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MUST SCIENTIFIC REALISTS RESPOND TO THE CHALLENGE OF THE PMI?

Abstract: *The Pessimistic Meta-Induction (PMI) says that because most past scientific theories turned out to be false, we have no reason to believe in the truthfulness of our current scientific theories. According to current consensus, this anti-realist argument presents a serious challenge to which proponents of the realist conception of science must give a response. In accordance with this requirement, some scientific realists try to demonstrate that PMI is a fallacious argument. Other realists make an attempt to block the pessimistic conclusion. The present paper offers a new perspective on the debate between scientific anti-realists and traditional scientific realists. The main argument consists of two interrelated steps. First, a structural analysis of the dialectical status of PMI is provided demonstrating that the anti-realists' argument is internally unstable. Second, it is argued, on that basis, that an internally unstable argument like the PMI does not require any strategic response from the opponents' side. This suggests that the consensus view is wrong: scientific realists need not respond to the challenge of PMI.*

Keywords: *Larry Laudan; the Pessimistic Meta-Induction; dialectical status; scientific anti-realism; scientific realism*

Musí vědecký realismus reagovat na PMI výzvu?

Abstrakt: *Argument pesimistické metaindukce (PMI) nám říká, že vzhledem k tomu, že se většina minulých vědeckých teorií ukázala jako nepravdivá, nemáme důvod věřit v pravdivost našich současných vědeckých teorií. Podle současného konsenzu představuje tento antirealistický argument vážnou výzvu, na kterou musí zastánci realistického pojetí vědy reagovat. V souladu s tímto požadavkem se někteří vědečtí realisté snaží demonstrovat, že PMI je chybný argument. Jiní realisté se pokoušejí pesimistický závěr zablokovat. Tento článek nabízí nový pohled na debatu mezi vědeckými antirealisty a tradičními vědeckými realisty. Hlavní argument se skládá ze dvou vzájemně souvisejících kroků. Nejprve je poskytnuta strukturální analýza dialektického stavu PMI, která ukazuje, že argument antirealistů je vnitřně nestabilní. Zadruhé se na tomto základě tvrdí, že vnitřně nestabilní argument, jako je PMI, nevyžaduje žádnou strategickou reakci ze strany odpůrců. To naznačuje, že konsensus je nesprávný: vědečtí realisté nemusí reagovat na výzvu PMI.*

Klíčová slova: *Larry Laudan; pesimistická metaindukce; dialektický stav; vědecký antirealismus; vědecký realismus*

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1. Introduction

Looking back at the seventies of the last century, we find several authors making an attempt to revive the classical debate on the accuracy of the scientific account of the world. Two rival general views gained much popularity in the philosophy of science at that time: scientific realism and its contrary, scientific anti-realism.

Strongly committed scientific realists such as Boyd[1] tried to justify the rationality of science as a complete-truth-seeking intellectual activity. Popper,[2] Hilpinen,[3] and others, who had reservations about the traditional doctrine of complete truth, opted for a more moderate realist position. Science can be taken to be rational and progressive, they said, even if we deny that it can establish complete or absolute truths. It does not matter that scientific theories are never completely or absolutely true, since it can still be argued that current theories are closer approximations to the truth than their predecessors.

In his monograph *Progress and Its Problems*,[4] Laudan offered several arguments against the realist conception of science.[5] Laudan's main objection against realists was that all attempts of using the concept of truth for linking rationality, progress, and science together are illegitimate, or at best utopian. The reason for this is that in an empirical enterprise like scientific research we are not in a position to know for sure whether our fundamental theories are true or are getting closer to the truth. We do not have independent, science-external criteria for definitely establishing that our theories are completely true. Neither do we have exact critera for determining what is meant when we say that one theory is closer to the truth than another. In order to give a historical weight to these critical points, Laudan construed an inductive argument which illustrated quite clearly the general

