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EDITORIAL

Thinking about Non-Universal Laws

Introduction to the Special Issue *Ceteris Paribus Laws Revisited*

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Abstract What are ceteris paribus (cp) laws? Which disciplines appeal to cp laws and which semantics, metaphysical underpinning, and epistemological dimensions do cp law statements have? Firstly, we give a short overview of the recent discussion on cp laws, which addresses these questions. Secondly, we suggest that given the rich and diverse literature on cp laws a broad conception of cp laws should be endorsed which takes into account the different ways in which laws can be non-universal (by being "non-strict", "inexact", "exception-ridden", "idealized" and so forth). Finally, we provide an overview of the special issue on that basis and describe the individual contributions to the special issue according to the issues they address: (a) the range of applications of cp laws as well as the (b) semantics, (c) metaphysics, and (d) epistemology pertaining to cp law statements.

1 Introduction

(1) What is the meaning of ceteris paribus (cp) law statements? (2) To which kinds of facts in the world do cp law statements refer? (3) How do scientists confirm statements that are qualified by cp clauses? Few questions in philosophy of science

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are more controversial. One group of philosophers believes that the debate on cp laws is misguided and does not improve our understanding of the sciences. Rather, the entire issue of cp laws is a homegrown problem of philosophers, or so these critics of cp laws hold (Earman and Roberts 1999; Woodward 2002). On the other hand, the friends of cp laws insist that the notion of a cp law is paramount for, among other issues, a descriptively adequate explication of explanation, prediction, and causation in the (special) sciences.[1] Some friends of cp laws even argue that our understanding of fundamental physics hinges on an adequate account of cp laws (see below). Accordingly, then, any account of laws in the special sciences and in fundamental physics should improve our understanding of the semantics, epistemology, and metaphysics of cp laws.

The clash of the friends and foes of cp laws influentially surfaced in the special issue *Ceteris Paribus Laws* in *Erkenntnis*, edited by Earman, Glymour, and Mitchell [2] (2002a, *Erkenntnis* 57). The special issue was certainly a milestone in the debate on cp laws in the sciences (see Reutlinger et al. 2011 for a detailed survey of the literature on cp laws). However, the special issue also shows that philosophers strongly disagree on how to answer the following questions: (a) Do accounts of cp laws improve our understanding of the sciences (for instance, the understanding of explanation, prediction, and causation)? (b) Do accounts of cp laws successfully solve serious semantic and epistemological problems, in particular Lange's dilemma—which goes back to Lange (1993)—i.e. the problem that cp law statements might be either simply false or trivially true (see below).[3]

The evaluation of these opposing arguments pulled in several directions in the special issue of Earman et al. (2002a) and elsewhere in the literature: some friends of cp laws reported that they stopped worrying about cp laws and learned to love them (Lange 2002). Other friends became unsure if they had ever defended cp laws, at least as characterized by the foes of cp laws (Cartwright 2002). In contrast, the foes of cp laws described the state of the debate as "a royal mess" (Earman et al. 2002b, p. 471).

The current special issue aims to shed new light on the philosophical issues surrounding cp laws. The core motivation of the contributions to this volume is the conjecture that there is a substantive philosophical problem underlying the rich and diverse literature on cp laws: the fact that there are many generalizations in the sciences that are neither universal nor strict and, prima facie, cannot be understood as universal and strict laws.

It is an apparent fact that laws in the sciences often lack universality and strictness and this fact matters, since it is in stark contrast to the received view of laws of nature (cf. Braithwaite 1959; Hempel 1965; Lewis 1973; Earman 1978; Armstrong 1983; see also Footnote 3). That is, in contrast to the received view, many scientific generalizations do not "hold" universally for all times and places, for all initial and background conditions, for all objects, and so forth, as the received

[1] The special sciences are all of the sciences excluding fundamental physics.

[2] Henceforth, we refer to the special issue of Earman, Glymour, and Mitchell by "Earman et al. (2002a)" as opposed to "Earman et al. (2002b)" which abbreviates "Earman, Roberts, and Smith (2002b)".

