuses the 'demarcation problem,' but also establishes a more nuanced understanding of cognitive diversity in scientific research; it allows us to appreciate relativity without falling prey to unconstrained relativism.

As the chapter has shown in some detail, although there may be a vast number of irreducible world theories not all of them are necessary trustworthy. Cognitive adequacy is a non-arbitrary feature only of the most promising theories, those which have shown great reliability and the capacity to refine themselves by withstanding cognitive scrutiny throughout Western intellectual history – 'formism,' 'mechanism,' 'contextualism,' and 'organicism.' This non-accidental diversity of different modes of 'world-making' brings into view the 'disunity of science' and puts the notion of *scientific pluralism* on a new metatheoretical footing. Major divergences in scientific theory and practice should consequently become re-interpretable in light of Pepper's world hypotheses theory – such epistemological divisions should be reconstructable by referring to Pepper's conceptual vocabulary.

An important consequence of this view on the nature of science is that 'disciplines,' 'fields,' and other kinds of research consortia are not necessarily homogenous entities. The relationship between Pepper's world theories and the social and epistemological contexts of scientific practice – e.g., what has variously been termed as 'research programmes' (*sensu* Lakatos 1970) or 'research traditions' (*sensu* Laudan 1977) – is far from straightforward.[223] Quite often, in fact, the boundaries between different modes of 'world-making' and the borders of scientific disciplines stand *oblique* to each other. Disciplinary frameworks tend to host a multitude of world hypotheses and this, in turn, can be considered an important motor of lively debate and mutual criticism (cf. e.g., Gillespie 1982; Hayes et al. 1988; Daley 2000; Karimi-Aghdam 2016). Yet, scientific disciplines also tend to seize and occasionally even 'monopolise' particular modes of 'world-making' – this is what is sometimes tagged as the 'received view' in a discipline. These trends typically propel critical sociological and historical dynamics that strongly influence the overall character of different scientific endeavours. Disciplinary and intra-disciplinary diversification can thus probably be much better understood as an expression of world theory negotiation (see e.g., Harrell 1982) – in other words, distinct socio-cognitive sub-units of research – i.e., what

[223] Although I cannot discuss this problem in much detail here, there are some more obvious possibilities to link the two. In the case of Lakatosian 'research programmes,' for example, it is possible to make use of the distinction between a research programme's *hard core* – that is, its basic and most essential ideas – and its *protective belt* – that is, its less fundamental and more 'operative' ideas typically used to apply the 'core' to actual phenomena. In the case of 'research programmes,' we would hence need to isolate the 'hard core' if we wish to lay bare basic aspects of 'world-making' as described by Pepper's world hypotheses.

Ludwik Fleck (1979 [1935]) termed *Denkgemeinschaften* – might ultimately be powered by vastly distinct world hypotheses and different eclectic tendencies.

From this vantage point, it is also much easier to retrace why and how different disciplines can *relate* to one another in constructive and beneficial ways; mapping the dynamics of how world theories inform scientific approaches in the various contexts of science may thus help to elucidate how the 'interdisciplinary landscape' of science is organised and has developed through time.[224] The intimate interplay between axes of epistemic and normative orientation established by the four relatively adequate world theories plays an important role in this. The general epistemic and normative anchoring provided by world theories pre-structures the research landscape and predefines potential partners, 'cognate' fields or disciplines, and/or antagonistic formations of research. For instance, co-evolution and ideational exchange between different disciplines or research traditions is much more likely to occur within a broadly *shared* framework of 'world-making.' Needless to say, the charted structural affinities and trade-offs between the four relatively adequate world hypotheses constitute crucial loci of epistemic convergence and divergence in this regard. It follows that disciplinary interactions and transdisciplinary theoretical developments are likely to be explorable with the toolkit mustered by Pepper's world hypotheses theory; this could potentially result in new 'topological maps' of various research endeavours. It should even be possible to investigate, at least tentatively, whether and how various disciplines have contributed to the cognitive advancement of the four main root metaphors: 'similarity,' 'cause-and-effect,' 'situationality,' and 'being alive.'

All of these insights can be drawn upon to better understand what is at stake when disparate approaches invariably clash in scientific practice. The following chapters try to do precisely this. They represent an attempt to re-organise the diversity of approaches to the lithic evidence that are encountered when French and Anglophone research in Palaeolithic archaeology is taken into account. I will use the concepts and categories developed in the present chapter to throw new light on the nature of plurality exposed by the French-Anglophone divide. Although I will surely make mistakes, the reader is trusted to recognise the larger merits of my undertaking. We will begin with an exposition of the general structure of the French-Anglophone divide in lithic analysis before turning to the bearing of specific world hypotheses.

[224] The term 'interdisciplinary landscape' refers both to mutualistic interdisciplinary cooperation and to unilateral conceptual import dynamics. The 'interdisciplinary landscape' of science thereby defines how likely it is that different disciplines, fields, or sub-fields productive engage with one another and borrow or share their cognitive resources. Concepts such as 'cognate' fields/disciplines become comprehensible only if this 'interdisciplinary landscape' of science is understood. Co-evolutionary interaction between different fields or disciplines can be seen as a product of a particular structural configuration of this 'interdisciplinary landscape.'