[1] Richard Boyd, "A Causal Theory of Evidence," *Nous* 7, no. 1 (1973): 1–12.
[2] Karl Popper, "The Rationality of Scientific Revolutions," in *Problems of Scientifc Revolutions*, ed. Rom Harré (Oxford: Oxford University Press, 1975), 72–101.
[3] Risto Hilpinen, "Approximate Truth and Truthlikeness," in *Formal Methods in the Methodology of the Empirical Sciences*, eds. Marian Przelecki, Klemens Szaniawski, and Ryszard Wojcicki (Dordrecht: Reidel, 1976), 19–42.
[4] Larry Laudan, *Progress and Its Problems* (Berkeley: University of California Press, 1977).
[5] According to an anonymous reviewer, Putnam's No-Miracle Argument (NMA) would have to be mentioned in my paper, because the tension between PMI and NMA marks the fundamental tension in the current debate on scientific realism. Even if this is right, I decided not to analyse this aspect of the debate here. The main reason is that my starting point is Laudan, *Progress and Its Problems*, and this early work did not make any reference to Putnam. See also footnote 8.

consequences of our epistemic limitedness in the empirical domain. This argument is known today as the Pessimistic Meta-Induction (PMI) on the history of science:[6]

> PMI: Most fundamental theories in science in the past turned out to be false; therefore, there is presumably every reason to anticipate that current fundamental theories in science will turn out to be false, too.[7]

Laudan understood PMI from his own anti-realist perspective as a double-sided or Janus-faced argument. One side of PMI was that it served to unveil the utopian character of epistemological dogmas adopted by scientific realists. The realist conception of science (i.e., the target of PMI) was more than a bold empirical hypothesis about the reliability of scientific methodology. Realists were convinced not only that robust experimental success indicates that empirical hypotheses are (at least approximately) true but also that experimentation offers the best evidence for the theoretical claims of fundamental theories. PMI made it clear that this kind of epistemological optimism concerning fundamental theories is unfounded in the historical dimension of scientific research. If fundamental theories count as (approximately) true within a given period of time but they are evaluated as false at a later period of time, then (approximate) truth plays little or no explanatory role in the analysis of the relation between science and the world. Realists cannot flight to a time-relativized concept of (approximate) truth since such a concept would be incompatible with a further component of their overall view, namely the hypothesis that science is a step-wise progression from

[6] Today there are several alternative versions of PMI in the relevant literature. For instance, Alai introduces an additional step into the argument (i.e., there is no radical difference between past and current theories, see Mario Alai, "Resisting the Historical Objections to Realism: Is Doppelt's a Viable Solution?," *Synthese* 194 (2017): 3267–90). Ruhmkorrf follows Laudan's original argument but supplements its inductive structure with a final conclusion making PMI thereby a deductive argument (i.e., *a reductio*, see Samuel Ruhmkorff, "Global and Local Pessimistic Metainductions," *International Studies in the Philosophy of Science* 27, no. 4 (2013): 409–28). However, all the extant versions presuppose the availability of a simpler form of the inductive argument (i.e., PMI), which has the following features: (i) it has a general scope, (ii) it is structured in a past-to-present direction, and (iii) it does not lead to a radical skeptical conclusion. Note that this is not intended to suggest that all of (i)–(iii) holds also for a deductive interpretation of PMI. Within such an interpretation, PMI obviously lacks feature (ii). The suggested point is that all interpretations, be they inductive or deductive, presuppose a simple argument with features (i)–(iii) as a background or starting point. In this sense, Laudan's PMI seems to be the most condensed and perhaps at the same time best manifestation of the anti-realists' objection to scientific realism.

[7] Laudan, *Progress and Its Problems*, 126.

ignorance to complete truth, where "truth" is emphatically understood as an atemporal concept.

The other side of PMI concerned exactly this latter problem. How could an opponent of the realist conception of science give an account for the strong impression of scientific progress? How could one make sense of apparently progressive transitions between fundamental theories like the transition from Ptolemaic astronomy to Copernican astronomy or the transition from Newtonian mechanics to Relativistic mechanics, if not in terms of approximating complete truth? Laudan answered these questions by saying that the progressiveness of a fundamental theory should be explained not in terms of its truth or falsity but rather in terms of its problem-solving effectiveness. This instrumentalist proposal offered a significant advantage over the realists' truth-centered approach to progress. While realists were strikingly unable to determine the exact criteria for (approximate) truth, an anti-realist can in principle determine whether a given theory does or does not solve a particular problem. It can also be determined in an instrumentalist manner whether our current theories are able to solve more problems than their predecessors. In this way, anti-realists may equate scientific progress with an increase in problem solving effectiveness. This conclusion is in full sync with the PMI. Even if anti-realists should agree with the pessimistic epistemic conclusion drawn from the historical record, they might still hold that fundamental scientific theories are progressive. More importantly, the instrumentalist account of progress did not render science an epistemically worthless enterprise. There is nothing in it that excludes categorically the *possibility* that scientific theories may move closer and closer to truth. In accordance with this, the PMI merely intended to show us that we are not in a position to posit a necessary correlation between progress and truth.[8]