[3] Lange's dilemma seems to imply that cp laws cannot be confirmed by empirical data.

view would have it. Instead, many central and well-entrenched generalizations in the sciences deviate from the received characteristics by being "non-strict", "inexact", "exception-ridden", "contingent on the circumstances", "sensitive", "non-robust", "idealized", "abstract", "merely statistical", and so forth. We call generalizations with these features "non-universal" (see also Reutlinger 2013: chapter 5).

Interestingly, the foes of cp laws in the more recent debate do not deny the non-universal character of some laws. Rather, the foes deny that our understanding of non-universal laws is significantly improved by invoking the phrase "ceteris paribus" (e.g., Earman and Roberts 1999; Earman et al. 2002b; Woodward 2002). Despite this, both the friends and foes of cp laws seem to agree that there are substantive questions about non-universal laws: what are the semantics, the epistemology, and the metaphysics of such non-universal laws? We contend that focusing on this point of agreement—i.e. the need to understand non-universal laws—will lead to a fruitful turn in the debate.

In Sect. 2, we first describe three central challenges which accounts of nonuniversal laws face. We then argue for a pluralistic conception of cp laws in line with the more general issue of non-universal laws. We, thus, oppose a narrow reading of cp laws as sometimes indicated by the mere use of a cp phrase (cf. Earman and Roberts 1999, Earman et al. 2002b). We return to the notion of cp laws in the final section (Sect. 3) and provide a brief overview of the contributions to this special issue. Importantly, we do so based on a broad pluralistic notion of cp laws which we identify with the problem of non-universal laws as described in Sect. 2.

2 Challenges for Accounts of Non-universal Laws

Accounts of non-universal laws face the following three challenges:

1. *Do non-universal laws really exist? Or, do all seemingly non-universal laws give rise to universal laws, since they can always be reformulated in terms of universal laws?*

Prima facie, one might be able replace cp laws by universal laws by the following completer strategy:[4] take the cp law and formulate a new law that explicitly excludes all exceptions pertaining to the cp law. Then, the new strict generalization describes the same regularity as the cp law does.

However, this so-called (simple) completer strategy is not a viable solution for non-universal laws. The completer strategy is bound to fail if there is an infinite number of heterogeneous exceptions. In this case, the regularity cannot be captured by a finite set of (non-arbitrary) predicates and, thus, cannot be described by a strict law (Reutlinger et al. 2011: §3.2). Earman and Roberts (1999) call cp laws for which some strict completion exists "lazy cp laws". Earman and Roberts argue that

[4] For a sophisticated completer account see, for example, Fodor (1991).

such lazy cp laws are a mere shorthand for strict laws. According to their view, only non-lazy cp laws—cp laws for which strict completions do not exist—are cp laws in a proper and philosophically interesting sense. The resulting challenge for an account of non-universal laws is to (a) accept that completion is not always possible and (b) address the following two questions.

2. *Do non-universal laws have the same characteristics as universal laws do (apart from the non-universality)?*

The received view of laws of nature attributes the following criteria to laws of nature:[5] laws (1) have empirical content, (2) are universal and exceptionless (across all space–time points), (3) are true, and (4) in contrast to merely accidentally true generalizations, laws of nature (i) support counterfactuals, (ii) are inductively confirmed by new evidence, and (iii) have explanatory and predictive power.

Lange's dilemma seems to capture a part of the reservations against the notion non-universal laws (Lange 1993; see Reutlinger et al. 2011: §4, Earman and Roberts 1999). According to this dilemma, non-universal law statements either lack empirical content—if they are hedged by the clause "unless something interferes"—or they are false (if no such clause is added).[6] In other words, any account of non-universal laws has to satisfy the following two conditions (see also Unterhuber 2013, pp. 21–25): Firstly, making sure that the cp clause does not exclude too much—otherwise the cp law results in an analytically true statement devoid of empirical content (see criterion (1) for lawhood above); and, secondly, that the cp clause does not exclude too little by rendering the cp statement factually false (see criterion (3) for lawhood above).

