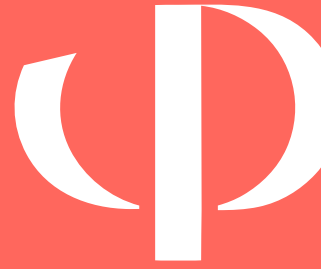


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SPECIAL ISSUE ON INDUCTION IN EASTERN AND WESTERN PHILOSOPHIES

FROM THE EDITORS

Kisor K. Chakrabarti, Yarran Hominh, and A. Minh Nguyen

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APA STUDIES ON

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A. MINH NGUYEN, EDITOR

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FROM THE EDITORS

An “Old” Solution to a “New” Problem: Induction in Eastern and Western Philosophies

Kisor K. Chakrabarti, Consulting Editor

UNIVERSITY OF VAASA
KISORCHAK@GMAIL.COM

Yarran Hominh, Associate Editor

BARD COLLEGE
YHOMINH@BARD.EDU

A. Minh Nguyen, Editor

FLORIDA GULF COAST UNIVERSITY
ATNGUYEN@FGCU.EDU

Human beings are creatures with limited cognitive and intellectual capacities. We come to have the knowledge and powers that we do have on the basis of learning and experience. Yet our experience, itself limited, often leads us astray, even in what may seem the simplest of matters. So it is that the philosophical problems of induction get a grip on us. This special issue on “Induction in Eastern and Western Philosophies” includes five articles dealing with challenges to induction and responses to those challenges by philosophers working across Indian and Euro-American philosophies. Three of these articles—by Kisor K. Chakrabarti, Gordon Haist, and Ethan Mills—originated in a session presented at the 2023 Annual Meeting of the American Philosophical Association Pacific Division in San Francisco. Titled “The Problem of Induction: East and West,” the session was organized by Chakrabarti, chaired by Haist, and arranged under the auspices of the APA Committee on Asian and Asian American Philosophers and Philosophies. The remaining two articles—by Edward Johnson and Franco Manni—were written specifically for this issue.

The articles share a number of touchstones. The first is Cārvāka’s rejection of induction and certain knowledge of causes in the sixth century BCE, influential not only for the classical Indian traditions but also for skeptical Hellenistic philosophy and, through that, modern European philosophy. The second is David Hume’s “old” problem of induction, which, in Hume’s formulation, is not, of course, nearly as old as Cārvāka. The third is Nelson Goodman’s “new” riddle of induction. The fourth is the great thirteenth-century Navya

Nyaya philosopher Gangesa’s response to Cārvākan doubt. Together, the articles sketch out a geography of problems of induction and responses to the problems using these four touchstones as points of reference.

These points of reference should not be taken to be fixed points, for the reason that context matters and context differs. So how we read and situate these points also matters. Just to take one instance, as Mills points out, the Sanskrit word translated as “inference” (*anumana*) does not mean or denote reasoning in general, but rather a specific inferential form that was prized as the highest form of inference—“the gold standard of argumentation in classical South Asia,” as Mills puts it.

In the first article, “The Anti-Generalization Move: The Standard Cārvāka Critique of Inference and Hume’s Problem of Induction,” Mills raises a number of important metaphysical questions in comparative philosophy, drawing on the Cārvāka schools and Hume’s “old” problem of induction. Mills argues that there are a number of significant differences between the structure of Cārvāka’s argument against induction and that of Hume’s. Yet, Mills contends, both arguments rely (albeit to different degrees and in different ways) on what he calls “the Anti-Generalization Move”: the claim that it is not rational to infer to the truth of general claims from a limited number of instances, though it may be unavoidable, practically necessary—even, in some sense, justifiable—to do so in ordinary life. Even noting this commonality at the level of generality he does, Mills suggests in closing, may obscure some of the crucial differences between the Cārvākas and Hume. And this raises some important issues for doing comparative philosophical work.

Chakrabarti argues in “The ‘New’ Riddle of Induction: Gangesa and Goodman” that the Grue Paradox, usually credited to Goodman, was anticipated by Gangesa, who lived in the thirteenth century in northeastern India. Chakrabarti explains Gangesa’s solution to the paradox and contends that his solution is more satisfactory than some other attempted solutions offered by some recent leading philosophers.

Haist’s article “Entrenchment, Postulation, and Phenomenal Evidence” provides an insightful comparison between Husserl’s phenomenological approach and Gangesa’s theory of “universal-based extraordinary sensory connection” (UBESC). Haist argues that both Gangesa and Husserl attempt to establish the priority of reason to perception by locating the former in the latter. Husserl succumbs, however, to transcendentalism and the felt need

to systematize philosophy. But, for Haist, Gangesa's UBESC sees the universal (the extraordinary) *in* the particular as an *aid* to perception and not as an attempt to transcend it. Haist suggests this is a more promising approach.

In his contribution to this issue, "So Far, So Good: Learning From Experience," Johnson situates the various problems of induction in relation to the more general human problem of learning from experience. This kind of learning occurs both in the sciences and in the everyday lives of individuals. In both, Johnson suggests, drawing on a variety of thinkers from Nelson Goodman and Karl Popper to Nancy Cartwright and Rom Harré, perhaps, in the end, we do what we do and make the best of it. More specifically, perhaps "making the best of it" means something like: In doing what we do, we learn—from the inside—how to do it better, without embarking on what John Dewey aptly calls "the quest for certainty" that involves looking for external standards of "betterness."¹

In the fifth and final article, "The Various Theoretical and Non-Theoretical Functions of Induction," Manni situates the philosophical problems of induction dealt with in analytical detail in the earlier articles in historical context, specifically in relation to human practices outside the hard sciences narrowly conceived: big data analytics, historiography, and psychoanalysis. In these fields, the general principle of the consistency of Nature criticized so forcefully by Hume and the Cārvākas is not what is at stake—at least, not obviously. Instead, for Manni, the reliance on induction in these areas is better understood by turning to Popper's psychological critique of induction as a "myth" or an "ideology." Manni suggests, by reference to Benedetto Croce and Sigmund Freud, that historiography and psychoanalysis reveal the possibility of being psychologically liberated from this myth or ideology. We need not rely on the consistency of Nature, we can read Manni as saying. Instead, recognizing that its centrality to our lives (the need for predictability) is the result of larger historical and cultural forces, we can come to the transformative possibility of other ways of thinking and being.

It may be useful for the reader, after this brief summary of the articles in this issue, to revisit the Nyaya solution to the problem of induction as originally conceived, which plays an important role in the positive responses to the various problems of induction discussed in the issue. The theory of universal-based extraordinary sensory connection (UBESC) and the theory of counterfactual reasoning (CR) are the two most important parts of the Nyaya response to the skeptical challenge to the rationality of induction.

First, the theory of UBESC. This theory seeks to provide phenomenological evidence for empirical inductions like "all smoky things are fiery," which, the skeptic alleges, make unjustified claims about unobserved things based on observation of a limited sample of observed cases. The Nyaya school responds to this allegation by drawing a distinction between ordinary sensory connection and extraordinary sensory connection. The Nyaya holds that, in an empirical induction, all things about which claims are made are observed, though not by means of ordinary sensory connection, but by means of extraordinary

sensory connection. This raises an obvious question: Why should extraordinary sensory connection be admitted? An argument for it is presented below.

After centuries of mutual criticism and comprehensive deliberation presented, preserved, and available in hundreds of Sanskrit philosophical works of exemplary originality, depth, and vigor (most of which are not discussed or reported by recent or contemporary specialists in Indian or comparative philosophy), the Nyaya articulates and defends the position that there are exactly four sources of knowing. These, in the order of epistemic priority (roughly translated), are perception (*pratyaksha*), inference (*anumana*), analogy (*upamana*), and testimony (*śabda*). Now, in an empirical induction such as "all smoky things are fiery," in some sense, one has awareness of all particular smokes and all particular fires. Which of the above four kinds of knowing should such awareness be subsumed under? Could it be inferential? No. A necessary condition of inference is the awareness that what is intended as the pervaded is pervaded by what is intended as the pervader. (For example, in "all smoky things are fiery," smoke is intended as the pervaded and fire is intended as the pervader.) Another necessary condition of inference is the awareness that what is intended as the pervaded belongs to what is intended as the inferential subject (*pakṣa*). (For example, in "the hill is smoky," when fire is sought to be inferred in the hill, the hill is intended as the inferential subject.) These conditions are not fulfilled in the present case.

Could the said awareness that all smoky things are fiery be analogical? No. For awareness of comparison based on similarity or dissimilarity, which is a necessary condition, is not fulfilled. Could the said awareness be from testimony? No. For awareness of an authoritative source, which is a necessary condition, is missing. The only remaining alternative is that such awareness is perceptual. But smokes and fires in distant times and spaces are included in "all smoky things are fiery." These cannot be perceived through ordinary sensory connection. Hence, the hypothesis of UBESC is introduced. In the Nyaya view, universals are common properties ontologically different from and inherent in the particulars of a natural kind.²

Since the universal is present in all particular instances of a natural kind, it is possible for one to be directly aware of all these particulars insofar as they are instances of a given universal. It is also claimed that such knowledge is phenomenologically presented as direct (*sakṣatkara*) and not as indirect (*parokāśa*) and that only perceptual knowledge is direct. Hence, too, it is claimed, the hypothesis of UBESC makes sense.³

It may be noted that UBESC is not needed for awareness of the universals themselves. In the Nyaya view, universals are present then and there in all the particulars of a natural kind. Hence, universals can be known by ordinary sensory connection.

We now move on to the other important part of the Nyaya response to the skeptic's challenge to induction, viz., counterfactual reasoning (CR). Cārvāka, like Hume, argues

that empirical induction (*vyaptigraha*) is irrational because it involves circularity (*parasparasrya*). The Nyaya agrees that the charge of circularity is serious and must be addressed. The Nyaya also agrees that the doubt that an empirical induction may be false (*vyabhicara-samka*) is reasonable. For an induction confirmed in hundreds of instances may still be falsified by a single counterexample and the possibility of an as-yet-unobserved counterexample cannot be ruled out. Both concerns are sought to be addressed by CR. An empirical induction does need the support of favorable observation of positive instances (*sapaksa*) where both the intended pervaded (*vyapya*) and the intended pervader (*vyapaka*) are observed to be co-present. Induction may also need the support of favorable observation of negative instances (*vipaksa*) where both the intended pervader and the intended pervaded are co-absent. For example, the induction that “all smoky things are fiery” may be supported by observation of positive instances such as a kitchen where both smoke and fire are present. And it may also be supported by observation of negative instances such as a watery lake where both smoke and fire are absent.

It may be noted, however, that in some cases only positive instances are possible and the possibility of favorable observation of negative instances is ruled out. Again, in some other cases only negative instances are possible and the possibility of favorable observation of positive instances is ruled out.⁴ However, additionally and importantly, the support of CR showing that denying the induction leads to an undesirable consequence is needed.

A specimen of CR providing epistemic favor and support (*anugraha*) for the induction that all smoky things are fiery is discussed in the second article in this issue. Another version of the argument developed by Bhavananda (sixteenth century) is presented below.⁵ Bhavananda points out that, in an induction like “all smoky things are fiery,” something (such as smoke) is intended to be the pervaded (*vyapya*). The intended pervaded (*vyapya*) is that the extension of which is not greater than (*anatirika-desa-vrtti*) the extension of the intended pervader (*vyapaka*), whereas the intended pervader is that the extension of which is not smaller than (*anyuna-desa-vrtti*) the extension of the intended pervaded. Now, suppose that the pervaded is not pervaded by the pervader. This supposition leads to an undesirable consequence—of inconsistency with one’s own position, both Cārvāka and Hume being empiricists—which we shall describe as follows.

If the pervaded had been preceded neither by an aggregate including the pervader nor by an aggregate excluding the pervader, the pervaded would not have come into being. But the pervaded is observed to come into being, e.g., smoke is observed to come out of a lit cigar. So the consequent of the above conditional is false and it also follows that the antecedent is false. Accordingly, it follows that either (a) the pervaded is preceded by an aggregate including the pervader or (b) the pervaded is preceded by an aggregate excluding the pervader. Now, according to the foundational empiricist principle of observational credibility (OC), of two empirical hypotheses making factual claims, the one with observational support is preferable to the one without such

support. Accordingly, (a), the hypothesis that the pervaded is preceded by an aggregate including the pervader, is accepted and not (b), the hypothesis that the pervaded is preceded by an aggregate excluding the pervader. What about the possibility that the pervaded may exist without the pervader in a distant time and space? To address this question, the induction that the pervaded is pervaded by the pervader may be modified as follows: The pervaded not separated from the preceding aggregate is pervaded by the pervader.

It may be noted that the above argument makes no use of induction in any step. Hence, the charge of circularity is ruled out. It also shows how logical truths can be combined with observation and the foundational empiricist principle of OC to counter the skeptical challenge to induction. The point is the following: If the skeptic engages in a dialectic that includes appealing to mere possibilities without observational support, it is appropriate, says Bhavananda, to offer a dialectical argument as a rejoinder. Furthermore, if the skeptic were doubtful about the need to speak or write, for example, to communicate, why would he unwaveringly have recourse to speaking or writing to communicate? Such conflict between what is said and what is practiced (*svakriya-vyaghata*), too, shows the illegitimacy of doubt.

In conclusion, while philosophical debates are hard to resolve, the Nyaya solution to the problem of induction may be defensible and a deeper study may yield rich dividends.

ACKNOWLEDGMENTS

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NOTES

1. John Dewey, *The Quest for Certainty: A Study of the Relation of Knowledge and Action* (New York: G. P. Putnam’s Sons, 1929).
2. See Kisor Chakrabarti, “The Nyāya-Vaiśeṣika Theory of Universals,” *Journal of Indian Philosophy* 3, nos. 3–4 (1975): 363–82.
3. For further discussion, see *The Tattvacintamani of Gangesa Upadhyaya*, Volume 2, ed. Kamakhyanath Tarkavagisa (Delhi: Chowkhamba Sanskrit Pratisthan, 1990), Part 1, especially the chapter on Samanya Lakshana. See also Kisor Kumar Chakrabarti, *Classical Indian Philosophy of Induction: The Nyaya Viewpoint* (Lanham, MD: Lexington Books, 2010), chap. 5.
4. See *The Tattvacintamani of Gangesa Upadhyaya*, the chapter on Kevalanvayi and the chapter on Kevala-vyatireki. See also Chakrabarti, *Classical Indian Philosophy of Induction*, chap. 3.
5. See Bhavananda, *Tattva-Cintamani-Didhiti-Prakasa*, Volume 2, ed. Kalipada Tarkacharya (Kolkata: The Asiatic Society, 1963), the chapter on tarka. See also Chakrabarti, *Classical Indian Philosophy of Induction*, chap. 3.

ARTICLES

The Anti-Generalization Move: The Standard Cārvāka Critique of Inference and Hume’s Problem of Induction

Ethan Mills

UNIVERSITY OF TENNESSEE AT CHATTANOOGA

ETHAN-MILLS@UTC.EDU

ABSTRACT

I maintain there are at least three Cārvāka subschools (mainly differentiated by their approach to the means of knowledge), but all three types of Cārvākas utilize what I call the “Anti-Generalization Move” in their arguments against the classical South Asian argumentative form known as *anumāna* (inference). I focus on the Anti-Generalization Move in the Cārvāka argument that appears in the *Sarvadarśanasamgraha* and compare it to David Hume’s problem of induction. This comparison raises intriguing philosophical issues about the human propensity to generalize from a small sample of experience; this comparison also raises metaphysical questions: Are the Cārvākas and Hume really discussing the same idea? Is “skepticism” the right label for the Cārvākas? Are there larger methodological questions about comparative philosophy looming in the background of such comparisons? I hope this article will encourage readers to further consider these questions for themselves.

Philosophers of the irreligious Cārvāka school in classical South Asia gave various critiques of inference (*anumāna*). I have argued elsewhere that there were three kinds of Cārvākas in the classical South Asian philosophical tradition: (1) Standard, (2) More Educated/Purandaran, and (3) Jayarāśian.¹ These branches can be understood with regard to their respective stances on the means of knowledge (*pramāṇas*). First, the Standard Cārvākas (as standardly understood by opponents in texts such as Mādhava’s *Sarvadarśanasamgraha*, c. 1300 CE, and Udayana’s *Nyāyakusumāñjali*, c. 1000 CE) hold the view that there is a single means of knowledge, perception;² Standard Cārvākas support this view with a critique of the reliability and coherence of inference (*anumāna*) as a means of knowledge. Second, the More Educated/Purandaran Cārvākas endorse a form of inference limited to empirical matters. Third, radical skeptical Cārvākas, whom I call Jayarāśian Cārvākas (after their main—and perhaps only—proponent), attempt to undermine all definitions of the means of knowledge (even perception), thus enjoying a life free from philosophical and religious speculation.

Despite these differences, however, each kind of Cārvāka utilizes what I call the “Anti-Generalization Move” in their arguments against the classical South Asian argumentative form known as *anumāna* (inference). In this article, I focus on the Anti-Generalization Move in the Standard Cārvāka argument as it appears in the *Sarvadarśanasamgraha* and compare it to Hume’s (in)famous problem of induction. Aside from being an intriguing philosophical issue in its

own right, a few metaphysical questions arise in making this comparison. Are the Cārvākas and Hume really discussing the same idea? Is “skepticism” the right label for the Cārvākas? How do these questions impact our understanding of responses to the Anti-Generalization Move in both South Asian and European contexts? Does this topic raise larger methodological questions about comparative philosophy? While I won’t provide many answers, I hope this article will encourage readers to consider these questions for themselves.

STANDARD CĀRVĀKA CRITIQUE OF INFERENCE

Before delving into the topic at hand, it is vital to note that in the context of classical South Asian philosophy, the word “inference” (*anumāna*) does not mean reasoning in general. Therefore, it should not be understood that the Cārvākas are arguing against arguments or anything quite like the inconsistency objection frequently raised against Pyrrhonian and Academic skeptics in the ancient Greek and Roman traditions.

Rather, in classical South Asian philosophy more generally and especially in the Brahmanical Nyāya (“Logic”) tradition, inference (*anumāna*) refers to a specific inferential form. It does not refer to everything that would go by “inference” in English. Much of what is called “inference” in English would be called *tarka*, which could be translated as “speculative reasoning.”³ Nonetheless, *anumāna* became the gold standard of argumentation in classical South Asia; arguments that could be non-fallaciously put into the *anumāna* form were prized—and criticized—to the highest degree.⁴

Here’s a stock example of an *anumāna*.⁵

1. There is fire on that mountain.
2. Because it has smoke.
3. (Wherever there is smoke, there is fire), as in a kitchen.
4. There is smoke on that mountain.
5. Therefore, there is fire on that mountain.