[8] A few years later, Laudan expressed once more his dissatisfaction with the realist's conception of science (see Larry Laudan, "A Confutation of Convergent Realism," *Philosophy of Science* 48, no. 1 (1981): 19–49). Unfortunately, there is no consensus how to interpret the main argument of this paper. Ladyman thinks that it is a piece of inductive reasoning like PMI (see James Ladyman, review of *A Novel Defense of Scientific Realism*, by Jarrett Leplin, *The British Journal for the Philosophy of Science* 50, no. 1 (1999): 181–88). Lyons believes that it is a valid *modus tollens* argument (see Timothy D. Lyons, "Scientific Realism and the Pessimistic Meta-Modus Tollens," in *Recent Themes in the Philosophy of Science: Scientific Realism and Commonsense*, eds. Steve Clarke and Timothy Lyons (Dordrecht: Springer, 2002), 63–90). Mizrahi understands it as pointing to historical counterexamples (see Moti Mizrahi, "The Pessimistic Induction: A Bad Argument Gone Too Far," *Synthese* 190 (2013): 3209–26). Whatever the right interpretation may be, it is important to emphasize that Laudan's main

Laudan's PMI has its own history. One remarkable fact of the development of this history is that it blurred the distinction between the above-mentioned two sides of the argument. Around the 1990s, when philosophers of science began to focus on the dialectical role of PMI, the relative independence of the pessimistic meta-argument from the possibility of progress received gradually less attention. Clearly, a shift in emphasis has taken place. From the early 2000s on, PMI has been dominantly regarded as one of the weapons anti-realists may make use of in their battle against realists. For instance, Michael Devitt claimed boldly that "PMI is offered as an argument against Scientific Realism."[9] More recently, Florian Müller has expressed a similar opinion by stating that "[o]ne of the most powerful and most influential objections against […] scientific realism is the pessimistic (meta-)induction (PMI)."[10] Other philosophers of science, like Paul Dicken and Greg Frost-Arnold, characterized the dialectical role of PMI in the same way.[11] Moreover, the current consensus is not only that Laudan's PMI has to be seen as an objection against scientific realism, but also that it presents a significant challenge to which proponents of the realist conception of science *must* offer a counter-response. The dialectical dynamics of the challenge can be described with the following four principal claims:

C1. A recent realist meta-hypothesis is that our fundamental scientific theories are at least approximately true.
C2. If PMI is not fallacious, then it is a serious counter-argument to the realists' meta- hypothesis.
C3. Therefore, realists should demonstrate that PMI is a fallacious argument.
C4. If realists cannot demonstrate that PMI is a fallacious argument, then they should block its conclusion.

conclusion did not change over the years. He is careful to stress that he did not want to claim that a realist epistemology of science is *in principle* impossible.

[9] Michael Devitt, "The Pessimistic Meta-Induction. A Response to Jacob Busch," *SATS* 7, no. 2 (2006): 130, emphasis omitted.

[10] Florian Müller, "The Pessimistic Meta-Induction: Obsolete Through Scientific Progress?," *International Studies in the Philosophy of Science* 29, no. 4 (2015): 394.

[11] See Paul Dicken, *A Critical Introduction to Scientific Realism* (London: Bloomsbury, 2016) and Greg Frost-Arnold, "How to Be a Historically Motivated Anti-Realist: The Problem of Misleading Evidence," *Philosophy of Science* 86, no. 5 (2019): 906–17.

In this paper I shall argue that the dialectical strategy lying behind the claims from C2 to C4 should be rejected because it rests on the false assumption that the contrast between fallacious and "serious" arguments is exhaustive.[12] As we will see below, the fallacious/"serious" contrast is not exhaustive, as there is a plausible third possibility for classifying the dialectical status of PMI. According to this classification, PMI is an *internally unstable* argument. Internally unstable arguments are, roughly, arguments which do not have the capacity to advance the dialectical process of argumentation. They cannot fulfil their proper function (i.e., contributing to the progression of a debate) because of specific elements present in their internal structure. They resemble typical fallacious arguments in the sense that their premise/conclusion set contains also a certain kind of logical or conceptual tension. Internally unstable arguments differ, however, from fallacious arguments in an important respect. Fallacious arguments have to go through a structural analysis, and before being rejected they must be confronted with effective counter-arguments. Internally unstable arguments require a structural analysis too, otherwise they could not be recognized as having the status they have, but there is no need to devise any *strategic response* to them. They can simply be disregarded or bracketed without further argumentative steps. This holds also for Laudan's PMI. If a structural analysis showed that PMI is an internally unstable argument, then realists would need not respond to it with additional defensive philosophical arguments. In fact, it is really possible to run such an analysis, so the "no need for strategic response" conclusion follows.