The critics of cp laws have taken this dilemma to preclude the possibility that cp laws can be confirmed by evidence (Earman and Roberts 1999; Woodward 2002). Consequently, Lange's dilemma imposes an adequacy condition on non-universal laws: non-universal laws have to be explicated as being true empirical statements.

In addition, how can non-universal laws satisfy their nomic role? More specifically, is it possible to distinguish non-universal laws from generalizations that are accidentally true? One not yet fully explored way to address the latter question is by reference to seminal accounts of lawhood.[7] The core idea of such an approach is the following: If non-universal laws qualify as laws of nature according to a seminal account of laws of nature, then non-universal laws play a nomic role.

Candidates for such seminal accounts of laws are the following: (a) best system, (b) necessitarian, (c) dispositional, and (d) invariance accounts. These accounts of

[5] For seminal statements of and accessible expositions of the received view see, for example, Braithwaite (1959, p. 301), Hempel (1965, pp. 335–342), Earman (1978, pp. 174–176), Mitchell (2002, p. 330), Hüttemann (2007, pp. 138–142), and Reutlinger (2011, p. 98, 2013, p. 126).

[6] Cartwright (1983, p. 45) presents another major challenge, which differs from Lange's dilemma. According to Cartwright, some law statements are either false statements, or vacuous empirical statements (that is, in contrast to the second horn of Lange's dilemma, the latter are not analytic truths).

[7] The seminal accounts of laws of nature described below have often preceded the cp debate and have not been tailored towards non-universal laws.

lawhood can be characterized as follows: (a) According to Lewis' (1999a, b) best system analysis those statements describe laws of nature which qualify as axioms or theorems of the best of system, where the best system exhibits the best balance between strength and simplicity relative to all basic non-nomic facts of the world.[8] (b) Necessitarians propose that laws of nature are characterized by a necessitation relation between universals (Dretske 1977; Tooley 1977; Armstrong 1983). (c) Dispositionalists hold the view that law statements describe dispositions or capacities (Bird 2007; Hüttemann 1998; Hüttemann 2007; Cartwright 1989). (d) Invariance accounts identify laws as being significantly invariant or stable under counterfactual changes, in contrast to accidentally true generalizations (Lange 2000, 2009, Woodward 2002).[9]

3. *Pluralism about non-universality*

Whereas, for example, Earman and Roberts (1999) seem to address merely a single way to understand cp laws (i.e., they are "non-lazy" laws), the recent debate shows that there is number of ways in which a generalization can be non-universal: due to idealization, by expressing statistical regularities, by drawing on the notion of normality, by being sensitive to initial and background conditions etc. In fact, the contributions to this special issue suggest a range of different ways to explicate non-universality. Also, for capturing different sorts of non-universality, different tools are required. Thus, to do justice to the non-universal character of cp laws, the notion of cp laws has to be broadened in order to encompass the different ways in which cp laws can be non-universal. We take such a broad notion of cp laws to be useful for the philosophical investigation of the diversity of "non-universal" generalizations in the sciences. We believe that this broad conception of cp laws is advantageous in at least the following three ways:

A. Such an approach is pluralistic, as it ensures that differences in the non-universal character exhibited by generalizations in the sciences are not overlooked. Focusing on non-universality minimizes the risk of over-generalizing one kind of analysis of cp laws.
B. This methodological approach places less a priori constraints on which philosophical tools are apt for understanding various kinds of non-universality. For instance, there is no a priori commitment to classical first-order or second-order logic as the formal tool for explicating non-universal generalizations.
C. The focus on non-universality allows for a re-evaluation of arguments against a number of accounts of cp laws as given in Earman et al.'s (2002a) special issue.

[8] Lewis (1999a) introduces the additional notion of fit in order to account for probabilistic laws and chances.