Here it is with appropriate labels:

1. [Thesis/*Pratijñā*]: (There is fire) = [property to be proved/*sādhya*] (on that mountain.) = [place/subject/*pakṣa*]
2. [Reason/*Hetu*]: Because it has smoke.
3. [Example/*Udāharana*] (Wherever there is smoke, there is fire) = [pervasion/*vyāpti*], as in a kitchen.
4. [Application/*Upanaya*]: There is smoke on that mountain.
5. [Conclusion/*Nigamana*]: Therefore, there is fire on that mountain.

The Standard Cārvāka challenge is this: How can the pervasion (*vyāpti*) in step three above be known? How does one know that wherever there is smoke, there is always and everywhere fire? Or, more technically, how does one know that smokiness (the *hetu*) is pervaded by fieriness (the *sādhya*)?

While a similar argument is presented in the *Nyāyakusumāñjali* (*Handful of Flowers of Nyāya*) by the Nyāya philosopher Udayana (c. 1000 CE),⁶ here I'll concentrate on the argument presented on behalf of the Cārvākas in the *Sarvadarśanasamgraha* (*Collection of All Philosophies*, hereafter SDS) by the Advaita Vedānta philosopher Mādhava (c. 1300 CE). Mādhava represents the Standard Cārvāka argument as considering several options, each of which is denied.⁷

1. The pervasion can't be perceived by the external senses since one cannot perceive the future and the past, e.g., all past and future instances of smoke and fire.
2. If the pervasion were a matter of a relation between universals, you wouldn't know from that that the specific individuals in question are related.
3. The pervasion can't be known by *internal* (i.e., mental) perception since internal perception is dependent on external perception.⁸
4. Neither can the pervasion be known by inference since this would constitute an infinite regress (*anavasthā*).
5. Testimony (*śabda*) creates an infinite regress if testimony is a kind of inference. And testimony can be doubted (e.g., Cārvākas doubt testimony of religious figures), and there would be no inference for oneself.
6. Comparison (*upamāna*) won't work because that reveals a relation between a name and a thing.
7. A special cause or extraneous condition (*upādhi*) creates a problem, e.g., wet fuel as a cause of smoke rather than merely fire. Fire using dry fuel or fire in a red-hot iron ball does not produce smoke. A pervasion (*vyāpti*) consists of a necessary connection (*avinābhāva*), which requires ruling out *upādhis*. Cognizing an *upādhi* would require cognizing the pervasion and cognizing the pervasion would require cognizing the *upādhi*. Hence, there is the fallacy of mutual dependence (*parasparāśraya*).

After the critique is complete, the Cārvāka is represented as saying, "Activity with regard to a cognition of fire and so forth immediately following a cognition of 'smoky' (*dhūmra*), etc., is made possible (*yujyate*) by error or by being based on perception."⁹ The Standard Cārvāka idea is that one really doesn't know anything as lofty as a pervasion that guarantees an inference (*anumāna*), but that knowing in such a deep sense was never required to act in

the first place—we act on the basis of perception of smoke without knowing for sure that wherever there is smoke, there is fire.¹⁰

THE ANTI-GENERALIZATION MOVE: STANDARD CĀRVĀKAS AND HUME

Several scholars have noted similarities between the Cārvāka critique of inference and David Hume's problem of induction.¹¹ Indeed, I imagine many readers have already been comparing the above argument to Hume's argument! It's worth stepping back, however, to consider what such comparisons can accomplish. Assuming that one is interested in more than mere comparison for comparison's sake, a comparison like this can help us do two things. First, it can clarify whether and to what extent the Cārvāka arguments can be considered to be tokens of the type of skepticism that philosophers working in Western traditions have called skepticism about induction, with Hume as the paradigm example. Whether Hume is the first Western philosopher to consider this type of skepticism depends in part on how the problem is defined; as Ruth Weintraub points out, Sextus Empiricus raised a similar problem about 1,500 years before Hume.¹² Nonetheless, if the Cārvāka critique predates Hume, the South Asian tradition would have temporal bragging rights for raising the problem earlier than Hume. Second, if there are major differences between the Cārvāka and Western versions, this could encourage scholars to expand their conception of what skepticism about induction is; it might also constitute a different kind of skepticism that remains relatively unexplored in contemporary scholarship.

Hume scholars in recent decades have demonstrated that the details of Hume's argument are more difficult to ascertain than most contemporary philosophers think,¹³ so I tread as lightly as possible here. Nonetheless, here's my reconstruction of the argument in Hume's *An Enquiry Concerning Human Understanding*:¹⁴

1. Knowledge of matters of fact is based on the relation of cause and effect.
2. Knowledge of the relation of cause and effect is not based on a *priori* reasoning or relations of ideas; it is based on experience.
3. Knowledge from experience is based on "the supposition that the future will be conformable to the past" or the principle of induction.
4. Knowledge of the principle of induction is not based on relations of ideas (because we can imagine the opposite being true); nor is it based on experience or probability (because there is no direct experience of it and appeals to probability are question-begging).
5. Therefore, knowledge of cause and effect, as well as knowledge of the principle of induction, is not rationally justified.

There are several things I notice when comparing Hume’s argument with the Cārvāka argument. First, the arguments occur in different contexts: the Cārvākas present their argument as a critique of pervasion within a specific argumentative form (*anumāna*), while Hume intends to discover a general explanation for reasoning about matters of fact. The Cārvāka problem has, of course, larger implications concerning the limits of knowledge and whether humans can have knowledge of unseen (*adr̥ṣṭa*) realities of *karma* and the divine. Hume conversely begins with a wide focus on reasoning about matters of fact and narrows it to the idea of induction. Thus, the Cārvākas go from specific to general, while Hume goes from general to specific.¹⁵

Second, the deepest similarity between the two arguments is a challenge to the idea that it is rational to infer the truth of general claims from a limited number of instances—indeed, doing so may be impossible given the temporal and spatial limitations of our evidence. I call this the Anti-Generalization Move. This can be seen as I’ve presented the arguments in options one, four, and five of the SDS argument above as well as in premise four of Hume’s argument. The Anti-Generalization Move is a central part of both arguments, although it’s less crucial in the SDS argument, which also relies on other types of arguments in the various options considered and then rejected.

Third, they appeal to different fallacies. Hume brings up the fallacy of begging the question, while the Cārvāka argument involves infinite regress. Both fallacies were well known in Hume’s European tradition and in the Cārvākas’ classical South Asian tradition. Hume could have appealed to infinite regress, and the Cārvākas could have claimed their opponents were begging the question. Perhaps one reason for this difference is that, in the South Asian tradition, knowledge was thought of as episodic, so the specific instances of inferential knowledge could form an infinite regress. For Hume, knowledge was a more static phenomenon. Perhaps a deeper reason is that Hume claims that we *assume* induction is legitimate—we by nature beg the question. The Cārvākas’ point is less about our quotidian assumptions and more about the idea that we don’t require anything as philosophically elaborate as their opponents’ concept of *anumāna*.

Fourth, according to both Hume and the Standard Cārvākas, human life proceeds smoothly without philosophically established generalization—by custom or habit for Hume and by perception or expectation for the Standard Cārvākas. Perhaps this is an example of Hume’s Pyrrhonian tendencies: we get along just fine by following appearances and the guidance of nature. Somewhat similarly, the Standard Cārvākas may be continuous with radical skeptical Jayarāśian Cārvākas: both types of Cārvākas deny that philosophically established inference is needed in the pursuit of regular human life.

When it comes to the Anti-Generalization Move, Cārvākas can claim temporal bragging rights over Hume, although perhaps Sextus Empiricus (second century CE) is the true winner as it is unclear whether arguments relying on the Anti-Generalization Move were used in South Asia before

the seventh or eighth century CE.¹⁶ While the Cārvākas and Hume differ in context, form, and motivation, they both make the Anti-Generalization Move, which is a deep philosophical challenge for any concept that relies on universal generalization (e.g., pervasion, induction, inference, and causation).

THE SAME IDEA? SOME QUESTIONS ABOUT COMPARATIVE PHILOSOPHY

Are we justified, given these cross-cultural comparisons, in taking the Anti-Generalization Move as the general philosophical issue of which Hume’s problem of induction and the Cārvāka critique of inference are two historical examples? I have previously said yes, thinking a larger general category was an effective way to avoid the culturally and temporally problematic act of subsuming the Cārvākas under a general Humean category, a comparative move that takes Western categories as the standard, natural, and “universal” categories into which the ideas of all other traditions must be sorted.¹⁷

While I still have some sympathy for my previous claim, I have begun to rethink comparative methodologies. In this specific case, there is, in fact, a great deal more going on in the SDS argument than in Hume’s; there are several prongs beyond the two of “Hume’s Fork,” not to mention the specific differences noted above with regard to context and details. The reason that most contemporary scholars—including, of course, myself—focus on specific parts of the SDS argument is precisely because they remind us of most of Hume. So, is the comparison leading the analysis in this case rather than the analysis leading the comparison? What would the SDS argument look like if we *didn’t* consistently compare it to Hume?¹⁸

Is the Anti-Generalization Move the *same* in both cases? And what if the Cārvākas are *not* the same as Hume? Are they perhaps engaging in a different kind of skepticism or something else equally worth exploring? Are the Cārvākas philosophically interesting *whether or not* they’re like Hume? After all, do we need Hume to authenticate the Cārvākas as sufficiently philosophically interesting to be worthy of our attention? What gets smuggled into these comparisons from contemporary Western understandings of philosophical skepticism? What are the effects of framing philosophical topics in terms of Western categories with particular histories of their own?¹⁹

My deeper methodological question is this: What if the Cārvākas or other non-Western texts and figures simply do not fit neatly into categories of modern Western philosophy? While I admit there’s a great deal of philosophical fun to be had in comparing the Cārvākas to Hume, I leave readers with two questions to consider for themselves: What if we engaged with the Cārvāka arguments—as well as their numerous responses within South Asian traditions—in their own terms without the intermediary of Hume or contemporary Western epistemology? What philosophical adventures might await us once we stop pretending that the cartographers of the Western tradition have already mapped out all the philosophical terrain there is to explore?

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I thank Kisor Chakrabarti and A. Minh Nguyen for inviting me to the APA session on which this article is based and for inviting me to contribute to this issue. While I have been questioning my own impulses toward comparative philosophy as of late, nothing I've written here should be taken to impugn the valuable comparative work of these eminent scholars! In particular, readers interested in the vast and sophisticated answers to the Cārvāka Anti-Generalization Move are strongly encouraged to seek out the work of Kisor Chakrabarti I've cited here.

NOTES

1. Mills, "Three Scepticisms in Cārvāka Epistemology."
2. The Standard Cārvākas are also the standard understanding of the Cārvāka tradition as a whole by many scholars of classical South Asian philosophy still today; however, some scholars who delve into the Cārvākas more thoroughly disagree with this assessment. For arguments that the true Cārvāka position was closer to what I call the More Educated/Purandaran variety, see, for instance, Bhattacharya, "Cārvāka Fragments" and "Development of Materialism in India."
3. *Tarka* is sometimes compared to *reductio ad absurdum* in Western philosophy. See Chakrabarti, *Classical Indian Philosophy of Induction*, ch. 4.
4. For introductions to *anumāna* and South Asian logic more generally, see Matilal, *The Character of Logic in India*; Ganeri, *Indian Logic*; Potter, *Presuppositions of India's Philosophies*; and Dasti and Phillips, *The Nyāya-Sūtra*, ch. 1.
5. This is the stock example found in most contemporary sources, e.g., Matilal, *The Character of Logic in India*, 4; Mohanty, *Reason and Tradition in Indian Thought*, 104; and Potter, *Presuppositions of India's Philosophies*, 60. The parts of an *anumāna* are laid out in *Nyāya Sūtra* 1.1.32. Major commentaries by Vātsyāyana and Uddyotakara tend to use the thesis, "Sound is non-eternal," in their examples.
6. For an overview of this version of the argument, see Chakrabarti, *Classical Indian Philosophy of Induction*, 2–7.
7. Mādhava, *Sarvadarśanasamgraha*, 3–4.
8. In Nyāya philosophy, internal perception is dependent upon external perception for matters pertaining to external objects, while internal perception is not dependent on external perception for matters pertaining to internal states (e.g., pleasure and pain).
9. Mādhava, *Sarvadarśanasamgraha*, 4.
10. There were, of course, numerous responses to arguments of this kind in the classical South Asian tradition. The Brahmanical Mīmāṃsā philosopher Prabhakara claims that the pervasion can be known via a single co-presence of the *sādhya* and the *hetu* (Chakrabarti, *Classical Indian Philosophy of Induction*, 9–10), the Buddhist philosopher Dharmakīrti proposed a theory of natural relation (*svabhāvapratibandha*), according to which the *sādhya* and the *hetu* in a pervasion are related either causally or as an identity (Dunne, *Foundations of Dharmakīrti's Philosophy*, ch. 3 and Chakrabarti, *Classical Indian Philosophy of Induction*, 11–12), Jain philosophers like Prabhacandra argued that the pervasion is known by hypothetical reasoning (*tarka*) (Chakrabarti, *Classical Indian Philosophy of Induction*, 10–11), and Brahmanical Nyāya philosophers appealed to parasitism objections, according to which human practices require a default acceptance of *pramāṇas* including inference (Dasti, "Parasitism and Disjunctivism in Nyāya Epistemology" and Chakrabarti, *Classical Indian Philosophy of Induction*). For a helpful overview of these and other responses, see Perrett, *An Introduction to Indian Philosophy*, 91–100.
11. See, for instance, Gupta, "Scepticism"; Gokhale, *Lokāyata/Cārvāka*; Perrett, *An Introduction to Indian Philosophy*, 88–90; Perrett, "The Problem of Induction in Indian Philosophy"; and Chakrabarti, *Classical Indian Philosophy of Induction*, "Nyāya's Response to Scepticism," and "The Problem of Induction."
12. Weintraub thinks Hume simply adds the idea that induction ought to be justified differently than deduction, whereas Sextus

presents the issue as a version of the problem of the criterion, applying as much to deduction as induction. See Weintraub, "What Was Hume's Contribution to the Problem of Induction?"

13. See, for instance, Weintraub, "What Was Hume's Contribution to the Problem of Induction?"; Hetherington, "Not Actually Hume's Problem"; Read and Richman, *The New Hume Debate*; Baier, *A Progress of Sentiments*; and Fogelin, *Hume's Skepticism in the Treatise of Human Nature*.
14. Hume, *An Enquiry Concerning Human Understanding*, sec. 4, pt. 2.
15. Chakrabarti points out that the Cārvākas do not accept memory as a means of knowledge, and Hume is unaware of the issue of *upādhis* (Chakrabarti, *Classical Indian Philosophy of Induction*, 15).
16. In "Development of Materialism in India," Bhattacharya claims that Cārvāka was not a school before the eighth century CE, which relies on taking Purandara and "more educated" Cārvākas as the single type of Cārvākas. My preferred three subschool model might allow for more flexibility. However, it is unclear whether the Anti-Generalization Move was present earlier than Jayarāśi (c. 770–830 CE), although Gokhale claims this type of argument can be found in the seventh or eighth century (Gokhale, *Lokāyata/Cārvāka*, 65 n31).
17. Mills, "Three Scepticisms in Cārvāka Epistemology."
18. For that matter, what would Hume's eighteenth-century argument look like if we didn't filter it through the concerns of contemporary analytic epistemology and philosophy of science?
19. For instance, in the Western tradition, there has been a long association between skepticism and social conservatism, although Hume was not religiously conservative like Sextus and Montaigne. Does this historical association lead us to suppose that the Cārvākas were similarly socially conservative even as they criticized their religious counterparts? Do we assume the Cārvākas' antipathy toward religion motivates them in the same way as Hume's own antipathy toward what he calls "religious enthusiasm"? Furthermore, do comparisons with Hume encourage us to think the Cārvākas were skeptical about reason in general, even though they focused on specific categories of South Asian intellectual history like *anumāna*?

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The "New" Riddle of Induction: Gangesa and Goodman

Kisor K. Chakrabarti
 UNIVERSITY OF VAASA
 KISORCHAK@GMAIL.COM

ABSTRACT

I try to show that both the "classical" problem of induction and the "new" riddle of induction were anticipated and discussed in depth in classical Sanskrit philosophy. I criticize the solutions to both problems by some recent leading philosophers and discuss the solutions to both problems offered by Gangesa (thirteenth century), a great Navya Nyaya philosopher. One main point of Gangesa is that inductions like "all smoky things are fiery" are acceptable or reliable because they have the support of observation of positive instances or observation of negative instances and nonobservation of any counterexample as well as the support of counterfactual reasoning that shows that the denial of these inductions leads to undesirable consequences. However, inductions incorporating fabricated predicates like "grue" are not equally confirmed and are not reliable, because they lack the support of counterfactual reasoning.

The "new" riddle of induction should be distinguished from the "classical" problem of induction that is often credited to David Hume (eighteenth century), though the same problem was introduced long before Hume in classical

Sanskrit philosophy by a legendary figure named Carvaka (sixth century BCE?).¹ Carvaka and Hume tried to show that past and present observed confirmation of a hypothesis does not provide any rational grounds for upholding the hypothesis in the future. To uphold the hypothesis, one must presuppose the conclusions of other inductive arguments, such as that nature is uniform, and, hence, induction is invariably circular. According to both Carvaka and Hume, only individuals exist. Universals or common features are nothing more than concepts or names corresponding to which there is nothing ontologically real.² This viewpoint, whether in the conceptualist version or in the nominalist version, is rejected by Nyaya philosophers. In the Nyaya view, identifying an individual as a human being presupposes awareness of universals such as humanity and being.³

Since such awareness is part of common experience (*anubhava*), like any other common experience, it cannot be dismissed as false without compelling counterevidence (*badhaka*), and there is no compelling counterevidence. Further, something offered as counterevidence may presuppose some common experience. If so, rejecting one common experience while accepting another common experience without compelling evidence could invite charges of arbitrariness and favoritism. One may try to avoid the charges of arbitrariness and favoritism by appealing to something other than common experience. But such attempts could lead either to a vicious infinite regress (*anavastha*) or, to stop the regress, to claiming something to be self-evident (*svatahpramana*) that could revive the charges of arbitrariness and favoritism.⁴

The underlying issues here are complex and require much discussion.