This conclusion constitutes a rather radical departure from the current consensus. In order to make it discussable, some key aspects of the theoretical background context must be brought to the fore. First of all, it should be demonstrated with data that the above series of claims, C1–C4, is not a speculative hypothesis but a correct description of the dialectical movements between the realist and the anti-realist camps. The next section will be devoted to this task.

[12] In order to avoid misunderstanding, I wish to emphasize that C1–C4 does not represent a logical argument, since it is a mixture of descriptive and prescriptive claims. The sole aim of C1–C4 is to represent the general structure of the current dialectics around PMI.

2. Realist Reactions to PMI

The central ambition of scientific realism did not change much in the last four decades. Realist philosophers of science, radical and moderate alike, have made continuous efforts to establish that our most sophisticated scientific theories are capable of representing adequately even the unobservable entities of reality. Scientific realists are, therefore, united by the epistemic optimism that our current fundamental theories in physics, geology or cosmology are at least approximately true. C1 is to be read as a descriptive claim which expresses this widely shared meta-hypothesis. So it would come as a surprise if someone raised an objection against it.

Laudan's observation about the history of science made it clear that the plausibility of this meta-hypothesis is questionable. If fundamental theories, like Newtonian mechanics, can be taken to be true at one time and false at a later time, then it seems we have good historical evidence to suppose that our current fundamental theories are generally unreliable. Many think that Laudan's pessimistic argument has an intuitive appeal that is hard to resist.[13] Juha Saatsi remarks, for instance, that PMI is "a powerful force to be reckoned with."[14] Seungbae Park is obviously of the same opinion. He holds that PMI is "the most forceful argument" against realism.[15] To mention just one more example, Mario Alai contends that Laudan's induction from the historical record "must be taken seriously" by everyone who is concerned with ensuring that our current scientific picture of reality is (more or less) accurate.[16] The claim expressed by C2 tries to summarize this popular opinion.

At the same time, and understandably, C2 implies an obligation for scientific realists to defend their position against the threatening epistemic pessimism of PMI.

[13] An anonymous reviewer said that Laudan's PMI is not an inductive argument but inductive skepticism. In a strict sense, this is a valid complaint: Laudan did not deny that inductive generalisations are useful means for research, but he was critical concerning the usefulness of inductive arguments like IBE. Often, however, "PMI" is used in a loose sense to characterise Laudan's overall position in his paper from 1981 (see Laudan, "Confutation of Convergent Realism"), and in *this* sense one can say that PMI is an inductive argument. A recent example for this usage is Jorge Manero, "Structural Losses, Structural Realism and the Stability of Lie Algebras," *Studies in History and Philosophy of Science* 91 (2022): 28–40. See also footnote 17.
[14] T. Juha Saatsi, "On the Pessimistic Induction and Two Fallacies," *Philosophy of Science* 72, no. 5 (2005): 1098.
[15] Seungbae Park, *Embracing Scientific Realism* (Cham: Springer, 2022), 23.
[16] Mario Alai, "Resisting the Historical Objections to Realism: Is Doppelt's a Viable Solution?," *Synthese* 194 (2017): 3286.

One type of defense strategies realists deploy is to point out that PMI is a fallacious argument. It was clear from the start what kind of "fallacy" is not sought for in developing this strategy. The pessimistic conclusion (i.e., current fundamental theories will probably turn out to be false) is derived from its premise (i.e., most past fundamental theories turned out to be false) by an inductive step. Inductive inferences are, however, unable to necessarily transmit the truth of their premises to their conclusions. Instances of this type of inference are logically invalid. So, it could be contended that PMI is fallacious because of its invalid inferential structure. Unfortunately, this charge would backfire on realists. Inductive inferences are an ineliminable part of first-order empirical methods in scientific research.[17] If inductive reasoning were condemned as illegitimate, realists would have to give up their deep trust in the epistemic reliability of experimental practice. Thus, it was clear from the start of the debate that realists cannot defend their position by pointing to the non-conclusiveness of PMI.