[9] For illuminating analyses of the robustness and stability of macro-laws see Batterman (2002), Strevens (2003), Woodward (2010), and Reutlinger (forthcoming).

3 Overview

Let us now provide an overview of the contributions to this special issue. To this end, we use the term “cp law” in the sense of “non-universal laws” as described in the previous section. The overview of the individual contributions is structured by the following questions:

1. *Range*: Which disciplines appeal to cp laws?
2. *Semantics*: What is the meaning (truth conditions) of cp laws?
3. *Metaphysics*: What is the metaphysical interpretation of cp laws?
4. *Epistemology*: How can cp laws be confirmed by evidence?

1. Range Some authors argue that there are cp laws in all the sciences (e.g., Cartwright 2002, 1983); others, such as Fodor (1991), Lipton (1999) and Schurz (2002), hold the view that cp laws are specific to the special sciences, i.e. all of the sciences excluding fundamental physics. Still others, such as Earman and Roberts (1999) and Earman et al. (2002b), contest that cp laws exist in a proper sense in any science whatsoever.

Despite these differences, there seems to be broad agreement that the special sciences include non-universal generalizations (e.g., Earman, and Roberts 1999), if not cp laws.[10] The main motivation for accounts of cp laws seems to lie in the fact that these accounts should also be plausible for special science laws.[11]

In fact, all authors of the special issue take this motivation as their starting point for cp laws. Pemberton and Cartwright (2014), and Hüttemann (2014) go one step further by arguing that cp laws exist also in fundamental physics.

2. Semantics In the literature, various semantics for cp laws have been proposed (for useful surveys see Earman and Roberts 1999 and Reutlinger et al. 2011). Strevens’s (2012, 2014) distinction between narrowness and softening approaches is useful for distinguishing different accounts of the semantics (and truth conditions) of non-universal laws. According to softening approaches, non-universal law statements are statistical or probabilistic generalizations rather than deterministic ones (e.g., Pemberton and Cartwright 2014; Reutlinger, 2014; Roberts 2014; Schurz 2014; Strevens 2014; also cf. Earman and Roberts 1999; Schurz 2002). Sometimes, it is argued that statistical generalizations naturally allow for exceptions and, thereby, capture the familiar non-universal character of special science laws (Earman and Roberts 1999; Schurz 2002). Reutlinger (2014), Roberts (2014), and Strevens (2014) provide an in-depth discussion of the merits and limits of the softness approach. Reutlinger argues against the statistical account of special science laws (Earman and Roberts 1999), according to which non-universal law statements of the special sciences describe correlations and are not hedged by cp-

[10] Reutlinger (2014) explicitly addresses this interpretation of Earman and Roberts (1999).

[11] See, for example, Braddon-Mitchell (2001), Cartwright (1989), Callender and Cohen (2010), Cohen and Callender (2009), Loewer (2009), Mitchell (2002), Reutlinger (2011), Schrenk (2007, 2008), and Weslake (in press).

clauses (see also Hüttemann and Reutlinger 2013).[12] Roberts (2014) defends the view that cp law statements are vague statistical law statements, which also exhibit a self-locating and self-referential character. Having been one of the most valuable critics of cp laws, Roberts' contribution to this special issue is, somehow, remarkable, as he now argues for a positive account of cp laws, which is intended to meet the challenges raised in Earman and Roberts (1999). Strevens (2014) appeals to the explanatory role of "non-causal antecedents" in the explanation of the non-universal character of higher-level laws. Strevens thereby extends his mechanism-based account of cp laws (as presented in Strevens 2012).

In contrast, narrowness approaches seek to restrict the domain, to which the specific cp law applies. Besides completer accounts also possible worlds semantics and ranking theory fall in this category (e.g., Spohn 2002, 2012, Ch. 13.2). Unterhuber (2014) specifies a narrowness approach of this sort to argue for the notion of cp laws. To this end he uses a possible worlds semantics for generics, that is statements, such as "birds can fly" (e.g., Pelletier and Asher 1997). Unterhuber employs a semantics that renders such statements true, if at the most normal bird worlds—i.e. the most normal worlds at which birds exist (provided that such most normal worlds exist)—all birds can fly (Delgrande 1998, Sect. 4).