Due to space limitations, after these brief remarks, we move on to the "new" riddle. The "new" riddle, often credited to Goodman, highlights the problematic nature of the relation between observed evidence and future prediction in a different way. Suppose that all emeralds observed are green. This seems to confirm that all emeralds are green and to permit the prediction that the next observed emerald will be green. But now consider the concocted predicate "grue." Something is grue if it has been seen as green whenever it has been observed so far or it has not yet been observed, and it will be next observed as blue. Clearly, the observed evidence that seems to confirm that all emeralds are green also seems to confirm that all emeralds are grue. But then we seem to have two conflicting predictions equally confirmed by the same inductive evidence. If all emeralds are green, the next one should be green, but if all emeralds are grue, the next one should be blue. It can easily be seen that we can fabricate an indefinite number of grue-like predicates and that the same difficulty will arise in each case. That is, if we want to, we can always come up with new fabricated predicates incorporated into empirical hypotheses that will lead to predictions conflicting with those based on commonly accepted empirical hypotheses while both sets of hypotheses seem to be equally consistent with the observed data. Clearly, induction cannot be rational if it leads to contradictory results.⁵ Thus, briefly stated, while according to the "classical" problem,

induction is irrational because it is circular, according to the “new” riddle, induction is irrational because it leads to contradictory results.

Goodman’s own solution is that the riddle does not invalidate induction or the generalization formula as such but presses home the need for criteria to separate projectable predicates like green from cooked-up, nonprojectable predicates like grue. The projectable predicates are essentially the well-entrenched ones. What makes a predicate better entrenched? Essentially, it has a longer history. In Goodman’s own words: “[W]e must consult the record of past projections. . . . Plainly, ‘green’, as a veteran of earlier and many more projections than ‘grue’, has the more impressive biography. The predicate ‘green’, we may say, is much better *entrenched* than the predicate ‘grue’.”⁶

Some critics have complained that such an account of entrenchment leaves the progress of science to luck. Is it merely a stroke of luck that “green” has a longer and more impressive history and biography than “grue”? If so, there is the danger that the growth of science may be stultified by excluding hypotheses with unfamiliar or new predicates. Goodman has responded to the criticism by arguing that entrenchment and familiarity are different concepts. An unfamiliar predicate may turn out to be well entrenched if the coextensive or parent or comparable predicates are already in frequent and wide circulation.⁷

Although Goodman’s theory is more elaborate than our sketch suggests, the criticism has a point. First, Goodman does not show how the danger of excluding new predicates that are not coextensive with or derived from or comparable to other predicates that are already in circulation can be avoided. Second, projectability and entrenchment are, because of the emphasis on history, overly dependent on past projection. But, for Carvaka and Hume, past regularity alone fails to provide rational grounds for future regularity.

W. V. Quine has offered to explain the distinction between projectable and nonprojectable predicates by saying that while the former are true of things of a kind, the latter are not.⁸ Being of a kind depends on similarity. The more similar things are, the more reason that they are of the same kind. Accordingly, a kind is a set of objects that are more similar to a paradigmatic member of the set than they are to something else (called a foil) that is not a member of the set and is too dissimilar to the paradigm.

The difficulty with this view centers around the basis of choosing the paradigm. Is the paradigm chosen because it has certain features or not? If the first, objects should become members of a set by virtue of having all or most of those features, which then are the family of common features that account for membership of the set. Projectability then depends on sharing some common features. But objects in a nonprojectable set, too, may be said to share some common features such as (at least trivially) that they are grue. So, unless we have some reasonable criteria to separate the “right” kind of common features from the “wrong” ones (and none are provided by Quine), the division between projectable and nonprojectable predicates would collapse.

If the second, someone may have chosen the paradigm for no reason and others may have followed suit merely for personal reasons. Projectability then may not have any rational foundation and even inductions with projectable predicates may be irrational. So, once again, it needs to be shown that, although the paradigm is chosen not because it has certain features, the set still has a rational foundation. But Quine has not done that and it is unclear that a rational basis can be provided. Without any doubt, a skeptic like Carvaka or Hume would like to utilize the situation to press home the irrationality of induction.

The new riddle of induction has generated considerable debate in recent decades and many other solutions and their criticisms have been offered. It would take too much space to discuss the merits of these solutions. We instead look briefly at a similar development in Sanskrit logic in the hope of casting some light on this recent controversy.

Take the stock inference of fire on a hill from smoke. The hill is the inferential subject (*paksa*) where, in a typical case, smoke is observed and fire is not. That there is fire on the hill is open to doubt; the doubt is removed by the inference of fire on the hill. The inference is based in part on the general premise or pervasion (*vyapti*) that all smoky things are fiery. The general premise is supported by observation of instances where smoke is found with fire and/or observation of instances where absence of fire is found with absence of smoke. Here, smoke is the pervaded (*vyapya*: something the extension of which is not greater than that of the pervader, *anতিরিক্ত-দেবর্ত্তি*) and fire is the pervader (*vyapaka*: something the extension of which is not smaller than that of the pervaded, *অনুদেবর্ত্তি*). Speaking generally, the pervasion is supported by observation of instances where the pervaded is found with the pervader and/or observation of instances where absence of the pervader is found with absence of the pervaded. The former are positive instances (*sapaksa*) and the latter are negative instances (*vipaksa*).

The inferential subject is neither a positive instance nor a negative instance. In the case of a positive instance, *presence* of the probandum is already reliably known before the inference. In the case of a negative instance, *absence* of the probandum is already reliably known before the inference. But in a typical case of inference, neither presence nor absence of the probandum is reliably known in the inferential subject before the inference. (In atypical cases, however, presence or absence of the probandum may be reliably known in the inferential subject before the inference).

Now take the cooked-up property of “not being either the inferential subject or a negative instance” (*paksa-vipaksa-anyafara-anyah*) cited by the great Navya Nyaya philosopher Gangesa.⁹ This property is true of any positive instance: a positive instance (being where presence of the probandum is reliably known) is not either the inferential subject (where neither presence nor absence of the probandum is reliably known) or a negative instance (where absence of the probandum is reliably known). In the above stock example, a case of this property is not being either the hill or a lake: the latter is true of a fiery kitchen hearth that

is neither the hill nor a lake. It should be clear that, by definition, in typical cases, the property of not being either the inferential subject or a negative instance is present wherever the probandum is reliably known to be present before the inference.¹⁰

It seems to follow that there is a warrant for the generalization that wherever there is the probandum, there is this property; or, put differently, that the property pervades the probandum. In the above stock example, then, there seems to be a warrant for the generalization that no fiery things are either the inferential subject or a negative instance.

At the same time, the property of not being either the inferential subject or a negative instance cannot be true of the inferential subject. If the said property pervades the probandum, absence of the probandum in the inferential subject then follows from absence of that property. But we also reliably know from the same observed evidence that the probans belongs to the inferential subject (in the stock example: the hill is smoky) and that wherever there is the probans, there is the probandum (in the same example: all smoky things are fiery). Thus, the above set of facts seems to warrant inference of both presence and absence of the probandum in the same thing at the same time—a contradiction.

The problem is mainly due to the fact that the same generalization formula that permits the induction that wherever there is the probans, there is the probandum also permits the induction that wherever there is the probandum, there is the said property. It is in this respect that this problem is similar to the new riddle of induction. In Goodman's example, the observed facts seem to support both that all emeralds are green and that all emeralds are grue. If all emeralds are green, the next emerald should be green. But if all emeralds are grue, the next emerald should be blue. This is a contradiction pointing to some possible gap in the generalization formula. In Gangesa's example, the same observed facts seem to support, in a typical case, both that all smoky things are fiery and that no fiery things are either the inferential subject or a negative instance. If all smoky things are fiery, then (since the hill is observed to be smoky) the hill is fiery. But if no fiery things are either the inferential subject or a negative instance, then (since it is true of the hill that it is either the inferential subject or a negative instance), the hill is not fiery. Here, too, is a contradiction pointing to some gap in the generalization formula.

The following is a solution (among others) mentioned in Gangesa's *Tattvacintāmaṇi*.¹¹ Induction does need the support of observation of positive instances or observation of negative instances. Further, there should be nonobservation of any counterexample. Thus, the generalization formula so far comprises observation of positive instances or observation of negative instances and nonobservation of any counterexample. The assumption that this is the whole story, however, leads to the problem. To solve the problem, it needs to be added that a reliable induction must also have the support of additional reasoning to counter the doubt that the induction may be false. The

doubt that an induction may be false is reasonable; an induction includes a claim about countless future cases based on favorable observation of a limited number of past or present cases. But sometimes an induction confirmed in a large number of cases is found later to have a counterexample. So it is reasonable to suppose that a counterexample may be found in other cases where none has been found so far. Such doubt should be countered by additional reasoning that explores the consequences of supposing that an induction is false and shows that an undesirable consequence results from that. Such additional reasoning is called *tarka*, which, for the lack of anything better, we translate as *counterfactual reasoning*. It includes a counterfactual conditional, the antecedent and the consequent of which are false. The following reasoning has been offered in support of the idea that all smoky things are fiery: "If smoke were preceded neither by an aggregate that includes fire nor by an aggregate that excludes fire, smoke would not have come into being."¹²

We reformulate the argument as follows: Gangesa has offered a counterfactual conditional to back up the induction that all smoky things are fiery. The conditional is: if smoke were preceded neither by an aggregate that includes fire nor by an aggregate that excludes fire, smoke would not have come into being. But we observe, it is implied, that smoke does come into being (as when one lights up a cigarette). So the consequent is false. It follows (by applying the implied law of *modus tollendo tollens*) that the antecedent is false. So we derive (by applying the implied De Morgan Law) that smoke is preceded either by an aggregate that includes fire or by an aggregate that excludes fire. Now we have two opposed factual claims, viz., (1) that smoke is preceded by an aggregate that excludes fire and (2) that smoke is preceded by an aggregate that includes fire. It is again implied in Nyaya empiricism (and empiricism in general) that of two factual claims, the one that has observational support is preferable to the one that does not. This may be called the Principle of Observational Credibility (OC). Given OC, it is then accepted that smoke is preceded by an aggregate that includes fire. But to say that smoke is preceded by an aggregate that includes fire is to say that smoke and fire are together.

The skeptical opponent may point out that although smoke and fire are together when smoke originates, they may not be together later and that this leaves open the possibility of smoke existing without fire. To counter this, Nyaya philosophers have modified the induction that all smoky things are fiery to the induction that all smoky things not separated from the preceding aggregate (*avicchinna-mula-dhuma*) are fiery.¹³ The argument thus bestows favor (*anugraha*) to the induction that wherever there is smoke, there is fire. This falls short of absolute certitude. But absolute certitude is out of place for factual claims in the Nyaya view and most empiricists' views in any case.

The above argument implicitly utilizes logical laws like *modus tollendo tollens* as well as OC. While even logical laws are not above challenge, they are as safe as it gets; proponents of inductive skepticism like Carvaka and Hume accept them as well. Accordingly, it is not necessary to argue for them here. As far as OC is concerned, critics

of induction like Carvaka and Hume should not reject it. Although Carvaka rejects an inductive leap into the future as unreasonable, he holds that particular observations may be reliable (*pramanika*) and are the only sources of knowing.¹⁴ Similarly, Hume labels induction as irrational but holds impressions or observations of particulars as the ultimate epistemic foundations.¹⁵ Neither Carvaka's nor Hume's positions can be sustained without OC. The said counterfactual reasoning does not involve induction in any step; hence, the charge of circularity, if raised, would be unfounded.

It may be noted that, in the above counterfactual reasoning, "smoke" and "fire" are quasi-variables that may be replaced by any observable putative pervaded (the extension of which is not greater than that of the intended pervader) and pervader (the extension of which is not smaller than that of the intended pervaded), respectively. Hence, the argument is relevant for empirical inductions in general.

The main point of the solution, then, is that a reliable induction should have the support of observation of positive instances or negative instances and nonobservation of any counterexample and also have the support of counterfactual reasoning showing that the denial of the induction could lead to an undesirable consequence. The undesirable consequence may be a contradiction in action (such as if I speak aloud in so many words, then I am dumb), a belief-behavior conflict (such as is involved in one unwaveringly and invariably avoiding jumping off a tall building while claiming that no uniformities in nature are knowable), a conflict with something reliably accepted, or an acceptance of something that is uneconomical (*guru*).¹⁶

Now let us look at the grue case. As far as the support from observation of at least one positive instance and nonobservation of any counterexample is concerned, both that all emeralds are green and that all emeralds are grue appear to have that support. But there is a difference when it comes to the support from counterfactual reasoning. Suppose that "all emeralds are green" is false and that the next emerald to be seen is not green. Then that emerald will not complement red, for only green complements red. But the next emerald may be observed to complement red and that would conflict with the supposition that it is not green. Thus, the assumed denial of the induction that all emeralds are green has the undesirable consequence that it invites the risk of conflict with what may be observed in the next case. Now suppose that "all emeralds are grue" is false and that the next emerald to be seen is not blue. No undesirable consequence follows. Even if the next emerald is observed to complement red, there is no incongruence: something not blue may complement red. Hence, "all emeralds are grue" fails to qualify as a reliable induction.

Further, compared to grue, green is simpler with respect to constitution (*sarira*), i.e., grue contains more concepts than green. Compared to grue, there is also greater economy in the cognitive order (*upasthiti*) as far as ordinary discourse is concerned: in ordinary discourse, awareness of grue cannot take place without awareness of green, but awareness of green can take place without awareness

of grue. So green is preferable to grue in terms of some principles of economy (*laghava*) as well.

Unlike Quine's position, the Nyaya solution does not hinge on deciding which predicate represents a kind and which predicate does not—a task that appears to be fraught with difficulties to say the least. Again, unlike Goodman's position, this solution is not pinned down to checking the history of how often a particular predicate has been projected and does not leave the choice between two predicates to counting which predicate (along with coextensive or parent or comparable predicates) has been projected more often in the past. So the test that an induction is not reliable unless its assumed denial leads to an undesirable consequence does not leave the progress of science to luck and does not forbid the introduction of new predicates. Needless to say, the undesirable consequences may result equally from future developments. An induction that passes the test now may fail it in the future. There are no guarantees in nature. Since Gangesa is a fallibilist, he also does not try to find one.

It is remarkable that both Gangesa and Goodman (though centuries apart and belonging to quite different philosophical traditions) have cited fabricated disjunctive predicates to press home the "new" riddle of induction. One may ask if disjunctive predicates are essential for this riddle and, if so, whether disjunctivity plays a critical role in providing a solution to the riddle. Indeed, a claim along these lines has been made by Wolfgang Freitag.¹⁷ Freitag has argued that the grue hypothesis (as distinguished from the green hypothesis) is not projectable because the grue-evidence epistemically depends on the evidence for a defeated hypothesis.

Freitag has offered a different strategy for the "independence" approach to the grue paradox, different versions of which seem to have been advocated by T. E. Wilkerson, John Moreland, Frank Jackson, and others.¹⁸ A key problem with the independence approach lies in precisely characterizing "independence" so that multifarious grue-like predicates could be shown to be unprojectable; there seem to be difficulties in different recent accounts.¹⁹ Instead of trying to recharacterize "independence," Freitag has introduced the theory of doxastic dependence relations that are counterfactual relations holding between our different beliefs.

Despite many subtleties in Freitag's theory that we skip due to space limitations, Freitag's theory may be vulnerable because of overemphasis on disjunctivity while searching for a solution. Indeed, it goes to the credit of Gangesa that he has shown that nondisjunctive predicates, too, may lead to the same problem. For example, take the nondisjunctive predicate "not being the inferential subject" (*paksetara*).²⁰ Since the probandum, by definition, is present in every positive instance that again, by definition, is not the inferential subject (where neither presence nor absence of the probandum is known, in typical cases, before the inference), it follows that "not being the inferential subject" may seem to pervade the probandum. But "not being the inferential subject" cannot be true of the inferential subject. Thus, absence of the probandum in the inferential subject

follows from absence of “not being the inferential subject,” the pervader. But it is also known from the same inductive evidence in the stock inference of fire on the hill cited above that smoke that is reliably known to be pervaded by fire is present on the hill. Thus, it follows both that fire is absent in the inferential subject (because of the absence of the pervader) and that fire is present in the inferential subject (because of the presence of the pervaded) and, once again, we have a contradiction.

Gangesa discusses the issue at length. Due to space limitations, we mention the main point of a suggested solution. Since it is possible that fire is present in the inferential subject where “not being the inferential subject” is necessarily absent, there remains the lurking doubt that “not being the inferential subject” may not pervade the probandum. Unless the doubt is obstructed by counterfactual reasoning (and none are available), that “not being the inferential subject” pervades the probandum is open to doubt and not reliable. Accordingly, the same observed evidence that permits (with the support of counterfactual reasoning) the induction that smoke is pervaded by fire does not permit the induction that the probandum is pervaded by “not being the inferential subject” (because of the lack of support from counterfactual reasoning). Thus, the contradiction is resolved.

It should be noted that Gangesa has introduced other nondisjunctive predicates as well and shown that they are equally problematic.²¹ Thus, it is possible that both multifarious disjunctive and nondisjunctive predicates may lead to the grue-like problem.

If the above makes sense, Freitag’s account, because of over-emphasis on disjunctivity, may not provide a sound solution. Gangesa’s solution with reference to counterfactual reasoning may have more promise. Again, one main point is the following: Given the old generalization formula, the same inductive evidence that permits the induction that smoke is pervaded by fire also permits the induction that the probandum is pervaded by the property of not being the inferential subject (and other problematic properties). Accordingly, the same inductive evidence seems to lead to the contradiction that the probandum is both present and absent in the inferential subject at the same time. Gangesa’s solution, as said, involves reformulating the generalization formula by adding the condition that an acceptable induction must also have the support of counterfactual reasoning. While some recent philosophers have restricted the discussion to only disjunctive properties (as mentioned above), Gangesa has gone deeper and dealt with both disjunctive and nondisjunctive properties and provided a solution that may work for all such problematic properties.

In the *Tattvacintāmaṇi*, Gangesa comprehensively discusses a wide range of logical, metaphysical, epistemological, and ethical topics—such as meaning, reference, truth, knowledge, perceptual error, fallacies, analogy, pervasion, induction, deduction, definition, universals, negative entities, the atomic theory, the self, God, materialism, hedonism, consequentialism, and deontological ethics—with exemplary depth, originality, and rigor. Gangesa has deeply influenced the Navya Nyaya school that has

produced a large number of philosophical works of exceptional technical clarity and precision and is alive today. Without any doubt, a serious, devoted, and patient reading of the *Tattvacintāmaṇi* (that is a massive work written in a thoughtfully organized but extremely condensed style) will show that he is a great philosopher whose work is beneficially relevant for contemporary philosophy. The above brief discussion of a part of the chapter on *upadhi* or pervasion defeaters is a pointer in that direction.