But there is another way to try to show that PMI is a fallacious argument. Realists may argue, as Park,[18] Fahrbach,[19] Mizrahi,[20] Doppelt[21] and others do, that Laudan's argument is fallacious because it illegitimately presupposes that past and current scientific theories are continuous in important respects. This cannot be generally correct. Past and current theories often show significant differences in some of their key methodological parameters. In many cases, current high-level experimental mechanisms were simply technically unavailable to older theories. For instance, Ptolemy's naked eye observations in the first century are so different in data structure that they cannot be directly compared with charge-coupled devices (CCDs) used in current optical astronomy. In other cases, ontological frameworks change so radically that continuity with previous research becomes doubtful. One recent example is the *it-from-qubit* effort in fundamental physics (i.e., an

[17] This holds also for the meta-level methods of the philosophy of science. For instance, the most forceful meta-level argument for scientific realism, the *No-Miracles Argument* (see Hilary Putnam, *Meaning and the Moral Sciences* (London: Routledge, 1978)), has also an inductive character. For a defense of the reliability of meta-level inductions, see Stathis Psillos, *Knowing the Structure of Nature* (New York: Palgrave, 2009), 48–68.

[18] Seungbae Park, "A Confutation of the Pessimistic Induction," *Journal for General Philosophy of Science* 42 (2011): 75–84.

[19] Ludwig Fahrbach, "How the Growth of Science Ends Theory Change," *Synthese* 180 (2011): 139–55.

[20] Mizrahi, "Pessimistic Induction."

[21] Gerald Doppelt, "Best Theory Scientific Realism," *European Journal for Philosophy of Science* 4 (2014): 271–91.

attempt to prove that all particles arise out of quantum bits of information). The ontological assumptions of older particle theories like Gassendi's and Newton's corpuscularianism are entirely absent in this new direction of research. In light of these continuity-breaking historical events and other similar effects, Laudan's past-to-present inference can be regarded as fallacious. Claim C3 encapsulates this point.

Another family of defenses holds that PMI is a non-fallacious form of argument but claims that realists have the resources to block its conclusion. This is now known, after Psillos,[22] as the *divide et impera* strategy. The central thought is that the best way to defend realism against Laudan's pessimistic conclusion is to make a principled distinction between elements which are abandoned as false, and which are retained as true in our constantly changing scientific image of the world. According to Kitcher,[23] the distinction is to be drawn between presuppositional posits and working posits. Worrall[24] distinguishes between the content of theoretical statements and the structure of the theory. The common aim of these proposals is to separate theoretical elements (working posits and theory structure, respectively) that can resist the continuity-destroying effects of theory-change.[25] Psillos's preferred candidates for playing this role are the elements that essentially contribute to predictive and explanatory success. The emphasis lies on the long-term stability of these essential contributions. In Psillos words,

[22] Stathis Psillos, "Scientific Realism and the 'Pessimistic Induction,'" *Philosophy of Science* 63, no. S3 (1996): S306–S314.

[23] Paul Kitcher, *The Advancement of Science* (Oxford: Oxford University Press, 1993).

[24] John Worrall, "Structural Realism: The Only Defensible Realist Game in Town?," in *New Approaches to Scientific Realism*, ed. Wenceslao J. Gonzalez (Berlin: De Gruyter, 2020), 169–205.

[25] Note that there are further members within this family of defense. Here, I limit myself to mention only two of them. (1) Timothy D. Lyons makes a non-epistemic attempt to block the conclusion of PMI. Lyons's view is that fundamental scientific theories seek not truth *per se*, but experientially concretized truth. This latter kind of truth is testable and testable truth is a suitable means for preserving continuity in a scientific enterprise. For more on this, see Lyons, "Scientific Realism and the Pessimistic Meta-Modus Tollens," 63–90 and Timothy D. Lyons, "Four Challenges to Epistemic Scientific Realism – And the Socratic Alternative," *Spontaneous Generations: A Journal for the History and Philosophy of Science* 9, no. 1 (2018): 146–50. (2) Samuel Ruhmkorff, Jamin Asay and Alexander Bird contend that the great diversity of applied methods in fundamental research makes impossible to run PMI as a global argument. Therefore, the route to Laudan's pessimistic conclusion can be blocked. At the same time, local versions of PMI may still put some pressure on realist philosophers of science. See Ruhmkorff, "Global and Local Pessimistic Metainductions"; Jamin Asay, "Going Local: A Defense of Methodological Localism About Scientific Realism," *Synthese* 196 (2019): 587–609; and Alexander Bird, *Knowing Science* (Oxford: Oxford University Press, 2022).