Additionally, mechanisms and causal Bayes nets are proposed as a basis of cp laws (e.g., Cartwright 2002; Woodward 2002). Pemberton and Cartwright (2014) and Nickel (2014) employ certain types of mechanisms to determine the meaning of cp laws, whereas Schurz (2014) employs causal Bayes nets. Pemberton and Cartwright (2014) argue that one needs nomological machines to account for laws of nature, a type of causal mechanism (in a broad sense, as advocated by, for instance, Machamer et al. 2000). Nickel (2014) endorses an analysis of cp laws based on mechanisms that support generics. Schurz (2014) reconstructs ceteris paribus and ceteris rectis laws based on a causal graphs framework and contrasts both notions. However, unlike Woodward (2002)—whose approach to cp laws is also based on causal graph theory—Schurz argues for the importance of the notions of ceteris paribus and ceteris rectis laws.

3. Metaphysics Several contributions address the question of how to interpret cp laws metaphysically. In addition, some of the papers in this special issue use the seminal approaches of laws of nature described in Sect. 2 to account for cp laws. Among the latter are Hüttemann (2014), Pemberton and Cartwright (2014), Schrenk (2014), and Unterhuber (2014). Hüttemann (2014) argues that non-universal laws (in physics) are best interpreted as describing the disposition of a physical system to display a particular behavior, if the physical system at issue is isolated. Pemberton and Cartwright (2014) combine the frameworks of Cartwrightian nomological machines (Cartwright 1989, 1999) and causal mechanisms in order to describe the

[12] Relatedly, Unterhuber and Schurz (2013) argue that a Bayesian softness approach, based on a single probability function, cannot model regularities with exceptions. Rather, an adequate probabilistic account has to employ two probability functions, one being subjective–evidential and the other being arguably objective-frequentistic (for related distinctions see, for example, Hawthorne 2005 and Lange 1999). Since in such an account, the objective-frequentistic probability function puts constraints on the subjective-evidential probability function, in a certain sense this account represents a mixture of a softness and a narrowness approach.

facts picked out by cp laws.[13] Schrenk (2014) and Unterhuber (2014) propose accounts of cp laws based on a Lewisian best system account of laws. Schrenk (2014) provides a detailed account of special science laws in a Lewisian best system analysis (cf. also Cohen and Callender 2009).[14] Unterhuber (2014) suggests a regularity-based best system analysis of lawhood. He argues that cp laws might earn a place in the best system of a regularity-based best system analysis and thus merit the status of laws of nature, since they might allow one to specify regularities in a simpler way compared to strict laws. Interestingly, none of the papers in the special issue endorses a necessitation account as described by Armstrong, Dretske or Tooley (see Sect. 2).

Nickel (2014) and Reutlinger (2014) also investigate the metaphysics of cp laws, albeit independently of seminal accounts of lawhood. Nickel (2014) uses generics to explore the impact of cp laws on the issue of natural kinds. Nickel targets in particular the homeostatic property cluster account of kinds (Boyd 1999). Reutlinger (2014) intends to establish a negative metaphysical claim. He argues that non-universal law statements cannot generally be interpreted as statements about correlations. To this end, Reutlinger investigates several alternative metaphysical accounts of correlations (and probabilities).

4. Epistemology Although the authors of this special issue do not put a central focus on elaborating epistemic accounts of cp laws—as, for example, Glymour (2002) and Spohn (2002, 2012) do—several authors address directly the epistemological challenge regarding cp laws, a challenge that was raised, in particular, by Earman and Roberts (1999) and Earman et al. (2002b; see Sect. 2): namely, the question of how non-universal laws can be confirmed empirically.