NOTES

1. P. T. Raju, *Structural Depths of Indian Thought* (Albany, NY: State University of New York Press, 1989), chap. 3; and Kisor Kumar Chakrabarti, *Classical Indian Philosophy of Induction: The Nyaya Viewpoint* (Lanham, MD: Lexington Books, 2010), chap. 1.
2. Kisor Chakrabarti, “The Nyāya-Vaiśeṣika Theory of Universals,” *Journal of Indian Philosophy* 3, nos. 3-4 (1975): 363-82.
3. Chakrabarti, “The Nyāya-Vaiśeṣika Theory of Universals.”
4. Chakrabarti, “The Nyāya-Vaiśeṣika Theory of Universals.”
5. Nelson Goodman, *Fact, Fiction, and Forecast*, 4th ed. (Cambridge, MA: Harvard University Press, 1983), chap. 3.
6. Goodman, *Fact, Fiction, and Forecast*.
7. Goodman, *Fact, Fiction, and Forecast*.
8. W. V. Quine, “Natural Kinds,” in *Ontological Relativity and Other Essays* (New York: Columbia University Press, 1969), 114–38; reprinted in *Grue!: The New Riddle of Induction*, ed. Douglas Stalker (Chicago: Open Court, 1994), 41–56.
9. *The Tattvacintamani of Gangesa Upadhyaya*, Volume 2, ed. Kamakhyanath Tarkavagisa (Delhi: Chowkhamba Sanskrit Pratisthan, 1990), 403–04.
10. The said property is also not true of any negative instance: it is not true of any negative instance that it is neither the inferential subject nor a negative instance, for it is a negative instance, and if something is a negative instance, it is also either the inferential subject or a negative instance (i.e., an inclusive disjunction is true if and only if either disjunct is true). Thus, by definition, in typical cases, wherever there is absence of the said property, there is absence of the probandum.
11. *Tatra anukula-tarka-abhavana sadhya-vyapakatva-aniscayat sahadhara-darsanadeh tena vina samsayakatvat*: due to the lack of supportive counterfactual reasoning, pervasion of the probandum (by the said property) is uncertain; without that (the counterfactual reasoning) observation of co-presence and so on is subject to doubt (i.e., is not a reliable or acceptable base for the inductive claim). See *The Tattvacintamani of Gangesa Upadhyaya*, 355.
12. *Dhūmo yadi vahni-asamavahita-ajanyatve sati vahni-samavahita-ajanyah syat, notpannah syat*. See *The Tattvacintamani of Gangesa Upadhyaya*, 219.
13. Panchana Shastri, *Samgraha on the Siddhanta Muktavali of Visvanatha*, 3rd ed. (Kolkata: Sanskrit Pustak Bhandar, 1972), 119.
14. Chakrabarti, *Classical Indian Philosophy of Induction*, chap. 1.
15. Chakrabarti, *Classical Indian Philosophy of Induction*, chap. 1.
16. Shastri, *Samgraha on the Siddhanta Muktavali of Visvanatha*, 204.
17. Wolfgang Freitag, “The Disjunctive Riddle and the Grue-Paradox,” *Dialectica* 70, no. 2 (2016): 185–200; and “I Bet You’ll Solve Goodman’s Riddle,” *Philosophical Quarterly* 65, no. 259 (2015): 254–67.
18. T. E. Wilkerson, “A Gruesome Note,” *Mind* 82, no. 326 (1973): 276–77; Frank Jackson, “Grue,” *Journal of Philosophy* 72, no. 5 (1975): 113–31; John Moreland, “On Projecting Grue,” *Philosophy of Science* 43, no. 3 (1976): 363–77; and Jared Warren, “The Independence Solution to Grue,” *Philosophical Studies* 180, no. 4 (2023): 1305–26.
19. Wilkerson, “A Gruesome Note”; Jackson, “Grue”; Moreland, “On Projecting Grue”; and Warren, “The Independence Solution to Grue.”

20. *The Tattvacintamani of Gangesa Upadhyaya*, 301.
 21. *The Tattvacintamani of Gangesa Upadhyaya*, chapter on *upadhi* or pervasion defeaters.

Entrenchment, Postulation, and Phenomenal Evidence

Gordon Haist
 UNIVERSITY OF SOUTH CAROLINA AT BEAUFORT
 GKHAIST@USCB.EDU

ABSTRACT

Attempts to describe properties of induction since Goodman's "new riddle of induction" show an interesting variety. Goodman based lawlike generalizations on the projectability of "entrenched" predicates. Quine, following that, suggested predicates were entrenched in natural kinds. According to Norton's material theory of induction, however, all induction is local, based on facts and not on universal schemas. Facts become material postulates. Gangesa's fourteenth-century response to the centuries-old skeptical challenge initiated by Cārvāka presented a theory of direct perceptual knowledge based on universal-based extraordinary perception and strengthened by counterfactual reasoning. Gangesa's approach suggests a way to read entrenchment as perceptual, not habitual as with both Goodman and Hume, and to read material postulates as *gestalt*-like facts. If supportable, this might provide a phenomenal and even phenomenological reading of inductive evidence. Thus, the paper concludes with a comparison of Gangesa's extraordinary perception and the concept of evidence in Husserl's phenomenology.

THE SKEPTICAL CHALLENGE

The effort to reason what lies beyond or even ahead of us has been fraught with doubt for millennia. In India's recorded history, the doubt was formed long ago in Cārvāka's sixth century BCE materialist philosophy. Cārvāka's rejection of inference as a knowledge source became the challenge to address for subsequent Hindu, Buddhist, and even Jain philosophers in India. Their combined exchanges over the problem of doubt anticipated the rich discourses of the Hellenistic period and paved the way, ultimately, for induction's "old riddle" (Hume) and "new riddle" (Goodman) views.

In the third century BCE, the philosopher Pyrrho traveled with Alexander to India. There he was exposed to Cārvāka's materialist orientation, which evidently accorded with Pyrrho's own Democritean, atoms-based philosophical orientation. Pyrrho then returned to Greece and reputedly lived an inference-free lifestyle, liberating his beliefs from all dogma and maintaining, Diogenes Laertius tells us, that "nothing is honourable or base, or just or unjust, and that likewise in all cases nothing exists in truth; and that convention and habit are the basis of everything that men do; for each thing is no more this than this."¹ Pyrrho relied on his perceptions as his only guide and would relativize dogma in a skeptical way by countering it with

possible alternatives to the contrary. This model of how to live well, that is, free of absolutes and devoted only to the pleasures produced by the senses, provided Sextus Empiricus the inspiration for shaping Pyrrhonian skepticism into a prominent philosophy in third century CE Hellenistic thought.

Two millennia later, it turns out that Cārvāka also anticipated in surprising detail the skeptical philosophy of David Hume. Cārvāka distinguished between external perception, which occurs in the present, and internal perception, which is dependent on external perception.² Attacking syllogistic reasoning which sought to guarantee certainty, Cārvāka argued that neither external nor internal perception unconditionally reveals an invariant connection that could unite the subject-term and the object-term of an inference, an invariance necessary for deriving a propositional truth. From seeing smoke on the hill to knowing the hill is on fire requires knowing that where there is smoke, there is fire, a universal causal connection unsupported by the perception of smoke alone. Unlike the eye, which causes perception mechanically, what the mind infers from what the eye sees cannot be established as causal. For apart from the present seeing, the "universal proposition which was to embrace the invariant connection [for all past and future seeings] . . . becomes impossible to be known."³ For Cārvāka, the mind knows only what the senses deliver, and the senses do not deliver—or support—causal knowledge. To claim they could would result in an infinite regress, starting with the question, "What causes this cause?" (since, in the present, none is perceived).

Hume, in his time, also defined causation as a two-fold relation, as both a natural relation and a philosophical relation. We relate naturally the ideas we draw by association from perception. For the philosophical relation, "precedency and contiguity" between cause and effect must be established, and these "can never be an object of reason" but only a matter of custom.⁴ Experience produces conjunctions of objects, and custom or habit leads to their future expectation. But imagination, not reason, is the foundation of all memory, sense, and understanding.⁵ Thus, we allow ourselves to assume the continued existence of objects and reason causally, even though cause and constancy are the product of our own convictions, of our fancy, and not perceived through our senses.⁶

Both Cārvāka and Hume claim that the invariance or constancy of nature could not be known. For Hume, however, our beliefs have to align with what our senses tell us of the modern world. Charles Hendel comments:

The remarkable thing about both [of Hume's] definitions is that they do not represent to us what causation is in itself. Causation is *relative* both to the character of physical objects and to the nature of the human mind. It is this conclusion which entitles Hume to liken his study of the world of knowledge to Newton's study of the world of matter and motion.⁷

In the twentieth century, Hume became the bedrock for logical positivism. To account for causation, A.J. Ayer

contended that Hume did not seek to deny it but to define it.⁸ Hume actually held that causation's necessary connection between objects "exists in the mind, not in objects."⁹ His theory of human nature was based entirely on the impressions we receive from the world: impressions of the understanding (which give us our beliefs), impressions of reflection (our passions), and impressions of our sentiments (from which spring our morals). From these impressions we shape our understanding and the desires and the will to direct our behavior. In place of a definition, what Hume provides is a clearing of the philosophical air: all impressions result from perception and the gap remains, as it did with Cārvāka, between what we claim to know and what we actually perceive.

Positivism, however, focuses on the logical structure of causation. Causal inferences are inevitably circular if they are based on relations between distinct perceptions judged to be, but not seen as, causally connected, which was Hume's point. To judge a connection that cannot be seen is to impute to the world a superstition drawn from the mind. For this reason, Ayer changed the topic.

He shifted away from the psychological question, how our knowledge originates, to the logical question, how knowledge is certified.¹⁰ Certifying knowledge meant verifying it, which seemingly avoided the problem of induction and its unprovable thesis of nature's uniformity. Ayer did not mince words. He called this problem of presumed uniformity fictitious.¹¹ No reasoning based on it could be known to be true. Propositions relying on it would be meaningless instead. Verification dispensed with it and served as the criterion for determining whether any proposition is cognitively meaningful.

To be cognitively meaningful, a proposition must be factually significant, that is, capable of being proved through observations. This notion of verification evoked a rebuke from Russell that one cannot "without incurring an endless regress, seek the significance of a proposition in its consequences, which must be other propositions."¹² But the path was now open from the old riddle of predicting the future to the new riddle of testing statements and "verifying" their projectable predicates and lawlike behavior.

My purpose in engaging this history is to provide a perspective on the logic of induction as it developed over the centuries. Innovative formalisms were introduced in the early part of the century, raising important questions about logical structure. This had a negligible effect on the ongoing use of induction in the dramatically innovative twentieth century, but that in itself is significant. Inductive reasoning does not lend itself to formalism, but it does operate in the same world that formalism attempts to frame. That is the world in which Russell held that "the present king of France is bald" has meaning even though the statement fails to denote, and the world that Wittgenstein framed as facts in logical space.¹³ In the view that we shall be examining presently, "the present king of France is bald" would have a logical structure of material implication with content that cannot be true due to an out-of-place adjunct or failed denotation. In the world of facts in logical space, the facts depend on

the logic of noncontradiction in order for propositions to determine places in this space.¹⁴ The point is that there is a connection between logical structure and the content of inductive inferences. Was Cārvāka's problem simply that he failed to appreciate the logical structure of induction? This brings me to John D. Norton's theory of material induction. Norton holds that all induction is local, drawn from facts without the formalism of universal schemas.

MATERIAL INDUCTION

Hendel's illuminating comment, quoted above, drew a comparison between the world of knowledge Hume wrote about and Newton's world of matter and motion. If you recall, Hendel said that Hume did not define causation itself but treated it as *relative* both to the character of physical objects and to the nature of the human mind. Hume's experimentalism in moral philosophy suggests the benefit of comparing impressions and matter, respectively, to thoughts and planetary movement. The spin of the one implies or coincides with the spin of the other, so to speak. The comparison also deformalizes the world of knowledge to explore its dynamics, meaning the "forces" of association between sense impressions and ideas which are, for the alert Humean observer, more telling than the causal claims made of them. To go further along this route would be to deformalize induction entirely and to study the pull of knowledge into a coherent world of facts.

That is what John D. Norton proposes to do.¹⁵ He holds that all induction is local. As a scientist, Norton maintains that his method is to minimize inductive risk by relying on material postulates, i.e., facts that license local inductions,¹⁶ amassing as much evidence as possible, and expanding inductive inference strategies that provide resources for accurate predictions.¹⁷ His point is that it is possible to convert inductive risk to "presumptive risk," that is, the risk associated with assessing facts as material postulates.¹⁸ "Crudely, the more we know [of facts in a domain], the better we can infer inductively. . . . The mere fact of learning more will augment their inductive powers automatically."¹⁹ Facts, we might say, speak for themselves.

But facts do not always speak for themselves. Alchemy, totemism, and Arrow's Impossibility Theorem (which holds that collective decision-making based on a fair ranked-voting system of three or more choices fails to rank individual preferences successfully) are evidence to the contrary. Sets of facts cohere upon occasion, comprising a collection from which the form of inferences can be drawn. The history of medicine, the study of evolution, and even the social choice theory that led to Arrow's Impossibility Theorem are cases where factual coherence has led to progress. As I read the relation between types of risk, inductive risk reduces to presumptive risk as facts cohere and give rise to the greater likelihood that an inference drawn from them will be supportable or provable. The model here is not a linear unfolding but appears to be more the figure of a *gestalt* whole which becomes greater than the sum of its parts. The trials of solving COVID-19, the inductive risk evolution predicts of species vulnerability through global warming, and Amartya Sen's use of social choice postulates to inform the theory of justice are, in my view, *gestalt*-like accomplishments.²⁰

The central issue in material induction is between the general and the specific. The general involves contentless logical structures such as Bayes's Theorem and probability theory. The specific refers to facts in a given domain. Because the logical structures are contentless, they appear as formulae or universal prescriptions for use when objectives are clear. The problem of drawing too sharp a distinction between these levels is touched on in a footnote on brute facts, where Norton acknowledges that universal knowledge is presupposed of "ball" and "red" in the singular fact "the ball is red."²¹ Hence, on one level as the other, the general or the specific, logic and ontology appear to get mixed up; the semantics is tangled. We might think of "ball" and "red" as types that serve as tokens when instantiated in the singular statement "the ball is red." That brings to mind another acerbic comment by Russell: "Seeing that nearly all the words to be found in the dictionary stand for universals, it is strange that hardly anybody except students of philosophy ever realizes that there are such entities as universals."²²

In quite different contexts, the interfusion of particulars and universals is what Husserlian phenomenology sought to clarify through its use of transcendental reductions—with limited success, if one takes Derrida's critique seriously that the method was rich on expression but thin on indication or reference. One can also detect Wittgenstein's later embrace of language-game analyses in place of the rich logical structure of the *Tractatus* as a movement in the same direction. Norton's material induction appears to work through the same problem but with an important refinement. It seeks to unite the two levels into a workable whole, treating facts in a given domain as interrogation points or material postulates and using logical schemas as purely localized means of directed inquiry. But there is a sense of transcendence unspoken here. We seem to be moving from tokens to types, from logical terms to ontological commitments. What, then, is a fact? And is there a fact, beyond words that predicate a quality of a subject, that is not embedded with other facts and capable of being typecast with them? In Nelson Goodman's study of counterfactuals, the flow goes in reverse, from statements of ontology to linguistic comparisons between statements. As a scientist, Norton seeks to make facts speak; as a theorist, Goodman strives to shape the language we use to reason about facts.²³ Space prevents me from pursuing this further. But if headway is to be made here, the value of logical structure should not be underestimated in inquiry.

THE NEED FOR LOGICAL STRUCTURE

The type/token distinction and Russell's dictionary comment are examples of the interpenetration of universals and particulars in routine perceptual encounters. Charles Sanders Peirce's observation that logic is semiotics, "the quasi-necessary, or formal, doctrine of signs,"²⁴ proposes an important structural link between inductive reasoning and connections made in experience. More to the point, however, is that, long before Peirce's theory of "abstractive observation," the logical structure of perception was seriously studied by Gangesa and others as an effective response to the skeptic. Modern phenomenology, responding in its own way to the skeptic, also treated rigorously the logical structure of perception. Its founder, Edmund Husserl,

introduced the concept of an eidetic perception, not to be confused with ordinary sense perception but a perception made by thought. "Experiencing, or *intuition of something individual* can become transmuted into *eidetic seeing (ideation)*," he writes.²⁵ Jitendranath Mohanty clarifies this insight to show its move from fact to essence: awareness of essence is based on a prior perception of an individual fact, while empirical perception "is not so founded, it being the absolute first!"²⁶ I shall return to this later, but for now, let us turn to Gangesa's use of logical structure.

GANGESAS JUSTIFICATION OF INDUCTION

Gangesa worked out a method for interfusing logical structure with content. Calling it "the deductive-epistemic justification of induction," Kisor Kumar Chakrabarti credits Gangesa for recognizing that logical truths (for example, "all *S* is *P* or not-*P*") make it possible to provide an epistemic justification of induction and therefore to resolve Cārvākan-styled doubt. "All smoky things are either fiery or not fiery" instantiates a logical truth; "All smoky things are fiery" expresses a contingent truth or truth-claim. "The genius of Gangesa," Chakrabarti writes, "lies in discovering how certain logical truths (together with the principle OC [Observational Credibility] that is understood) can be utilized in supporting an empirical generalization and thereby countering the skeptical challenge."²⁷

Gangesa's method relies on observational credibility throughout its stages. Chakrabarti details its moves as follows. Given two mutually exclusive and collectively exhaustive alternatives, if one is observationally more credible and reliable, then it provides a reason to examine the aggregates associated with it to determine what could have produced the effect witnessed. Thus, the smoke on the hill was either produced or it was not. Accepting that it is only credible that it was produced, the aggregate that includes fire (even though it may include other adjuncts, a donkey sighted in the vicinity, for example) is preferable to the aggregate that excludes fire. The aggregate that includes fire "favors accepting that fire is a constant causal condition of smoke and thus that the induction that wherever there is smoke there is fire is reliable,"²⁸ a conclusion that is warranted if and when other adjuncts can be eliminated through counterfactual reasoning.

Logical truth (*A* or not-*A*) functions in this justification by providing the ontological grounding for the empirical truth induced from it. It clarifies the ontological commitment required for empirical truths. At the very least, any possible ontology must state the way of all things such that contingent statements can have truth value. Thus, climate change deniers make the unjustified claim that global warming is a hoax because they hold that such change can both be and not be, that is, both witnessed and denied. ("Why is it so cold when the globe is supposedly warming?" a US president sarcastically quipped.) Alternatively, inferences based on perception can be true on the condition that they conform to the way things are, to an ontology framed by logical truths (which is why we confidently accept only rational explanations for UFOs and paranormal occurrences).