if it is possible to demonstrate that theoretical elements "that are essentially employed are those that have 'carried over' to subsequent theories, then the 'pessimistic induction' gets blocked."[26] To repeat: successful blocking means in this context that realists have found a method for showing that the unreliability of past theories does not necessarily project into the present and the future.[27] In other words, even if the logical form of PMI is compatible with their methodological principles, realists are not under pressure to accept the conclusion of this inference. Claim C4 expresses this often-made point.

As we have seen, PMI is understood by realists as a significant challenge to which a response must be made. We have also seen that the main response options are rather limited: either it should be shown that PMI rests on a false presupposition, and so it is a fallacious argument; or a strategy should be developed that provides the means for blocking the conclusion of PMI.

It would be certainly an interesting task to assess the strength of these responses.[28] One could also explore whether there are response options for realists which have hitherto not or insufficiently been considered in the literature. However, I will follow a different line of argumentation by showing that claims from C2 to C4 characterize the challenge posed by PMI misleadingly. If this is so, as I think it is, then we should rethink the status of PMI in the realism/anti-realism debate.

[26] Psillos, "Scientific Realism," S310.

[27] Note that this is intended to be a general claim about realist predilections. And as always, predilections can create conceptually different versions of the same methodological procedure.

[28] It is worth mentioning that realist responses to PMI have provoked a number of anti-realist counterarguments. Anti-realists argue against the first kind of response by saying that there is no conclusive proof of the discontinuity of past and present science. Thus, we have still no reason to believe in the reliability of our current theories. See, for instance, K. Brad Wray, *Resisting Scientific Realism* (Cambridge: Cambridge University Press, 2018), 93. Against the second kind of response, it is argued that separating historically stable theoretical elements requires a distinguishing ability whose reliability depends also on historical factors. PMI can therefore be applied to this response, too. For more on this, see P. Kyle Stanford, *Exceeding Our Grasp: Science, History, and The Problem of Unconceived Alternatives* (Oxford: Oxford University Press, 2006), 183–84. There is little doubt that realists can in principle provide more fine-grained responses to these anti-realists counterarguments. One can hardly escape the impression that the debate around PMI behaves now as a self-generating chain of arguments.

3. Releasing Realists from the Response Obligation

The scientific realist attitude to PMI is unambiguous. If Laudan is right, then the historical record may provide decisive evidence against the realists' meta-hypothesis about science. The felt need for a response arises from this general worry. Another part of this attitude concerns the dialectical status of Laudan's meta-induction: Defending the realist position requires that PMI be classified not as a "serious" argument but as a fallacious argument (or an argument with a blocked conclusion). Moreover, the contrast between "serious" and fallacious (or blockable) arguments is assumed to be exhaustive. There is no third classificatory possibility. Most realists who participate in the debate about PMI seem to accept this background assumption tacitly.

One can point to some interesting exceptions, however. For instance, Alexander Bird has recently observed that the inferential relation on which PMI was built on exhibits an internal tension. Bird's primary aim is to investigate the reliability and truth-conduciveness of first-order scientific research from the perspective of PMI. He admits that Laudan's meta-hypothesis can provide us reason for not believing in our current first-order scientific findings. But the supporter of PMI must demonstrate that there is a genuine unity to science because that unity is what allows the induction on the predicate "(approximately) true theory." And then Bird adds, *en passant*, that

> [t]here is some irony in the PMI using an inference with the form and character of a scientific inference to cast doubt on the cogency of scientific inferences. I do not think, however, that this means that the PMI is self-refuting, although it does put the supporter of the PMI under some obligation to explain why the second-order reasoning succeeds where the first-order reasoning fails.[29]

This is a careful critical observation since PMI is not said to be a self-refuting argument. But Bird characterizes the dialectical status of PMI in an unusual way when he says that it is the supporter of the historical induction who owes us an explanation why we should believe in the correctness of her meta-induction. This amounts to saying, or at least implying that realists are not automatically obliged to give a response to PMI.