For example, Hüttemann (2014) and Schurz (2014) directly address the issue of confirmation of cp laws. Hüttemann (2014) argues that law statements about the disposition of a physical system behave in a certain way (in isolation) can be empirically confirmed, if one is able to approximate the manifestation conditions of the disposition in an experiment (i.e., the situation in which a system is isolated). Schurz (2014) presents a novel argument for the claim that cp laws have empirical content, which is based on his distinction of ceteris paribus and ceteris rectis laws.

Finally, some papers in the special issue focus on both the metaphysics and the epistemology of cp laws, inasmuch as they exploit the connection between generics, their cognitive basis, and their relation to the world. The generics-based approach to cp laws is novel and has a promising impact on the metaphysics of cp laws, since generics are a linguistic tool which describes regularities in our world and which thereby tolerates exceptions (e.g., Pelletier and Asher 1997; Nickel 2009; Drewery 2000). On the other hand, generics have a naturalistic epistemological edge, since generics seem to be cognitively more fundamental than representation formats that correspond to strict regularities, as evidence from child development suggests (e.g.,

[13] Earman and Roberts (1999), Lipton (1999), and Drewery (2001), among others, argue against a dispositional analysis of cp laws.

[14] See, for example, Backmann and Reutlinger (forthcoming) for a critique of Lewisian best system accounts of special science laws.

Hollander et al. 2002; Leslie 2008). Nickel (2014) and Unterhuber (2014) pursue such a generic-based approach. By employing generics, Nickel (2014) argues against the homeostatic property cluster view of natural kinds (e.g., Boyd 1999). Finally, Unterhuber (2014) suggests a formal account of cp laws, based on a formal semantics that was explicitly proposed for generics (Pelletier and Asher 1997; Delgrande 1998).

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References

Armstrong, D. M. (1983). *What is a law of nature*? Cambridge: Cambridge University Press.

Backmann, M., & Reutlinger, A. (forthcoming). Better best systems: Too good to be true. *Dialectica*.

Batterman, R. (2002). *The devil in the details: Asymptotic reasoning in explanation, reduction and emergence*. New York: Oxford University Press.

Bird, A. (2007). *Nature's metaphysics: Laws and properties*. Oxford: Oxford University Press.

Boyd, R. N. (1999). Homeostasis, species, and higher taxa. In R. A. Wilson (Ed.), *Species: New interdisciplinary essays* (pp. 141–185). Cambridge, MA: MIT Press.

Braddon-Mitchell, D. (2001). Lossy laws. *Noûs, 35*, 260–277.

Braithwaite, R. B. (1959). *Scientific explanation: A study of the function of theory, probability and law in science*. Cambridge: Cambridge University Press.

Callender, C., & Cohen, J. (2010). Special sciences, conspiracy and the better best system account of lawhood. *Erkenntnis, 73*, 427–447.

Cartwright, N. (1983). *How the laws of physics lie*. Oxford: Oxford University Press.

Cartwright, N. (1989). *Nature's capacities and their measurement*. Cambridge: Cambridge University Press.

Cartwright, N. (1999). *The dappled world*. Oxford: Oxford University Press.

Cartwright, N. (2002). In favor of laws that are not ceteris paribus after all. *Erkenntnis, 57*, 425–439.

Cohen, J., & Callender, C. (2009). A better best system account of lawhood. *Philosophical Studies, 145*, 1–34.

Delgrande, J. P. (1998). On first-order conditional logics. *Artificial Intelligence, 105*, 105–137.

Dretske, F. (1977). Laws of nature. *Philosophy of Science, 44*, 248–268.

Drewery, A. (2000). Laws, regularities and exceptions. *Ratio, 13*, 1–12.

Drewery, A. (2001). Dispositions and *Ceteris Paribus* Laws. *British Journal for the Philosophy of Science, 52*, 723–733.

Earman, J. (1978). The universality of laws. *Philosophy of Science, 45*, 173–181.

Earman, J., Glymour, C., & Mitchell, S. (Eds.) (2002a) [Special Issue on Ceteris Paribus Laws]. *Erkenntnis*, *57*, 277–450.