By incorporating logical truths, Gangesa's justification of induction succeeds where the inductive justification of induction fails. To return for the moment to material induction, if the task is to predict likelihoods based on present evidences, material induction succeeds. For, unlike formal inductions, it does not separate factual content from formal schemes.²⁹ That, indeed, is its appeal. But it does not escape regress, which for the inductive justification of induction is infinite and its Achilles heel.

Facts are inductively grounded in other facts; and those yet in other facts; and so on. As we trace back the justifications of justifications of inductions, we are simply engaged in the repeated exercise of displaying the reasons for why we believe this or that fact within our sciences.³⁰

This repeated display can only occur with logical truths failing to ground the reasoning. Peirce perhaps said it best when he held that a logical principle "can add nothing to the premises of the argument it governs, although it is relevant; so that it implies no fact except such as is presupposed in all discourse."³¹ Logical structure is important but, as we shall see in the case of phenomenology, it is also important to pay heed to how it is being used.

GANGESA'S UNIVERSAL-BASED EXTRAORDINARY PERCEPTION (UBESC)

To defend universals in perception makes observations more than factual. It makes them credible as well. Gangesa does not deny that skepticism may sometimes be warranted. The skeptic who sees no fire in the smoke beyond denies that it is there. His grounds are that either it is there or it is not, and perception defers to the latter position. He judges, in other words, on the basis of ordinary perception. But this judgment should not be reached without examining the greater resources of evidential reasoning. Aristotle held that if some perception is lacking, some understanding is also lacking, for induction depends on particulars, while "demonstration" (deduction) depends on universals. An understanding "can be got neither from universals without induction nor through induction without perception."³²

What the skeptic's perception lacks, Gangesa says, is the extraordinary perception of universals. The skeptic knows smoke and does not see fire. His understanding lacks the awareness that smoke is produced by fire. By providing the logical structure for an adequate answer and by using counterfactual reasoning to ascertain that no other adjuncts in the aggregation that includes fire could have produced the fire, Gangesa provides an alternative to skepticism by pointing out that the smokiness of the perceived smoke is caused by fire.

Speaking of pots and potness, however, Chakrabarti writes:

It is true that all pots can be known through UBESC with such a common feature as knowability. But in an awareness of a pot as a knowable, the qualifier is knowability and not potness. This is significantly different from the awareness that that is a pot with potness as the qualifier. It is the latter and not the

former that is opposed to the doubt if that is a pot or not. So, the said kind of doubt cannot be ruled out.³³

So the skeptic is not always wrong. Knowing that an object is a pot is not knowing what potness is, such that even an unusual object can also be accurately qualified as having potness. Whether the appearance (pot, smoke on the hill) is the reality (potness, fiery smoke on the hill) depends on the qualifier sought and the question asked. The skeptic depends on what he recognizes in his perceptions and cannot be refuted except by proving his judgment is contradictory rather than merely contrary. In that case, UBESC does not provide grounds for a causal connection.

Gangesa's strategy, in sum, is to first provide the logical structure for a possible answer, then to ascertain by counterfactual reasoning that the probans does not contain an adjunct which disqualifies the inference considered. If the subject is smoke on a distant hill, where further information is lacking, extraordinary sensory perception is needed in place of ordinary sense perception. UBESC is extraordinary because it is based on the reliability of the perception and the knowability of the universal which allows specific sightings to vary individually. It avoids the nominalism of the skeptical view, a nominalism that insists solely on seeing as believing.

There does remain the possibility that skepticism could be refuted by showing what it means for the universal to be perceived through the particular. As said before, Nyaya thought accepts the universal as perceived, and Gangesa built his theory of extraordinary perception on this view. What actually is extraordinary is not that universals are perceived but that the perceiver acquires knowledge through perception about particulars of a type, including particulars not seen. When combined with counterfactual reasoning to ensure against error, all this provides a justification of induction.

Here it is important to establish how universals are perceived. The pot is the object of an ordinary perception, and its potness inheres in it. Its potness then can be the object of extraordinary perception. Analogous to what Mohanty said in the passage quoted earlier concerning intuition and eidetic seeing in Husserl, ordinary perception comes first, and extraordinary perception is grounded in it. In ordinary perception, the two are copresent in the same act of sensation when the pot is recognized as having potness. The perceived pot is individual and contingent; it is a particular thing. The potness perceived through it, however, is universal. Its universality is necessary for there to be individual variations of other particular pots. Its universality also prepares for subsequent acts of reflection which recognize it across variations. This brings me to an important object lesson concerning conceptual boundaries drawn from Husserlian phenomenology.

HUSSERL AND THE QUEST FOR PHILOSOPHY

The relevance of Western phenomenology to Indian thought should be more obvious than it is, to judge by the literature. Like "philosophy," "phenomenology" is a Western concept, just as "grammarians" represents a long-held tradition of

Indian thought, and names of schools of thought often tend to be treated as borders. Structural linguistics and Derrida's *Of Grammatology* crossed this linguistic border in the last century, and Harold Coward's study of *Derrida and Indian Philosophy* provides a bridge in the philosophy of religion for comparative analyses. Coward notes that Indian philosophy in the previous century anchored its differences to modern Western thought, Kant and Hegel in particular.³⁴

There is, however, a natural if not a common ground between Indian and Western thought, which this essay addresses. That concerns the interrogation of phenomenal evidence in ancient skepticism and the grammarian responses to it, as well as the effort to describe phenomena in Western phenomenology. It is at this juncture that Husserl's distinction between essence and fact becomes relevant for our analysis.

Husserl holds that individuals are contingent but, in respect of their essences, they could be otherwise. This contingency or factualness, however, "has the character of *eidetic necessity* and with this a relation to *eidetic universality*."³⁵ In holding this view, Husserl is committed to a double sense of "evidence" or "truth." Evidence is, he says, a mental seeing of something itself.³⁶ It is *adequate* when given as itself and *apodictic* when it cannot be doubted. In describing the phenomenology of reason, he describes what could be called intellectual sight:

What we usually call evidence and *intellectual sight* (or *intellectual seeing*) is a positional, doxic, and *adequately* presentive consciousness which "excludes being otherwise"; the positing is motivated in a quite exceptional manner by the adequate givenness and is, in the highest sense, an "act of reason."³⁷

This is, at best, a very dense description, but its dynamic attempts to heighten adequate givenness to the exceptional level of apodicticity, which is only accessible through an act of reason.

Later, in the first *Cartesian Meditation*, this integration no longer appears as seamless. There Husserl will describe apodictically perfect evidence as evidence that can actually be inadequate, even though it is "absolutely unimaginable" that its being could be doubted.³⁸ Studying this complication, Jua Himanka argues that there are actually two phenomenologies at odds in Husserl's works: a purely descriptive phenomenology based on adequate evidence and a transcendental philosophy based on a Cartesian-inspired apodicticity.³⁹

Concerning the latter, modern philosophy in the West began with Descartes's *cogito* argument: I think, therefore I am. The sense of indubitability in this argument convinced Husserl that his descriptive studies of phenomena could become a philosophy only if they proceeded from a similar apodicticity. Otherwise, they would reduce to a psychology which his earlier work, the *Logical Investigations*, had devoted an inordinate amount of time refuting. Yet, in the end, he found no way to replace adequacy with the priority of apodicticity. Himanka explains: Experience is

temporal, and "reflection that reaches for primordially is done before one enters into action. . . . Husserl even writes that timely being cannot even be apodictically known." Hence, Himanka asks, "Which of these two possibilities—experience and adequacy, or reflection and apodicticity—is then primordial?"⁴⁰

The answer is obvious. Even though Husserl continued to hope that phenomenology could be anchored in apodicticity, for Himanka, this was the least interesting of its possibilities. Experiential adequacy is what gives phenomenology its distinctive edge in the pursuit of lived experience. Phenomenology was, and still remains, a source of interest and inspiration through its descriptive studies of experiential adequacy.

CONCLUSION

From Cārvāka to Gangesa to Husserl, the study of evidence can be cast in the broader context of the search for truth. Throughout these traditions, the challenge has been to reconcile the claims of perception to those of reason. Yet this challenge quickly becomes a contest between the irresistible demands of change and the seductress of reason in ordering them. This is the pivot that Himanka describes well in Husserl's thought: "Husserl tried to combine the phenomenological view of experience with the philosophical view of certain foundation. In order to do this, he has to replace the priority of experience (adequacy) with the priority of reflection (apodicticity)."⁴¹

The difference between Gangesa and Husserl in this respect is that Gangesa does not attempt to systematize his philosophy. Instead, he utilizes it as an aid to perception. Husserl, on the other hand, appears to have undermined his phenomenology in an effort to institute a transcendental philosophy. Phenomenology since then has survived largely by abandoning the temptations of transcendentalism. Learning, with Gangesa, to use reason to address the extraordinary *in* perception seems pragmatically more effective. In the philosophy of induction, this approach suggests that facts treated as material postulates are decidedly more open to variations that give a perceptual hint of the extraordinary than are projectible predicates which have been well-entrenched through previous usage.

NOTES

1. Diogenes Laertius, *Life of Pyrrho* 9.61, as quoted in *The Hellenistic Philosophers, Volume 1: Translations of the Principal Sources, with Philosophical Commentary*, trans. and ed. A. A. Long and D. N. Sedley (Cambridge: Cambridge University Press, 1987), 13.
2. The Nyaya view, discussed later, agrees that internal perception is dependent on external perception for external objects, but not for internal states such as pleasure and pain, which internal perception apprehends directly.
3. Charvaka, *The Spirit of Charvaka Lokayata: From the Sarva-Darsana-Samgraha* (Orlando, FL: CreateSpace Independent Publishing Platform, 2017), 17.
4. David Hume, *A Treatise of Human Nature* (London: Oxford University Press, 1888), 170.
5. Hume, *Treatise*, 265.
6. Hume, *Treatise*, 266.
7. Charles W. Hendel, *Studies in the Philosophy of David Hume* (Indianapolis, IN: Bobbs-Merrill Company, 1963), 176.

8. A. J. Ayer, *Language, Truth and Logic* (New York: Dover Publications, 1946), 54.
9. Hume, *Treatise*, 165.
10. Ayer, *Language, Truth and Logic*, 137: "But while it must be recognized that scientific laws are often discovered through a process of intuition, this does not mean that they can be intuitively validated. . . . [I]t is essential to distinguish the psychological question, How does our knowledge originate? from the logical question, How is it certified as knowledge?"
11. Ayer, *Language, Truth and Logic*, 50.
12. Bertrand Russell, "Logical Positivism," in *Logic and Knowledge: Essays 1901–1950*, ed. Robert Charles Marsh (London: George Allen & Unwin, 1956), 377.
13. Ludwig Wittgenstein, *Tractatus Logico-Philosophicus*, trans. D. F. Pears and B. F. McGuinness (London: Routledge & Kegan Paul, 1961), ¶1.13; 7.
14. Wittgenstein, *Tractatus* ¶3.4: "A proposition determines a place in logical space."
15. John D. Norton, "A Material Theory of Induction," *Philosophy of Science* 70, no. 4 (2003): 647–70.
16. Norton, "A Material Theory of Induction," 650.
17. Norton, "A Material Theory of Induction," 664.
18. Norton, "A Material Theory of Induction," 655.
19. Norton, "A Material Theory of Induction," 664.
20. Amartya Sen, *The Idea of Justice* (Cambridge, MA: Harvard University Press, 2011), 106–111.
21. Norton, "A Material Theory of Induction," 666 n9.
22. Bertrand Russell, *The Problems of Philosophy* (Oxford: Oxford University Press, 1912), 93f.
23. Nelson Goodman, *Fact, Fiction, and Forecast*, 4th edition (Cambridge, MA: Harvard University Press, 1983), 35: "By thus moving to the plane of relations between statements, we feel we have exchanged an ontological problem for a linguistic one."
24. Charles Sanders Peirce, "Logic as Semiotic: The Theory of Signs," in *Philosophical Writings of Peirce*, ed. Justus Buchler (New York: Dover Publications, 1955), 98.
25. Edmund Husserl, *Ideas Pertaining to a Pure Phenomenology and to a Phenomenological Philosophy*, trans. F. Kersten (The Hague: Martinus Nijhoff Publishers, 1983), ch. 1 §3; 8.
26. Jitendranath Mohanty, "Individual Fact and Essence in Edmund Husserl's Philosophy," *Philosophy and Phenomenological Research* 20, no. 2 (1959): 222–30, quote on 223.
27. Kisor Kumar Chakrabarti, *Classical Indian Philosophy of Induction: The Nyaya Viewpoint* (Lanham, MD: Lexington Books, 2010), 129.
28. Chakrabarti, *Classical Indian Philosophy*, 130.
29. Norton, "A Material Theory of Induction," 666.
30. Norton, "A Material Theory of Induction," 668.
31. Charles Sanders Peirce, "What Is a Leading Principle?" in *Philosophical Writings of Peirce*, ed. Justus Buchler (New York: Dover Publications, 1955), 134.
32. Aristotle, *Posterior Analytics* 81^b9, in *The Complete Works of Aristotle, Volume One: The Revised Oxford Translation*, ed. Jonathan Barnes (Princeton, NJ: Princeton University Press, 1984), 132.
33. Chakrabarti, *Classical Indian Philosophy*, 167.
34. Harold Coward, *Derrida and Indian Philosophy* (Albany, NY: State University of New York Press, 1990), 9: "During the past century Indian philosophy has developed its own self-understanding by recasting its traditional systems in terms of the thought of Western thinkers such as Kant and Hegel." Coward notes the towering influence of Krishna Chandra Bhattacharyya.
35. Husserl, *Ideas*, §2, 7.
36. Edmund Husserl, *Cartesian Meditations*, tr. Dorion Cairns (The Hague: Martinus Nijhoff, 1960), 12.

37. Husserl, *Ideas*, §137, 329.
38. Husserl, *Cartesian Meditations*, 16.
39. Juha Himanka, "Husserl's Two Truths: Adequate and Apodictic Evidence," *Phänomenologische Forschungen* (2005): 93–112.
40. Himanka, "Husserl's Two Truths," 110.
41. Himanka, "Husserl's Two Truths," 110.

So Far, So Good: Learning from Experience

Edward Johnson
UNIVERSITY OF NEW ORLEANS
ERJOHNS1@UNO.EDU

In memoriam Gilbert Harman

"Nature is always too strong for principle."

– David Hume¹

ABSTRACT

The problem of induction is that learning from experience presupposes that past experience continues to be relevant in new circumstances (a view challenged by David Hume) and that we understand accurately what it is we have experienced (a view challenged by Nelson Goodman). In recent decades, there has been a return to Aristotle and a revival of the concepts of "causal powers" and "natural kinds." Talk of natural kinds has also figured in some evolutionary accounts of naturalized epistemology. This paper examines some strengths and weaknesses of this movement in relation to the problem of induction. Philosophers considered include Rom Harré, Nancy Cartwright, and Brian Ennis, among causal-powers theorists, as well as W. V. Quine and John Norton. There is also discussion of psychological factors in induction and the cross-cultural ideal of self-criticism.

Insanity has been defined as doing the same thing and expecting a different result, and thus sanity or rationality would involve expecting that the same cause can be counted on to produce the same effect. Learning from experience presupposes that our experience continues to be relevant in new circumstances and that we understand exactly what our experience has been. The philosophical problem of induction casts doubt on these assumptions.

David Hume challenges the first assumption by asking how we can justify our belief in the constancy of nature. It is not a necessary, logical truth, he thinks, since we can imagine change coherently.² And it cannot be a contingent, empirical truth learned from experience, because we cannot acquire any of those unless we presuppose such constancy. If those are the only two kinds of knowledge, as Hume assumes, then there would seem to be a problem about the justification of induction.

Nelson Goodman challenges the second assumption by pointing out that all the evidence we have is consistent

with infinitely many incompatible predictions. Have the emeralds we have seen so far been green—or *grue* (green if first examined before now, and blue otherwise)? What justifies us in treating the former predicate as “projectible” but not the latter? Mere *familiarity* (“entrenchment”)? Even if we can somehow assume that nature will not change on us, how can we tell which version of nature we have been experiencing? Early responses to Goodman, such as that by Rudolf Carnap, tried to appeal to a distinction between predicates that were “purely qualitative” (green) and those that were not (*grue*). Goodman and his defenders responded that such a distinction begged the question.³

It appears we would have Goodman’s riddle even if (as he seems to think) Hume’s problem can be evaded.⁴ And even if we could somehow be sure what pattern nature has been following, that would provide no guarantee against nature’s changing. We might say: *when* induction is reliable is one question, and *why* induction is reliable is another.⁵ But the lesson of Goodman’s argument is, as Gilbert Harman and Sanjeev Kulkarni put it, that “we cannot allow enumerative induction to treat all possible hypotheses equally,” and that “induction requires inductive bias among hypotheses.”⁶ In the words of Clark Glymour, “we know the probabilities of very few things, and to understand inductive competence we must construct theories that will explain how preferences among hypotheses may be established in the absence of such knowledge.”⁷ Does the necessity of bias in dealing with the practical problem of induction (the “when” question) affect treatment of the theoretical problem of induction (the “why” question)?

For Bayesians,⁸ recognition of the inescapability of bias is expressed in talk of “priors” (that is, judgments of “prior probability”). What Hume lets us see, Colin Howson argues, is that inductive reasoning, to be justified, requires premises that contain “initial assignments of positive probability that cannot themselves be justified in any absolute sense.”⁹ If we accept these prior probabilities, induction can be made to work; if not, not. “Without our assistance, the evidence cannot tell us that the course of Nature may not change, or for that matter remain the same in the emeralds’ continuing greenness. Nothing can. Hume was right.”¹⁰

Attempts to address Hume’s problem of induction have often appealed to some notion of *natural necessity*. Kant argues that besides the two kinds of knowledge recognized by Hume (analytic *a priori* and synthetic *a posteriori*), there is also synthetic *a priori* knowledge, and our knowledge of the constancy of nature is of that kind. In the 1970s, the work of Saul Kripke, Hilary Putnam, and others raised hope for the fourth possibility, analytic *a posteriori* knowledge. This would allow, as Rom Harré puts it, “*a posteriori* discoveries of the natures of things,”¹¹ and so open the door to talking about natural kinds again¹²—as, of course, Aristotelians had never quite stopped doing.¹³

Besides the outright Aristotelians, natural kinds have been entertained in a modified form by recent quasi-Aristotelian¹⁴ metaphysicians of causal powers, and in an evolutionary form by some friends of naturalized epistemology. Because of limitations of space, I will not examine full-blown neo-Aristotelianism in the present paper, but some of the

considerations below can be applied to it as well. As representatives of the causal powers approach to natural kinds, I focus on Rom Harré and Nancy Cartwright. The anti-Aristotelian evolutionary approach is exemplified by W. V. Quine.