One can also mention Samuel Ruhmkorff who goes one step further in this direction. Like Bird, Ruhmkorff focuses also on the question of how

[29] Bird, *Knowing Science*, 235.

opponents of scientific realism can support PMI.[30] According to Ruhmkorff, anti-realists are faced with an epistemic dilemma. When they want to defend their historical meta-induction, they should either question the truth of currently accepted theories and thus undermine the reliability of the inductive method; or they should question the reliability of the inductive method, becoming thus unable to assert anything about the likely falsity of currently accepted theories. This seems to be a genuine dilemma, says Ruhmkorff, so one can plausibly claim that PMI is a self-refuting argument.

My position is that this diagnosis is essentially correct. But I would like to add two qualifying remarks to this assessment. First, as I have already mentioned, Ruhmkorff understands the self-refutation problem as being fundamentally an epistemic phenomenon. He argues explicitly that "PMI is epistemically, not logically, undermining."[31] From this understanding it follows that the PMI argument undermines itself because the assumption concerning the reliability of the inductive scientific method plays a double role in it. On the one hand, the aim of the PMI argument is to question the tenability of this assumption in its target domain. On the other hand, the reasoning in the PMI argument works only if this assumption is supposed to be valid.

I do not wish to claim that an epistemic understanding of the problem like this is misleading. Instead, I would like to claim that there is a simpler and more promising way to demonstrate why the PMI argument should be regarded as "self-refuting." In contrast to Ruhmkorff's epistemic understanding, my proposal locates the main problem in the (hitherto unanalysed) dialectical status of PMI. Second, I would like to change the terminology, and instead of saying that PMI is self-refuting, I will say that it is an internally unstable argument. This is not intended to be a simple terminological change. Rather, I want to modify the focus of Ruhmkorff's diagnosis. He approaches the self-refutation problem from an anti-realist point of view and emphasizes why it is difficult for anti-realists to overcome this problem. On my view, however, it is more important to see, what the consequences of this diagnosis are for scientific realists.

As indicated in the Introduction, the most salient property of an internally unstable argument is that it is dialectically inefficacious in the sense that it does not have the potential for contributing to the progression of a debate. In general, the said instability may arise from a conceptual

[30] Ruhmkorff, "Global and Local Pessimistic Metainductions," 416–18.
[31] Ibid., 418.

tension (incompatibility in the functional roles of certain interdependent terms), or it may come from a logical tension (some kind of inconsistency or contradiction in the substructure of the argument). The result in both cases is that the argument becomes unable to fulfil its proper function, that is, it becomes unable to confirm or refute a prior empirical hypothesis (or a set of prior empirical hypotheses) in a debate. To borrow an apt phrase from Douglas Walton, this is best thought of as an inability "to meet the argument requirement."[32] Instances of this kind of argument may therefore be received by disregarding or bracketing the concern they (seemingly) create for the target audience.

My contention is that Laudan's historical meta-induction has to be classified as an internally unstable argument. And because of this I think that realists are not obliged to devise any strategic response to it. But in order to see that this is indeed the right interpretation of the dialectical situation, an appropriate structural analysis of PMI must first be given. My proposal for such an analysis is as follows:

(A1) PMI has been put forward as a counter-argument to a recent realist meta-hypothesis about scientific theories.
(A2) Because of this, PMI should be seen as an integral part of current theories of science.
(A3) According the conclusion of PMI, we should be pessimistic concerning the reliability and truthfulness of current theories of science.
(A4) Given (A2) and (A3), the conclusion of PMI that we should be pessimistic concerning the reliability and truthfulness of current theories of science is applicable even to PMI itself.
(A5) Therefore, we should be pessimistic concerning the reliability and truthfulness of PMI.
(A6) The overall lesson to be drawn from (A1)–(A5) is that there is no positive reason to consider PMI as a reliable or true counter-argument to the realists' recent meta-hypothesis.

According to this analysis, PMI as a premise-conclusion complex is within the scope of its own pessimistic conclusion and this generates some kind of logical inconsistency. Laudan's historical meta-induction is therefore an internally unstable argument. Because of this, it is unable to advance the dia-

[32] Douglas Walton, *Fallacies Arising from Ambiguity* (Dordrecht: Kluwer, 1996), 271.

lectical process concerning the reliability and truthfulness of current theories of science (i.e., it fails to satisfy the Waltonian argument requirement).