Earman, J., Roberts, J., & Smith, S. (2002b). Ceteris paribus lost. *Erkenntnis, 52*, 281–301.

Earman, J., & Roberts, J. (1999). Ceteris paribus, there is no problem of provisos. *Synthese, 118*, 439–478.

Fodor, J. A. (1991). You can fool some of the people all of the time, everything else being equal; hedged laws and psychological explanations. *Mind, 100*, 19–34.

Glymour, C. (2002). A semantics and methodology for ceteris paribus hypotheses. *Erkenntnis, 52*, 395–404.
Hawthorne, J. (2005). Degree-of-belief and degree-of-support. Why Bayesians need both notions. *Mind, 114*, 277–320.
Hempel, C. (1965). *Aspects of scientific explanation*. New York: The Free Press.
Hollander, M. A., Gelman, S. A., & Star, J. (2002). Children's interpretation of generic noun phrases. *Developmental Psychology, 38*, 883–894.
Hüttemann, A. (1998). Laws and dispositions. *Philosophy of Science, 65*, 121–135.
Hüttemann, A. (2007). Naturgesetze. In A. Bartels & M. Stöckler (Eds.), *Wissenschaftstheorie* [Philosophy of Science] (pp. 135–153). Paderborn: Mentis.
Hüttemann, A., & Reutlinger, A. (2013). Against the statistical account of special science laws. In V. Karakostas & D. Dieks (Eds.), *EPSA11: Perspectives and foundational problems* (pp. 181–192). Dordrecht: Springer.
Hüttemann, A. (2014). Ceteris Paribus Laws in Physics. *Erkenntnis*, 79 Supplement 10, 1715–1728. doi:10.1007/s10670-014-9637-6.
Lange, M. (1993). Natural laws and the problem of provisos. *Erkenntnis, 38*, 233–248.
Lange, M. (1999). Calibration and the epistemological role of Bayesian conditionalization. *Journal of Philosophy, 96*, 294–324.
Lange, M. (2000). *Natural laws in scientific practice*. Oxford: Oxford University Press.
Lange, M. (2002). Who's afraid of ceteris paribus laws? Or: How I learned to stop worrying and love them. *Erkenntnis, 52*, 407–423.
Lange, M. (2009). *Laws and lawmakers*. Oxford: Oxford University Press.
Leslie, S.-J. (2008). Generics. Cognition and acquisition. *The Philosophical Review, 117*, 1–47.
Lewis, D. (1973). *Counterfactuals*. Oxford: Blackwell.
Lewis, D. (1999a). Humean supervenience debugged. *Papers in metaphysics and epistemology* (pp. 224–247). Cambridge: Cambridge University Press.
Lewis, D. (1999b). New work for a theory of universals. *Papers in metaphysics and epistemology* (pp. 8–55). Cambridge: Cambridge University Press.
Lipton, P. (1999). All else being equal. *Philosophy, 74*, 155–168.
Loewer, B. (2009). Why is there anything except physics? *Synthese, 170*, 217–233.
Machamer, P., Darden, L., & Craver, C. F. (2000). Thinking about mechanisms. *Philosophy of science*, *67*, 1–25.
Mitchell, S. (2002). Ceteris Paribus—an inadequate representation of biological contingency. *Erkenntnis*, *52*, 329–350.
Nickel, B. (2009). Generics and the ways of normality. *Linguistics and Philosophy, 31*, 629–648.
Nickel, B. (2014). The role of kinds in the semantics of ceteris paribus laws. *Erkenntnis*, 79 Supplement 10, 1729–1744. doi:10.1007/s10670-014-9637-6.
Pelletier, F. J., & Asher, N. (1997). Generics and defaults. In J. van Benthem & A. ter Meulen (Eds.), *Handbook of logic and language* (pp. 1125–1177). Amsterdam: Elsevier.
Pemberton, J., & Cartwright, N. (2014). Ceteris paribus laws need machines to generate them. *Erkenntnis*, 79 Supplement 10, 1745–1758. doi:10.1007/s10670-014-9639-4.
Reutlinger, A. (2011). A theory of non-universal laws. *International Studies in the Philosophy of Science, 25*, 97–117.
Reutlinger, A. (2013). *A theory of causation in the biological and social sciences*. New York: Palgrave Macmillan.
Reutlinger, A. (forthcoming) Why is there universal macro-behavior? Renormalization group explanation as non-causal explanation. *Philosophy of Science*.
Reutlinger, A. (2014). Do statistical laws solve the problem of provisos? *Erkenntnis*, 79 Supplement 10, 1759–1773. doi:10.1007/s10670-014-9640-y.
Reutlinger, A., Schurz, G., & Hüttemann, A. (2011). Ceteris paribus laws. In E. N. Zalta (Ed.), *The stanford encyclopedia of philosophy*. Society for Analytic (Spring 2011 Edition). http://plato.stanford.edu/archives/spr2011/entries/ceteris-paribus/.
Roberts, J. T. (2014). CP-law statements as vague, self-referential, self-locating, statistical, and perfectly in order. *Erkenntnis* , 79 Supplement 10, 1775–1786. doi:10.1007/s10670-014-9641-x.
Schrenk, M. (2007). *The metaphysics of ceteris paribus laws*. Frankfurt am Main: Ontos.
Schrenk, M. (2008). A Lewisian theory for special science laws. In D. Bohse, K. Dreimann & S. Walter (Eds.), *Selected papers contributed to the sections of GAP.6, 6th international congress of the Society or Analytic Philosophy* (pp. 121–131). Paderborn: Mentis.