Harré emphasized the importance of causal powers from the beginning of the 1970s until his death, at the age of ninety-one, just before the emergence of the COVID pandemic at the end of 2019.¹⁵ He believed that such an approach provided the best way of understanding the *practice* of science, as well as providing a response to the challenges posed by Hume and Goodman.

The causal powers approach underwrote, he thought, a notion of natural necessity that exposed the misguided character of Hume’s assumptions. While he does not explicitly align himself with Aristotle, he does recognize affinities between his views and those of Thomas Aquinas, as interpreted by Elizabeth Anscombe and Peter Geach.¹⁶ And Harré at one point identifies Saul Kripke as a kindred spirit.¹⁷ In short, he sees Hume’s problem as an artifact of Hume’s elimination of modalities, which is a failure to see that things are (sometimes) connected by natural necessity.

Goodman’s riddle is regarded by Harré as ultimately self-refuting:

The paradoxical character of Goodman’s puzzle in the positivist framework is a *reductio ad absurdum* of that framework. Once we have to hand the distinction between powers, natures and appearances . . . the *grue* problem illustrates the enormous importance that the concept of a natural-kind plays in real science. Emeralds, as a natural-kind, cannot change spontaneously from blue to green [sic] at some arbitrary moment when someone chooses to examine them. . . . The green/*grue* puzzle does not constitute a problem for a realist philosophy of science because the theoretical context of any research programme depends on some scheme of interlocking type-hierarchies. Such a scheme is elaborated . . . in terms of theoretically defined stable natures.¹⁸

This response seems to involve a misunderstanding of Goodman. Harré says, “Whenever an observation of a *grue* emerald is made we must suppose that it changes from blue to green. Green emeralds do not change when observed.”¹⁹ But twenty years earlier, Goodman had explained that “the interpretation of ‘*grue*’ . . . does not require that a thing change from green to blue in order to remain *grue*. . . . ‘All emeralds are *grue*’ may be true even though some emeralds are permanently green and the rest permanently blue.”²⁰

Nancy Cartwright has for four decades questioned the availability and relevance of universal laws of nature, arguing that scientific practice is better understood in terms of a “dappled” world of various limited and loosely connected domains, causal powers (“capacities”), semi-Aristotelian “natures,” and models and mechanisms.²¹ Like

Harré, she views Hume as having created a problem by illegitimately eliminating the “natural modalities.”

Given her emphasis on the study of variegated causal powers operating in diverse domains, Cartwright is unsurprisingly drawn to the “material” theory of induction, which John Norton has been developing in exquisite detail over the past couple of decades.²² She declares:

We see analogies among situations, similarities and differences; we learn that these similarities and differences are likely to matter in this kind of situation and not that, though we cannot give a description of ‘this kind’ and ‘that kind’ that turns this into a general truth. We rely on . . . a vast array of context-specific ‘rough-and-ready principles’. . . . If John Norton is to be believed—as I think he should be—these rough-and-ready principles are at the heart of much of our inductive inference. They guide us in regarding one situation as similar to another with respect to transferring effects from one to the other.²³

She adds that

in all of Norton’s examples the material facts that support inductive inference turn out to include natural modalities. . . . Hume’s argument . . . constructs a Hume world, a world without any of the natural modalities. Then he formulates a problem about reasons that cannot be solved without modalities. . . . But the Hume world is not a good model for ours and there are no good arguments that it is once Hume’s doctrines about what impressions are, his copy theory of ideas and his accompanying associationist theory of concept formation are rejected. . . . Our world, even as we experience it, is rife with modalities. One might argue, following Wilfrid Sellars, that if we can know that objects have specific properties, we must already have access to some natural laws. That’s because properties . . . come in families with natural behaviors and natural relations to other properties.²⁴

Cartwright’s “families” resemble Harré’s “type-hierarchies,” and her “natural behaviors and natural relations” are akin to his “natural necessity” and “natural kinds.” Cartwright’s “rough-and-ready principles” are much like what Norton calls “material facts,” and what others call “background knowledge.”²⁵

Much of Norton’s case for his material theory of induction consists in arguing that supposed formal or quasi-formal approaches end up appealing to background knowledge. For example, he agrees with Elliott Sober: “Appeal to simplicity is a surrogate for stating an empirical background theory.”²⁶ Again, he quotes the judgment of Timothy Day and Harold Kincaid that “appeals to the best explanation are really implicit appeals to substantive empirical assumptions, not to some privileged form of inference. It is the substantive assumptions that do the real work.”²⁷

Often, the concept in question can be shown to be too vague to carry any weight unless bolstered by context-specific assumptions. Gilbert Harman, for example, in making the case for simplicity as a pragmatic criterion for deciding what hypotheses to take seriously, says, “By simplicity I will mean whatever distinguishes the hypotheses people take seriously from those other hypotheses they (normally) do not take seriously even though the other hypotheses account equally well for the data.”²⁸

Beyond this, Norton, like Cartwright and Harré, counts on detailed historical studies of the practices of scientists to identify what scientists have found convincing, even though, as Cartwright suggests, it may be difficult or impossible to articulate criteria, let alone to say exactly why they apply, whenever and wherever they have been applied.

All this will seem cold comfort to those who yearn for the days of yore, before Thomas Kuhn’s “paradigms” and Michel Foucault’s “discourses.” Where is the line—is there a line—between the history or the sociology of science and the philosophy of science? Decades of handwringing about “demarcation” and “relativism” and “progress” have not settled the matter. If, as philosophical provocateur Paul Feyerabend claimed, “anything goes,” whither the concept of inductive competence?²⁹

Norton suggests that, with the failure of the quest for a universal, formal theory of induction, the problem of justifying it, in the abstract, disappears.³⁰ Still, he offers the metaphor of the arch, with its multiple, mutually-supporting components, as a better, nonfoundationalist image for understanding why induction is, after all, reasonable. Cartwright and her colleagues have recently proposed the image of the tangle, in which, as in a bird’s nest, the viability of the structure depends on interconnected and interacting parts. They are clear, however, that this does not solve the problem of induction: it does not guarantee that favored methods will be reliable, nor does it explain why they are reliable, when and if they are.³¹ But Cartwright thinks there is no reason to expect that any general solution is possible.³²

Many other philosophers have linked causal powers with natural kinds. Stewart Umphrey notes that “no sooner had they [sc., natural kinds] disappeared from biology than they started to show up in chemistry and atomic physics. Aristotelian bioessentialism may be dead, but the new scientific essentialism is very much alive.”³³ Brian Ellis, a defender of “scientific essentialism,” states the central point simply: “Essentialists hold that once we know the essential natures of things, we know how they must be disposed to behave whenever or wherever . . . they might exist.”³⁴ Louis Groarke takes a similar position: “The principle Kornblith attributes to Locke—that two things that possess the same real nature must possess the same properties—is in fact the hidden premise in Aristotle’s account of inductive reason.”³⁵ Howard Sankey similarly asserts, “It is the natural kind structure of the world that makes induction reliable.” And asserts, “The fact that . . . members of a kind possess the same essential properties is what makes induction reliable.”³⁶

Ellis argues that his essentialism about causal powers and natural kinds declaws Hume’s argument and indicates the flaw in Goodman’s. He says thus:

[I]t is metaphysically impossible for things to behave in any of the bizarre ways envisaged by some philosophers. Emeralds cannot all turn blue in the year 2050, for example (as Nelson Goodman . . . envisaged). . . . [For] the essential nature of a thing cannot be dependent on anything that is extrinsic, such as the date or place of its existence, or whether or not, or how often, it has been observed. Consequently, date-dependent properties, such as those postulated by Nelson Goodman in his various examples, cannot be essential properties.³⁷

Critics have suggested that attempts to solve the problem of induction by appealing to natural kinds must be question-begging. Howson, for example, argues that “grue” is disqualified as a natural-kind term because of its temporal characteristics, then “temperature” must be similarly unacceptable since water exists in different states at different temperatures. “The only recourse of the natural kinds defender,” he concludes, “is to define them in terms of their use in stable, perduring theory. But then to say that natural kinds are projectible and other kinds are not is empty.”³⁸

Ellis concedes that questions remain to be answered, though he views these as practical scientific problems rather than “irresolvable sceptical doubts.”³⁹ “How are the natural kinds to be identified, and how are their essential natures to be discovered?”⁴⁰ There are difficulties here, however tempting it might be to dismiss them as “epistemic.”⁴¹ As Harré and Madden blithely admit: “The real essence of a kind . . . is progressively revealed a *posteriori* by empirical investigation. The real essence is only finally discovered when the analysis is complete. So far as we can tell no analyses of things and substances have yet been completed.”⁴²

The turn to science can take various forms. W. V. Quine in the late 1960s proposed naturalizing epistemology and offered an evolutionary account of natural kinds as a way of responding to Goodman. Human beings’ “sense of comparative similarity,” Quine suggested, might be aligned by natural selection with the relevant “regularities of nature.” And that naive sense of kinds might subsequently undergo further refinement by science, as part of “a development away from the immediate, subjective, animal sense of similarity to the remoter objectivity of a similarity determined by scientific hypotheses and posits and constructs.”⁴³

Like all evolutionary arguments, however, this proposal does not get us *at* truth, but only *close enough* to truth for us to survive—and not to survive in general, but only to survive within the limited niche to which we have adapted. In the face of radical recontextualization, all bets are off, and what had hitherto been our best instincts may lead us astray.⁴⁴ And even in “normal” times, we find our theorizing is a mixed bag.

“By age 3 or 4 children expect natural kinds to have a richly correlated structure that goes beyond superficial appearances,” psychologist Ellen Markman reports. “Even with properties that for adults are blatantly determined by superficial perceptual features . . . some children based their inductions on the category [rather than the appearance].”⁴⁵ Why? She hypothesizes that “from an early age children expect categories named by language to be richly correlated and to therefore promote inductive inferences. Only after learning more about various domains would children come to restrict their inferences.”⁴⁶

Moreover, as psychologist Andrew Shtulman notes, “our intuitive theories in several domains of knowledge carve up the world into entities and processes that do not actually exist.”⁴⁷ In principle, science allows us to do better, often by replacing imaginary substances with real processes,⁴⁸ and fanciful properties with genuine relations or interactions.⁴⁹ But in practice, magical thinking is hard to displace, since intuitive theories “are a permanent fixture of human cognition because they are the handiwork of children, and children are not likely to be affected by changes in the availability or accessibility of scientific information.”⁵⁰

We do the best we can, as Otto Neurath famously suggested, to rebuild our ship at sea. Modern culture celebrates the shibboleth of “critical thinking,” though there is scant agreement about what that might involve. Philosophers, confident that the subject is their bailiwick, may discover, as I did once when I chaired an academic task force on revising general degree requirements, that all professors, regardless of their disciplines, are convinced that what they teach is already critical thinking.⁵¹

Karl Popper’s “falsificationism” grew out of his conviction that, while Hume had shown the impossibility of justifying induction, science (which was obviously the epitome of rational belief) must proceed by deduction (“conjectures and refutations”) rather than induction. Falsificationism fails as a theory of science because, for example, it leaves infinitely many incompatible but so-far-not-falsified contenders standing. It is attractive, however, as a spur to self-criticism and as a caution against the temptation to cherry-pick one’s evidence. “The first principle,” as renowned physicist Richard P. Feynman said, “is that you must not fool yourself—and you are the easiest person to fool.”⁵²

Everything can be questioned, but of course not at the same time. We do the best we can. Or maybe we just do what we do and make the best of it. We are like the fellow in the old joke who fell from the top of a thirty-story building, and who said, as he went past each floor, “So far, so good.” Or, as the song says, “Falling feels like flying—for a little while.”⁵³

NOTES

1. David Hume, *An Enquiry Concerning Human Understanding*, ed. Eric Steinberg (Indianapolis, IN: Hackett Publishing, 1993), sec. 12, pt. 2; 110.
2. This may be open to debate. See Walter Ott, *Causation and Laws of Nature in Early Modern Philosophy* (Oxford: Oxford University Press, 2009), 248–49; and, more generally, Tamar Szabó Gendler

- and John Hawthorne, eds., *Conceivability and Possibility* (Oxford: Oxford University Press, 2002).
3. For an extensive survey of the literature up to the mid-1990s, see Douglas Stalker, ed., *Grue! The New Riddle of Induction* (Chicago: Open Court, 1994). My interest in the grue problem was revived by David Johnson, "Induction and Modality," *Philosophical Review* 100, no. 3 (1991): 399–430.
 4. Nelson Goodman, *Fact, Fiction, and Forecast*, 4th ed. (Cambridge, MA: Harvard University Press, 1983), 62–65. Among works arguing that Goodman's "new riddle" is confused, see Samir Okasha, "What Does Goodman's 'Grue' Problem Really Show?" *Philosophical Papers* 36, no. 3 (2007): 483–502, which draws upon Frank Jackson, "Grue," *Journal of Philosophy* 72, no. 5 (1975): 113–31, and Peter Godfrey-Smith, "Goodman's Problem and Scientific Methodology," *Journal of Philosophy* 100, no. 11 (2003): 573–90.
 5. Cf. Gilbert Harman and Sanjeev Kulkarni, *Reliable Reasoning: Induction and Statistical Learning Theory* (Cambridge, MA: MIT Press, 2007), 3, and Ian Hacking, *The Emergence of Probability* (Cambridge: Cambridge University Press, 1975), 176.
 6. Harman and Kulkarni, *Reliable Reasoning*, 67–68.
 7. Clark Glymour, "On Testing and Evidence," in *Testing Scientific Theories*, Vol. 10 of *Minnesota Studies in the Philosophy of Science*, ed. John Earman (Minneapolis: University of Minnesota Press, 1983), 3–26, at 3.
 8. Whoever they may be. Richard C. Jeffrey insists that he is a Bayesian, but not in the sense criticized by Glymour, and Roger Rosenkrantz insists that Glymour himself is really a Bayesian, after all. See Jeffrey, "Bayesianism with a Human Face," in *Testing Scientific Theories*, ed. John Earman (Minneapolis: University of Minnesota Press, 1983), 133–56, and Rosenkrantz, "Why Glymour Is a Bayesian," in *Testing Scientific Theories*, ed. John Earman (Minneapolis: University of Minnesota Press, 1983), 69–97.
 9. Colin Howson, *Hume's Problem: Induction and the Justification of Belief* (Oxford: Oxford University Press, 2000), 239.
 10. Howson, *Hume's Problem*, 240.
 11. R. Harré and E. H. Madden, *Causal Powers: A Theory of Natural Necessity* (Totowa, NJ: Rowman and Littlefield, 1975), 71: "[T]his necessity ... constitutes the internal warrant of inductive inference because the a posteriori discoveries of natural necessities have been 'taken up' into the meaning of empirical concepts."
 12. See, e.g., Stephen P. Schwartz, ed., *Naming, Necessity, and Natural Kinds* (Ithaca, NY: Cornell University Press, 1977); Hilary Kornblith, *Inductive Inference and Its Natural Ground: An Essay in Naturalistic Epistemology* (Cambridge, MA: MIT Press, 1993); and Joseph Keim Campbell, Michael O'Rourke, and Matthew H. Slater, eds., *Carving Nature at Its Joints: Natural Kinds in Metaphysics and Science* (Cambridge, MA: MIT Press, 2011).
 13. See, e.g., Louis Groarke, *An Aristotelian Account of Induction* (Montreal: McGill-Queen's University Press, 2009). For background, see William A. Wallace, *Causality and Scientific Explanation, Vol. 1: Medieval and Early Classical Science* (Ann Arbor, MI: University of Michigan Press, 1972); and William A. Wallace, *Causality and Scientific Explanation, Vol. 2: Classical and Contemporary Science* (Ann Arbor, MI: University of Michigan Press, 1974), both of which were endorsed by Harré and Madden, *Causal Powers*, 117. See also William A. Wallace, *The Modeling of Nature: Philosophy of Science and Philosophy of Nature in Synthesis* (Washington, DC: Catholic University of America Press, 1996).
 14. Walter Ott—in his insightful critique, "The Case against Powers," in *Reconsidering Causal Powers: Historical and Conceptual Perspectives*, ed. Benjamin Hill, Henrik Lagerlund, and Stathis Psillos (Oxford: Oxford University Press, 2021), 149–67, at 149—declares: "By 'Aristotelian' I mean any view that construes powers as intrinsic properties of the objects that possess them."
 15. Key among his many works are Rom Harré, *The Principles of Scientific Thinking* (Chicago: University of Chicago Press, 1970); R. Harré and E. H. Madden, *Causal Powers: A Theory of Natural Necessity* (Totowa, NJ: Rowman and Littlefield, 1975); Rom Harré, *Laws of Nature* (London: Duckworth, 1993); and Jerrold L. Aronson, Rom Harré, and Eileen Cornell Way, *Realism Rescued: How Scientific Progress Is Possible* (Chicago: Open Court, 1995).
 16. Harré and Madden, *Causal Powers*, 98–100. For the relevance of Aristotle's distinction between "essence" and "property" to the problem of induction, and comparison with the Nyaya philosophers of India, see Kisor Kumar Chakrabarti, *Definition and Induction: A Historical and Comparative Study* (Honolulu: University of Hawai'i Press, 1995). See also his *Classical Indian Philosophy of Induction: The Nyaya Viewpoint* (Lanham, MD: Lexington Books, 2010).
 17. Harré and Madden, *Causal Powers*, 146, 159.
 18. Harré, *Laws of Nature*, 105–06.
 19. Harré, *Laws of Nature*, 103.
 20. Nelson Goodman, *Problems and Projects* (Indianapolis, IN: Hackett Publishing, 1973), 359. This is a common misunderstanding. Even Hilary Putnam, who wrote the foreword to the fourth edition of *Fact, Fiction, and Forecast*, makes the same mistake in "Strawson and Skepticism," in *The Philosophy of P. F. Strawson*, ed. Lewis Edwin Hahn (Chicago: Open Court, 1998), 273–87, at 275; he corrects the error when he reprints the essay in his *Philosophy in an Age of Science: Physics, Mathematics, and Skepticism*, ed. Mario De Caro and David Macarthur (Cambridge, MA: Harvard University Press, 2012), 539.
 21. Key among her many works are Nancy Cartwright, *How the Laws of Physics Lie* (Oxford: Oxford University Press, 1983); Nancy Cartwright, *Nature's Capacities and Their Measurement* (Oxford: Oxford University Press, 1989); Nancy Cartwright, *The Dappled World: A Study of the Boundaries of Science* (Cambridge: Cambridge University Press, 1999); Nancy Cartwright, *Nature, the Artful Modeler: Lectures on Laws, Science, How Nature Arranges the World and How We Can Arrange It Better* (Chicago: Open Court, 2019); and Nancy Cartwright, Jeremy Hardie, Eleonora Montuschi, Matthew Soleiman, and Ann C. Thresher, *The Tangle of Science: Reliability Beyond Method, Rigour, and Objectivity* (Oxford: Oxford University Press, 2022).
 22. John D. Norton, "A Material Theory of Induction," *Philosophy of Science* 70, no. 4 (2003): 647–70; "A Little Survey of Induction," in *Scientific Evidence: Philosophical Theories and Applications*, ed. Peter Achinstein (Baltimore: Johns Hopkins University Press, 2005), 9–34; "How the Formal Equivalence of Grue and Green Defeats What Is New in the New Riddle of Induction," *Synthese* 150, no. 2 (2006): 185–207; "There Are No Universal Rules for Induction," *Philosophy of Science* 77, no. 5 (2010): 765–77; "A Material Dissolution of the Problem of Induction," *Synthese* 191, no. 4 (2014): 671–90; *The Material Theory of Induction* (Calgary, Alberta: University of Calgary Press, 2021); "A Material Defense of Inductive Inference," in *Living Skepticism. Essays in Epistemology and Beyond*, ed. Stephen Hetherington and David Macarthur (Leiden: Brill, 2022), 54–72; and *The Large-Scale Structure of Inductive Inference* (book manuscript). All of these are available online at Norton's remarkable website: <http://www.pitt.edu/~jdnorton>, accessed August 21, 2024.
 23. Cartwright, *Nature, the Artful Modeler*, 25.
 24. Cartwright, *Nature, the Artful Modeler*, 107–08. Marc Lange—"What Would Reasons for Trusting Science Be?" in Naomi Oreskes, *Why Trust Science?*, with contributions by Ottmar Edenhofer, Jon Krosnick, M. Susan Lindee, Marc Lange, and Martin Kowarsch, ed. Stephen Macedo (Princeton, NJ: Princeton University Press, 2019), 181–90, at 184–85—puts the Sellarsian point as follows: "[I]f I take myself to be observing something to be the case, then I must believe that I am qualified to make that observation. . . . Without this additional belief about myself, I cannot justly take myself to have genuinely observed that something is so. . . . So in making an observation, we must already allow that we are justified in believing various generalizations about matters that go beyond what we have already observed."
 25. Hilary Putnam, *Words and Life* (Cambridge, MA: Harvard University Press, 1994), 397: "Because the project of symbolic inductive logic appeared to run out of steam after Rudolf Carnap, the thinking among philosophers of science has . . . run in the direction of . . . bootstrapping methods, methods that attribute a great deal to background knowledge." Putnam, *Philosophy in an Age of Science*, 539: "If we try to deal with grue by talking of 'normal' changes, 'we are appealing to a fund of background knowledge, not to some supposed 'canon of induction' by which all that background knowledge was allegedly obtained." Harré and Madden, *Causal Powers*, 124: "[S]omething called 'background knowledge' ('entrenchment', etc.) finds its way into