One possible objection to this analysis might be that (A2) is false and so the last claim, (A6), does not follow. (A2) might be judged to be false on the grounds that it uses the technical term "current theories of science" in a misleading manner. While it is obviously correct to say that the realists' meta-hypothesis is about the reliability and truthfulness of current first-order scientific theories, it is incorrect to suggest, as (A2) does, that PMI is an integral part of current first-order scientific theories. Laudan intended PMI to be a meta-induction on the history of science, and from this it follows that it should be seen as part of current meta-scientific and not first-order research.

This objection can be easily answered. "Current theories of science" should be understood in (A2) as a general term referring to any theory of our time, be it first-order or meta-scientific, that has its basis in empirical evidence. And given that PMI starts from a reflection on the fact that most of our past first-order scientific theories turned out to be unreliable, it has its basis in empirical evidence.[33] Though the problem of the reliability of scientific theories is seen here through a meta-scientific (i.e., philosophical) lens, it is still a problem that concerns the empirical evidential basis of science. This seems to be sufficient to elucidate the intended meaning of the term "current theories of science" in (A2). And now that (A2) has been secured, there seems nothing remaining to stop the analysis going to (A6).

It is also possible to object that the structural analysis presented above cannot fulfil its own proclaimed goal because it also provides a strategic response to PMI. First, a series of analytical claims, (A1)–(A5), is presented. Then a conclusion, (A6), is drawn, which suggests that Laudan's argument suffers from internal instability. Now, it is hard to avoid the impression that the analysis as a whole has been constructed in order to offer a strategic realist response to the challenge of PMI.

I think this possible objection misses its target. As it has previously been mentioned, the aim of the (A1)–(A6) analysis is to clarify the dialectical status of PMI. If we want to take a critical position on PMI, such an analysis seems to be unavoidable. It is important to emphasize, however, that

[33] It should be noted that this observation is not entirely original. There are already some examples for it in the literature. For instance, Dicken says that PMI "is a second-order philosophical argument against the approximate truth of any particular scientific theory, on the basis that we have good historical evidence to suppose that our first-order scientific evidence is generally unreliable" (Dicken, *Critical Introduction to Scientific Realism*, 127).

the presented analysis definitely stops at (A6), in the sense that it does not imply the need of further dialectical steps in the debate initiated by Laudan's original argument. It does not suggest any way of defending the realists' meta-hypothesis about scientific theories from pessimistic consequences. Quite the contrary, it suggests that the argument Laudan has offered in his 1977 book *Progress and Its Problems* can simply be disregarded or bracketed.

4. Conclusion

Laudan's PMI in 1977 was a novel and interesting contribution to the emerging debate between scientific realism and scientific anti-realism. The current consensus is that PMI has to be seen as presenting a significant challenge to which proponents of scientific realism must give a response. We have seen, however, that the challenge is wrongly conceived. A structural analysis showed that Laudan's pessimistic meta-induction is an internally unstable argument. And as such, it does not necessarily require a response on the part of realists. This claim implies that the current consensus about the dialectical status of PMI is wrong.

But it is also important to clarify what this claim does not imply. It is certainly not implied that we should accept the realist approach to science as ultimately superior to anti-realism on the sole grounds of the internal instability of PMI. It is true that Laudan's pessimism regarding the epistemic capabilities of science plays a prominent role in most versions of anti-realism. But this pessimism can, in principle, be packaged into strategically equivalent arguments, which shift the epistemic focus from science to other factors. For instance, Kyle P. Stanford makes an attempt to show that scientists are never able to exhaust the entire space of available hypotheses, and so the cognitive limitation of scientists is the main reason that can motivate pessimism about the reliability of current research.[34] In a similar spirit, Greg Frost-Arnold points out that most past scientists based their research on misleading total evidence sets.[35] Perhaps scientists always tend to base their research on misleading total evidence sets. And then again, we may end up drawing a pessimistic conclusion on the epistemic underpinning of current fundamental theories.

[34] Stanford, *Exceeding Our Grasp*.
[35] Frost-Arnold, "How to Be a Historically Motivated Anti-Realist."

Now, it is a further question whether these and other new incarnations of PMI are internally stable enough for forcing a response from the proponents of realism. But this should be left for another occasion.

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