Schrenk, M. (2014). Better best systems and the issue of cp-laws. *Erkenntnis*, 79 Supplement 10, 1787–1799. doi:10.1007/s10670-014-9642-9.

Schurz, G. (2002). Ceteris paribus laws: Classification and deconstruction. *Erkenntnis, 52*, 351–372.

Schurz, G. (2014). Ceteris paribus and ceteris rectis laws. Content and causal role. *Erkenntnis*, 79 Supplement 10, 1801–1817. doi:10.1007/s10670-014-9643-8.

Spohn, W. (2002). Laws, ceteris paribus conditions, and the dynamics of belief. *Erkenntnis, 57*, 373–394.

Spohn, W. (2012). *The laws of belief, ranking theory and its philosophical applications*. Oxford: Oxford University Press.

Strevens, M. (2003). *Bigger than chaos*. Cambridge, MA: Harvard University Press.

Strevens, M. (2012). Ceteris paribus hedges: Causal voodoo that works. *Journal of Philosophy, 109*, 652–675.

Strevens, M. (2014). High-level exceptions explained. *Erkenntnis*, 79 Supplement 10, 1819–1832. doi:10.1007/s10670-014-9644-7.

Tooley, M. (1977). The nature of laws. *Canadian Journal of Philosophy, 7*, 667–698.

Unterhuber, M. (2013). *Possible worlds semantics for indicative and counterfactual conditionals? A formal philosophical inquiry into Chellas–Segerberg Semantics*. Frankfurt am Main: Ontos.

Unterhuber, M. (2014). Do ceteris paribus laws exist? A regularity-based best system analysis. *Erkenntnis*, 79 Supplement 10, 1833–1847. doi:10.1007/s10670-014-9645-6.

Unterhuber, M., & Schurz, G. (2013). The new Tweety puzzle: Arguments against monistic Bayesian approaches in epistemology and cognitive science. *Synthese, 190*, 1407–1435.

Weslake, B. (forthcoming). Statistical mechanical imperialism. In A. Wilson (Ed.), *Asymmetries of chance and time*. Oxford: Oxford University Press.

Woodward, J. (2002). There is no such thing as a ceteris paribus law. *Erkenntnis, 57*, 303–328.

Woodward, J. (2010). Causation in biology: Stability, specificity, and the choice of levels of explanation. *Biology and Philosophy, 25*, 287–318.