- putative solutions. . . . The effect of introducing material of that kind is precisely to effect among the properties . . . a linking of a non-accidental kind." For discussion of a natural kind theory in the Sanskrit tradition, see Kisor Chakrabarti, "The Nyāya-Vaiśeṣika Theory of Universals," *Journal of Indian Philosophy* 3, nos. 3–4 (1975): 363–82.
26. Norton, *The Material Theory of Induction*, 174.
 27. Norton *The Material Theory of Induction*, 249.
 28. Gilbert Harman, "Simplicity as a Pragmatic Criterion for Deciding What Hypotheses to Take Seriously," in *Grue!: The New Riddle of Induction*, ed. Douglas Stalker (Chicago: Open Court, 1994), 153–71, at 155.
 29. For Paul Feyerabend's final reflections, see his *Conquest of Abundance: A Tale of Abstraction versus the Richness of Being*, ed. Bert Terpstra (Chicago: University of Chicago Press, 1999).
 30. Putnam, *Words and Life*, 464, takes Goodman to have shown that "a purely formal method cannot be hoped for in inductive logic." For Norton's reservations, see "How the Formal Equivalence of Grue and Green Defeats What Is New in the New Riddle of Induction."
 31. Cartwright et al., *The Tangle of Science*, 174, 220, 232.
 32. Cartwright, *The Dappled World*, 105: "The term 'cause' is highly unscientific. It commits us to nothing about the kind of causality involved nor about how the causes operate. Recognising this should make us more cautious about investing in the quest for universal methods for causal inference."
 33. Stewart Umphrey, *The Aristotelian Tradition of Nature Kinds and Its Demise* (Washington, DC: Catholic University of America Press, 2018), 235. See also Christopher J. Austin, *Essence in the Age of Evolution: A New Theory of Natural Kinds* (New York: Routledge, 2019).
 34. Brian Ellis, *The Philosophy of Nature: A Guide to the New Essentialism* (Montreal: McGill-Queen's University Press, 2002), 135.
 35. Groarke, *An Aristotelian Account of Induction*, 51. Cf. Kornblith, *Inductive Inference and Its Natural Ground*.
 36. Howard Sankey, "Induction and Natural Kinds Revisited," in *Reconsidering Causal Powers: Historical and Conceptual Perspectives*, ed. Benjamin Hill, Henrik Lagerlund, and Stathis Psillos (Oxford: Oxford University Press, 2021), 284–99, at 297, 292. Cf. Harré and Madden, *Causal Powers*, 145.
 37. Ellis, *The Philosophy of Nature*, 137. This is the same misreading of Goodman discussed earlier in connection with Harré; see note 20.
 38. Howson, *Hume's Problem*, 32.
 39. Ellis, *The Philosophy of Nature*, 136.
 40. Ellis, *The Philosophy of Nature*, 135–36. Cf. Harré and Madden, *Causal Powers*, 152: "There is no problem of extrapolation in a thing ontology, though there is a problem of the correct identification of a thing."
 41. Ian Hacking, *Representing and Intervening: Introductory Topics in the Philosophy of Natural Science* (Cambridge: Cambridge University Press, 1983), 82: "Kripke holds that when one succeeds in naming a natural kind of thing, a thing of that kind must, as part of its very essence, be that kind. This harks back to a philosophy due to Aristotle, called essentialism. . . . Of course for all we know, it might be something else, but that is an epistemic matter."
 42. Harré and Madden, *Causal Powers*, 102.
 43. W. V. Quine, "Natural Kinds," in *Ontological Relativity and Other Essays* (New York: Columbia University Press, 1969), 114–38, at 134; reprinted in *Grue!: The New Riddle of Induction*, ed. Douglas Stalker (Chicago: Open Court, 1994), 41–56, at 52.
 44. See Laurence Gonzales, *Deep Survival: Who Lives, Who Dies, and Why* (New York: W. W. Norton, 2004). Cf. Harré and Madden, *Causal Powers*, 75: "If such a 'breakdown' of old particulars occurred we would try to understand the new happenings in the light of the newly discovered natures of the new particulars. If the change had not been total we would find such connections. . . . If we failed to find them we would no longer have to worry about the problem of induction, or any other."
 45. Ellen M. Markman, *Categorization and Naming in Children: Problems of Induction* (Cambridge, MA: MIT Press, 1989), 106.
 46. Markman, *Categorization and Naming in Children*, 226.
 47. Andrew Shtulman, *Scienceblind: Why Our Intuitive Theories about the World Are so Often Wrong* (New York: Basic Books, 2017), 5.
 48. Shtulman, *Scienceblind*, 7.
 49. Shtulman, *Scienceblind*, 11.
 50. Shtulman, *Scienceblind*, 7. Freud might thus have been right that we are permanently marked by the explanations we construct for ourselves in childhood, even if he erred by focusing too exclusively on sexual theories. Shtulman focuses on examples from the physical and biological domains but acknowledges baleful influence in relation to social categories or stereotypes as well (161–62). See also Craig McGarty, Vincent Y. Yzerbyt, and Russell Spears, eds., *Stereotypes as Explanations: The Formation of Meaningful Beliefs about Social Groups* (Cambridge: Cambridge University Press, 2002); and Michael L. Perlin, *The Hidden Prejudice: Mental Disability on Trial* (Washington, DC: American Psychological Association, 2000).
 51. And that is an issue in the literature on critical thinking. See, e.g., John E. McPeck, *Critical Thinking and Education* (London: Routledge, 1981).
 52. Richard P. Feynman, "Cargo Culture Science," in "Surely You're Joking, Mr. Feynman!": *Adventures of a Curious Character* (New York: W. W. Norton, 1985), 338–46, at 343. The cross-cultural ideal of self-criticism is well stated in Bryan W. Van Norden, "What Should Western Philosophy Learn from Chinese Philosophy?" in *Chinese Language, Thought, and Culture: Nivison and His Critics*, ed. Philip J. Ivanhoe (Chicago: Open Court, 1996), 224–49, at 239: "There is nothing wrong with . . . biases so long as we . . . strive to provide evidence and arguments for our beliefs, and remain open to changing our minds through ongoing discussion."
 53. The song, "Fallin' and Flyin'" by Stephen Bruton and Gary Nicholson, is sung by Jeff Bridges in the 2009 film *Crazy Heart*.

The Various Theoretical and Non-Theoretical Functions of Induction

Franco Manni

LICEO SCIENTIFICO STATALE LEONARDO

COSIMOFRANCO.MANNI@LEONARDOBS.IT

ABSTRACT

Bertrand Russell argued in 1912 that induction, although not provable as a reliable method of knowledge at the logical level, is the basis of our psychological expectations and actions in daily life. Unlike Russell, from the 1930s onward, neo-empiricists such as Rudolf Carnap, Alfred Jules Ayer, and Stephen Barker continued to argue that induction is also logically valid as a cognitive method of truth. But Karl R. Popper, after arguing in 1934 that induction is not logically valid, argued in 1963—more radically—that it is not even a psychological tendency of the human mind, nor is it used in the actions of everyday life. What is induction then? According to Popper, it is only a "myth," that is, a commonplace ideology, or a "demon" that haunts society and constitutes a mental cramp widespread among all human beings—a distorted ideology that hinders the flourishing and strengthening of thought and thus hinders the growth of knowledge. In this study, I would like to show how this "myth" hinders an industrial practice, so-called "big data analytics," and two humanistic disciplines: historiography and psychoanalysis.

INTRODUCTION

In *Posterior Analytics*, Aristotle described what induction is and differentiated it from deduction. Philosophers have been talking about the true importance and usefulness of induction for the pursuit of knowledge for millennia, differentiating between those who support it and those who criticize it: Francis Bacon, Auguste Comte, John Stuart Mills, and the logical positivists of the Vienna Circle such as Rudolf Carnap support it; Sextus Empiricus, David Hume, Immanuel Kant, Bertrand Russell, and Karl R. Popper criticize it.

In *Conjectures and Refutations*, his main book on the theory of knowledge written during his second period—i.e., after the Second World War, when, as Ludwig Wittgenstein had done over the preceding decade and a half, he abandoned formal logico-philosophical language as a means of dealing with epistemology—Popper writes forcefully: “Induction, i.e. inference based on many observations, is a myth. It is neither a psychological fact, nor a fact of ordinary life, nor one of scientific procedure.”¹ While Popper’s position has been defended by a number of scholars such as Paul Feyerabend and Imre Lakatos, it has been attacked by Alfred Jules Ayer, Anthony O’Hear, Stephen Barker, Nelson Goodman, Friederich Rapp, Herbert Feigl, Carl Gustav Hempel, Jaakko Hintikka, Francesco Barone, Dario Antiseri, Marcello Pera, and countless other empiricist philosophers, so much so that one scholar, Maurilio Lovatti, rightly spoke of “a neo-empiricist crusade against Popper.”²

In this essay, I first follow Popper’s “outline” and examine (1) whether induction is a scientific procedure; (2) whether it is a natural tendency of our mind, i.e., an innate and universal psychological act for all human beings; (3) whether it is a frequent experience in everyday life; and, finally, (4) whether it is only a “myth,” i.e., a more or less negative or more or less functional ideology that serves as an oppressive social superego, or as a tranquilizer in the routines of life.

Secondly, I raise the particular examples of two twentieth-century philosophical theories—Benedetto Croce’s historicism and Sigmund Freud’s psychoanalysis—that display an anti-inductivist spirit.

Thirdly, I present a hypothetical historical explanation of how and why the camps of the inductivists and anti-inductivists were formed.

IS INDUCTION A “SCIENTIFIC” PROCEDURE?

As has been noted, the twentieth century especially drew inspiration from Hume’s critique of induction, for example, Bertrand Russell who “holds that all empirically based opinions about the future are based on the inductive principle which experience can neither confirm nor confute.”³ Here, by “empirically based opinions,” Russell means only judgements based on past experience and not those based on logic: e.g., the judgement that “the sun always rises in the morning” but not the judgement that “the sum of the interior angles of a triangle is always 180°.” This is a point that fully involves science:

The general principles of science, such as the belief in the reign of law, and the belief that every event must have a cause, are as completely dependent upon the inductive principle as are the beliefs of daily life. All such general principles are believed because mankind have found innumerable instances of their truth and no instances of their falsehood. But this affords no evidence for their truth in the future, unless the inductive principle is assumed.⁴

All particular examples or individual cases that are included in an inductive generalization are more certain than the generalization itself.⁵ In fact, the inductive principle itself is based on induction in a circular relationship:

The inductive principle, however, is equally incapable of being proved by an appeal to experience. Experience might conceivably confirm the inductive principle as regards the cases that have been already examined; but as regards unexamined cases, it is the inductive principle alone that can justify any inference from what has been examined to what has not been examined. All arguments which, on the basis of experience, argue as to the future or the unexperienced parts of the past or present, assume the inductive principle; hence we can never use experience to prove the inductive principle without begging the question.⁶

Nor is the observation logical that, if multiple explanatory hypotheses still remain after an eliminative test, induction can be used to narrow their number by choosing those that can explain a greater number of past phenomena. Indeed, even such a selection criterion cannot be justified except by basing it—again—on induction. It could be said—instead—that the decision to validate the inductive principle, if not its adherence to logic, is based on a tendency or willingness to equate the future with the past, as if they were homogeneous “periods or segments” of time, conceiving them only according to J. M. E. McTaggart’s B-series but not according to his A-series.⁷

It does not seem to be an effective defense of induction. It seems to be one of those that concede that the future cannot replicate the past because otherwise the former would render the latter useless, but that even if the *details* of future events being something new cannot be predicted by inductively relying on past events, the probability of general events, i.e., without details, can nevertheless be thought of as an “average science” (the so-called “average science” that sixteenth-century theologians attributed to God so as not to cancel out human free will). This does not seem effective because at least in general the future would replicate the past and the probability of this repetition would still be taken from the repetition of events in the past, i.e., by induction.

Russell’s doubts about the logic of induction posed Popper with the problem of what then to support the “scientificity of science.” Popper famously replied that it rests on *a priori* conjectures (hypotheses), which use experience not as a

source of truth, but, instead, as a test of conjecture, i.e., as a challenge to falsification: "it is a theory of experience that assigns to our observations the equally modest and almost equally important role of tests which may help us in the discovery of our mistakes."⁸ This talk of "falsification" for Popper should not discourage the researcher by making him fall into skepticism, for the growth of knowledge exists and "science can progress just because we can learn from our mistakes."⁹

IS INDUCTION A PSYCHOLOGICAL FACT?

Russell had already distinguished the epistemological from the psychological point of view: "We have therefore to distinguish the fact that past uniformities cause expectations as to the future, from the question whether there is any reasonable ground for giving weight to such expectations after the question of their validity has been raised."¹⁰ Popper says that induction, besides not being a scientific procedure, is not even a psychological tendency. We would have to see what he means by "tendency," whether, in the manner of Francis Bacon's *idola tribus*, he means prejudices inherent in the human species and therefore innate and universal but deforming, i.e., producing bad interpretations of reality, or like the "projective identification" of which Sigmund Freud and Melanie Klein speak, a psychological mechanism that is also innate and universal for the species but does not in itself produce bad interpretations of reality, but, on the contrary, for Freud and Klein, such mechanisms are necessary to understand the emotional realities of other people. Given his criticism of induction as a scientific procedure, I think he indeed means a universal "psychological tendency," but a tendency that is wrong, along Baconian lines.

Russell specifically notes that if we left the inductive method in our reasoning, according to his epistemological critique, a change in psychological tendency would occur and we would have to "forgo all justification of our expectations about the future."¹¹ This would happen if we assume that there is a widespread human psychological tendency to wish we could give "justification" for our expectations.

Why, however, "all" expectations about the future? For instance, if we no longer had faith in induction, does it not seem that we would also have to abandon our expectation of mathematical truths (even in the future $2 + 2 = 4$), and also our expectation of truths of faith (even though God has often given me pain and trouble in the past, in the future He will give me joy and good)? Let us remember that it was precisely on faith (belief) that Hume insisted. In addition, there could be a third category of expectations for the future that should not be abandoned if we leave the inductive method, namely, those mentioned by Benedetto Croce in his ethics: actions, i.e., the decisions of the will (independently of the "happening," i.e., the external success of the action, which depends on a thousand events independent of the agent's will) that, by taking effect, modifies the person. For example, if I decide not to lie in a future conversation, even if this will not be believed by others, it has already modified me, and will lead me towards a stronger tendency towards sincerity in the future, which I can expect even if this never happened in the past (absence of induction).¹² A fourth category of

expectation that we will not abandon by not using induction is our expectation of truths about future facts that are not certain but at least possible, i.e., whose contrary does not imply contradiction: it concerns the tenacious hopes of the poor and humble who, even if no repeated fact in the past makes the object of their hope probable, can nevertheless expect that, sooner or later, God or karma or history and the time of goodwill will do justice and grant them those goods of which they were unjustly deprived before.

I conclude on this psychological point by disagreeing here at least in part with Popper and saying that induction is not the only psychological tendency concerning expectations about the future. But I do not claim that induction is one psychological tendency among others. This last psychological tendency could perhaps be described as the "self-soothing function of the psyche." In fact, if tranquility, i.e., the lack of disturbances, derives from the idea that the future will be similar to the past, there will be no "disturbances," i.e., changes neither in the events around us nor in our habits of dealing with them.

IS INDUCTION A FACT OF ORDINARY LIFE?

What Popper says, I believe, means that induction is not a common fact (so much as to call it "a fact of everyday life"), i.e., widespread in society and frequent over time. Diffusion and frequency are quantitative categories. This is what Russell also seemed to be talking about when he made this list of acts of prediction that we do each and every day on an inductive basis:

If the [inductive] principle is unsound, we have no reason to expect the sun to rise tomorrow, to expect bread to be more nourishing than a stone, or to expect that if we throw ourselves off the roof we shall fall. When we see what looks like our best friend approaching us, we shall have no reason to suppose that his body is not inhabited by the mind of our worst enemy or of some total stranger.¹³

However, diffusion and frequency do not imply truth. In fact, Russell states, "Thus our instincts certainly cause us to believe the sun will rise tomorrow, but we may be in no better a position than the chicken which unexpectedly has its neck wrung."¹⁴

Induction is a fundamental practice in everyday life with regard to what we expect in myriad situations in the future from the composition of things and people. However, there is also another experience in everyday life: making assumptions and propositions of new actions in order to obtain new experiences and results. For example, (1) in a situation of crisis and pain due to an illness for which chemical medicine has not cured a serious physical symptom, I can try a psychotherapy never tried by me before, psychoanalysis; (2) out of curiosity and desire for historical understanding, if historians expected that, in the communications between politicians and diplomats, there was an escalation of aggression shortly before the war started, but they do not find such a correlation in documents, then they can change the theory and decide to research whether it is true that, precisely when there is no escalation of aggression in the communications between

politicians and diplomats, it is more likely that war will break out shortly afterwards, because the two sides show that they are not afraid and do not take precautions. Perhaps historians could refine the explanatory theory and say that this happens but not always, i.e., not in all types of war, but only in wars where there is strong ideological hatred such as religious wars, but not, for example, in dynastic and economic wars.

This example can be accused of concerning only a few specialist scholars and not the everyday life of the majority. I then propose another example. In the past, I have seen many times that my friend John would only accept my invitations to dinner if he was at my house, and then I expected him to be stingy with money. One time, however, I saw him donate a lot of money to a charity, and so I changed my hypothesis (which, if verified as true, would lead me to change my expectations for the future): John does not want to invite me to dinner at his house not because he is stingy but because at his house there is an elderly and demented father whom John thinks might disturb me as his guest. If this were true, I could then decide to talk to John and convince him that I would not be disturbed. On the contrary, I would be happy to help him with his father, and then I would not expect further refusals from John or, in other situations, miserly behavior.

From this perspective, then, we can say that “everyday life” is largely about building on events that have occurred in the past and expecting them in the future as well, but there is not only this: there is also a tendency towards discovery and innovation.

TWO PHILOSOPHIES THAT CRITICIZE INDUCTIVISM: HISTORICISM AND PSYCHOANALYSIS

The founder of historicism, Benedetto Croce (1866–1952), denied that one can predict the future. The future is the realm of the will, and therefore I can only know what I want to do, but not what will happen, as events are produced by myriad known and unknown causes of which my will is one. What, then, is knowledge of the past for? To know what one can do and what one cannot do while acting. For example, since the events of the Congress of Vienna (1814–1815), we have realized that one cannot wish to establish a lasting absolutist political regime in an industrialized and schooled society in order to maintain law and order against revolutions, civil wars, and anarchy. We cannot foresee the future. For instance, it is true that, even if we establish a liberal state for ourselves, it may be that other neighboring absolutist states may conquer us and put an end to liberalism. However, at least, we know that if I want one thing (a lasting state in an industrialized and schooled society), I cannot want this thing and, at the same time, want to establish an absolute state.

When he was young, the founder of psychoanalysis, Sigmund Freud (1866–1939), won a scholarship to Paris where he visited the asylum of a famous French neurologist, Jean-Martin Charcot (1825–1893), who had succeeded, at least in part, in curing hysteria. This mental illness was then explained by the secretion of hormones by the uterus and

was therefore thought to have existed only in women. But Charcot had found a couple of cases of hysterical men. So many women led to the inductive theory concerning the uterus, and not the very few men. But Charcot thought he would try to explain these exceptions, instead of building his psychiatric theory on the “rule,” and invented a theory whereby the uterus was not a cause of hysteria, but certain sexual fixations (and repressions) that in the society of the time were much more common among women, and, thanks to the new theory (which later inspired Freud’s psychoanalysis), he was able to explain both how some men could also be hysterical, and how the many hysterical women began to heal not through a hysterectomy but through verbal communication with a psychiatrist concerning such sexual fixations (and repressions).

THE SOURCES OF KNOWLEDGE AND THE METHOD OF THEIR CONTROL

In his critique of induction, which seeks the source of knowledge from outside, Popper looks for that source in an internal act of the mind, conjecture. He writes: “The actual procedure of science is to operate with conjectures: to jump to conclusions—often after one single observation (as noticed for example by Hume and Born). Repeated observations and experiments function in science as tests of our conjectures or hypotheses, i.e., as attempted refutations.”¹⁵ I would add the name of Kant who first powerfully stated that the source of knowledge is *a priori*, i.e., prior to external experience.

According to this philosophy, the sources of ideas are internal, in the human intellect, while external experience plays the precious and irreplaceable role of testing—confirming or refuting—the hypotheses or conjectures, i.e., the ideas that come from within, from our mind.

But from our mind can come “anything”: single episodes of life, psychological tendencies, metaphysical and religious beliefs, political preferences, dreams, and games. For Popper—as then for Feyerabend—conjectures can have any origin, and all of them can be useful. This is why Popper, from the tragic experiences of his life as a Jew fleeing Nazism and as a liberal thinker opposing the Communism of the Cold War, conceived a daring analogy between political theory and epistemology, because idealizing (overestimating) the problem of the sources of knowledge is an authoritarian attitude similar to idealizing the importance of the sources of power, as was done by Plato, for whom a state was good or bad depending on who (one, a few, many, poor, rich, warriors, philosophers, demagogues, etc.) had sovereign power, without having to take into account the fact that the state was not sovereign, but that it was a state that was good or bad according to who (one, a few, many, poor, rich, warriors, philosophers, demagogues, etc.) had sovereign power. He did not realize that the real problem in politics is not in the search for the “good” source of power, but in how one can replace the old rulers with others without too much tragedy. Similarly, it is misleading to give too much weight to the sources of knowledge, as any one of them can go right as well as wrong: idealism, criticism, historicism, even inductivism. Ideas come from any source, but the problem is how to

put them to the test, to see without too much trauma in the scientific community, whether they can be refuted, i.e., found false and, therefore, replaced with others:

The traditional systems of epistemology may be said to result from yes-answers or no-answers to questions about the sources of knowledge. *They never challenge these questions, or dispute their legitimacy; the questions are taken as perfectly natural, and nobody seems to see any harm in them.*

This is quite interesting, for these questions are clearly authoritarian in spirit. They can be compared with that traditional question of political theory, 'Who should rule?', which begs for an authoritarian answer such as 'the best', or 'the wisest', or 'the people', or 'the majority'. (It suggests, incidentally, such silly alternatives as 'Whom do you want as rulers: the capitalists or the workers?', analogous to 'What is the ultimate source of knowledge: the intellect or the senses?') This political question is wrongly put and the answers which it elicits are paradoxical (as I have tried to show in chapter 7 of my *Open Society*). It should be replaced by a completely different question such as 'How can we organize our political institutions so that bad or incompetent rulers (whom we should try not to get, but whom we so easily might get all the same) cannot do too much damage?' I believe that only by changing our question in this way can we hope to proceed towards a reasonable theory of political institutions.

The question about the sources of our knowledge can be replaced in a similar way. It has always been asked in the spirit of: 'What are the best sources of our knowledge—the most reliable ones, those which will not lead us into error, and those to which we can and must turn, in case of doubt, as the last court of appeal?' I propose to assume, instead, that no such ideal sources exist—no more than ideal rulers—and that *all* 'sources' are liable to lead us into error at times. And I propose to replace, therefore, the question of the sources of our knowledge by the entirely different question: 'How can we hope to detect and eliminate error?'

The question of the sources of our knowledge, like so many authoritarian questions, is a genetic one. It asks for the origin of our knowledge, in the belief that knowledge may legitimize itself by its pedigree. The nobility of the racially pure knowledge, the untainted knowledge, the knowledge which derives from the highest authority, if possible from God: these are the (often unconscious) metaphysical ideas behind the question. My modified question, 'How can we hope to detect error?'¹⁶

In this very interesting passage, the words (regarding the search for the most "reliable" sources of knowledge, those that will never lead us to "error" and may constitute, when

we have a "doubt," the "last court of appeal") strongly allude to Descartes in his reasoning that leads from the "dubito" to the "cogito" and the indubitable sources of knowledge (the *cogito* and God). Descartes was not an empiricist and thus was not explicitly an inductivist; on the contrary, he questioned the most common sensible experiences. However, just like the later empiricists, he idealized, i.e., overemphasized, the subject of the "sources of knowledge."

THE RELATIONSHIP BETWEEN PAST AND FUTURE AND ITS HISTORICAL DEVELOPMENT

The title of this section may seem strange, because usually topics such as "intellect and will," "God and the universe," "good and evil," and, indeed, "past and future" are considered philosophical problems outside of time, with no historical development. I, on the other hand, following the historicism of Hegel and Croce for whom "everything is nothing but history," believe that philosophical problems also have a historical development, both in the way the questions are formulated and in the answers given to them.

As seen in the previous section, the problem of what weight to give to the "sources of knowledge" in the search for truth versus the weight to give to our method of testing them, whatever they may be, can be usefully linked to a more general attitude in our social life. In this section, I would first like to return to the "epistemological" problem itself, i.e., that concerning our search for truth, and then link one of its important aspects (the "sources") to a historical profile of our Western society.¹⁷

I therefore begin with the epistemological problem. One of the main points of criticism of the inductive method is that it equates past and future: as if, by collecting more documents about a fact from past history, we could have greater certainty about the truth of that fact, and so, by accumulating more experiences now in the present and in the past (but the present is past), we could have greater certainty about the future.

Russell had precisely focused on the point: "All our conduct is based upon associations which have worked in the past, and which we therefore regard as likely to work in the future; and this likelihood is dependent for its validity upon the inductive principle."¹⁸ For it is not accumulated factual data that affirm the predictability of the future, but a theory, namely, the inductivist principle itself: "The beliefs of daily life . . . are believed because mankind have found innumerable instances of their truth and no instances of their falsehood. But this affords no evidence for their truth in the future, unless the inductive principle is assumed."¹⁹

And herein lies the difficulty:

Thus all knowledge which, on a basis of experience tells us something about what is not experienced, is based upon a belief which experience can neither confirm nor confute, yet which, at least in its more concrete applications, appears to be as firmly rooted in us as many of the facts of experience. The existence and justification of such

beliefs . . . raises some of the most difficult and most debated problems of philosophy.²⁰

However, Popper undertook a liberating move away from this difficulty and he accepted that conjectures came from diverse and heterogeneous sources: refusal of a previous theory, attempt to explain new phenomena, justification of metaphysical and religious views, love of the aesthetic elegance of a theory, inspiration from an important life experience, visualizations in a dream. As already mentioned, Popper is, on the one hand, liberal and tolerant with regard to the sources of conjecture, and, on the other hand, convinced that the problem of sources has been overestimated and today we need to scale it down. Now, among the sources of the conjectures (theoretical hypotheses) I listed just above, Popper also puts induction from particular cases repeated in the past. And this is the liberating (or at least partly liberating) move from the epistemological difficulty pointed out by Russell: if we follow Popper, we do not have to worry if a possible, and perhaps frequent, source of our scientific hypotheses, which aim to describe and explain reality, comes from induction. We do not have to worry because whether the hypothesis comes from induction or comes from, say, the desire to refute a rival scientist's scientific theory, the main point for its "scientificity" is not the origin, the source, but the next step, that is, whether this theory stands up to the experiments that produce those experiences that it is supposed to allow or forbid. The main point about the "scientificity" of a scientific theory is its potential "falsifiability" by real experiences, and the main point about its "usefulness" is the fact that, for a certain period, this theory is not falsified by the crucial experiments that could have falsified it, but, for now, it has been "corroborated" (not falsified) and therefore still usable to explain aspects of reality.

If we take a historical look at when induction was taken "authoritatively" (I follow Popper's interesting analogy between sources of sovereign power and sources of knowledge), we can see that it was questioned by Enlightenment philosophers such as Hume and Kant. Later on, it was upheld by positivist philosophers such as Herbert Spencer in the last decades of the nineteenth century, during the peak of imperialist colonial expansion. Afterwards, it was again questioned during the crisis between the two world wars by liberal philosophers such as Russell and Popper. Then, it was again upheld by neo-positivist and analytical empiricists (as Maurizio Lovatti has well shown in his study devoted to this topic²¹) after the Second World War and with the great technological, industrial, and economic growth that took place in the Western world in those years.

A literary icon of this period most recently mentioned, a renowned symbol of inductivism in a fictional work of literature, is the concept of "psychohistory" invented by Isaac Asimov in his *Foundation Trilogy* (which later expanded into the *Foundation Series*), where massive amounts of data about the past of peoples and civilizations, processed by powerful computers, enable the prediction of the future for millennia to come.

A more recent social and technological phenomenon, on the other hand—in our years of strong globalization of the Western model, but also of strong criticism of certain aspects of this globalization and of this model²²—is that of the "big data analysis," which presents the problem of induction in a controversial manner. On the one hand, the Western model seems to exalt induction by justifying induction's existence and character on the massive collection of data, i.e., documents of past events. On the other hand, the presence of a theory independent of induction seems necessary to avoid oddities and irrelevancies. The big data analysis does not include any explicated or systematic theory that gives a sense of research throughout the mass of data or a set of evaluation criteria for interpreting them. Without such a well-thought-out theory to base one's own interpretive work on, the data themselves very often can be both irrelevant and contradictory. Is it possible to deal with big data without an interpretive theory and just rely on a mechanical induction? Gary Smith explains "The Paradox of Big Data" as follows:

Theory before data: classical statistical tests begin with a falsifiable theory, followed by the collection of data for a statistical test of the theory. For example, it is known that heart attacks and strokes can be triggered by blood clots, and that aspirin inhibits blood clotting. A research hypothesis is whether regular doses of aspirin will reduce the chances of heart attacks and strokes. This conjecture was tested in the 1980s by a five-year, double-blind randomized control trial involving 22,000 doctors, with half taking an aspirin tablet every other day, and half taking a placebo. The doctors taking placebos had more than three times as many fatal heart attacks and nearly twice as many nonfatal heart attacks as the treatment group.

Data mining: data mining goes in the other direction, putting data before theory, indeed viewing the use of a *priori* knowledge as an unwelcome constraint that limits the possibilities for knowledge discovery. In the heart attack example, a data miner might compile a database of 1,000 personal characteristics of 10,000 people who suffered heart attacks and 10,000 people who did not, and then use a data mining algorithm to identify distinguishing characteristics. It might turn out that the heart attack victims were more likely to have a fondness for apples, work for city government, live in a small town, have green eyes, and use the word *great!* on Facebook.²³

I have made these connections between the broader political, social, and cultural history with the ups and downs of the inductive method, because supporting the inductive method or criticizing it is not a culturally or politically neutral choice. I believe there can be a correlation between inductivism and authoritarianism, and a correlation between criticism of inductivism and criticism of authority.

CONCLUSIONS

I would like to be balanced and recall both the pros and cons of induction, and so, returning to the first point mentioned in the introductory section, I do not agree with Popper who calls induction only a “myth.” I recall the pros: (1) it calms, because it makes us think that the future will be similar to the past; (2) it gives effectiveness in action through the use of knowledge and skills already seen and learned; and (3) it stimulates the accuracy of observation and data collection of experiences. I recall the cons: (1) it closes our eyes to possible different and new experiences, because it does not facilitate the invention of new theories (points of view) that could make them observable; (2) it overestimates the sources of knowledge and makes us focus on the sources instead of testing them; and (3) it tends to dull our perception of the difference between past and future.

Secondly, I brought the examples of two intellectual disciplines, historicism and psychoanalysis, which do not rely on induction.

Thirdly, I suggested seeing how confidence in the inductive method, or skepticism towards it, varies according to the changing broader historical context within which intellectuals operate.

In conclusion, I would therefore state that induction serves not only theoretical purposes, i.e., continuous improvement of knowledge and understanding, but also practical purposes of various kinds.

NOTES

1. Karl R. Popper, *Conjectures and Refutations: The Growth of Scientific Knowledge* (London: Routledge and Kegan, 1963), 53.
2. Maurizio Lovatti, “La crociata neo-empirista contro Popper,” *Per la filosofia* 13, no. 36 (1996): 99–109.
3. Kisor Kumar Chakrabarti, *Classical Indian Philosophy of Induction: The Nyaya Viewpoint* (Lanham, MD: Lexington Books, 2010), 16.
4. Bertrand Russell, *The Problems of Philosophy* (Oxford: Oxford University Press, 1997), 66.
5. Russell, *The Problems of Philosophy*, 80, 112.
6. Russell, *The Problems of Philosophy*, 68.
7. J. M. E. McTaggart, “The Unreality of Time,” *Mind* 17, no. 68 (1908): 457–74.
8. Popper, *Conjectures and Refutations*, vii.
9. Popper, *Conjectures and Refutations*, vii.
10. Russell, *The Problems of Philosophy*, 63.
11. Russell, *The Problems of Philosophy*, 68.
12. Benedetto Croce, *Filosofia della pratica: Economia ed etica* (Bari: Laterza, 1923), 46–49.
13. Russell, *The Problems of Philosophy*, 69.
14. Russell, *The Problems of Philosophy*, 63.
15. Popper, *Conjectures and Refutations*, 53.
16. Popper, *Conjectures and Refutations*, 25.
17. As for the Eastern one, I do not have sufficient expertise and must leave the task to others, if they ever want to undertake it.
18. Russell, *The Problems of Philosophy*, 69.
19. Russell, *The Problems of Philosophy*, 69.
20. Russell, *The Problems of Philosophy*, 69.
21. Lovatti, “La crociata neo-empirista contro Popper.”
22. Very briefly and for the purpose of this paper, I define “the Western model” as that pattern of civilization that is built upon three main pillars: 1) Greek philosophy and science, 2) Roman law, and 3) Christian religion.
23. Gary Smith, “The Paradox of Big Data,” *SN Applied Sciences* 2, art. no. 1041 (2020). <https://doi.org/10.1007/s42452-020-2862-5>.

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