

Perception and observation unladen

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Abstract Let us call ‘veridicalism’ the view that perceptual beliefs and observational reports are largely truthful. This paper aims to make a case for veridicalism by, among other things, examining in detail and ultimately deflating in import what many consider to be the view’s greatest threat, the so-called ‘theory-ladenness’ of perception and/or observation. In what follows, it is argued that to the extent that theoretical factors influence the formation of perceptual beliefs and observational reports, as theory-ladenness demands, that influence is typically not detrimental to their veridicality or at least not irreversibly so. Central to the defence of veridicalism are two principles: that of internal similarities and that of internal dissimilarities.

Keywords Theory-laden · Perception · Observation · Evidence

1 Introduction

Philosophical debates have numerous departure points. I am interested in a rather rich departure point that takes not only the world of mental states for granted but also the existence of a mind-independent world populated with distinct things, some of which are embodied humans with brains and sensory organs. This departure point still leaves open the question whether our mental states about the mind-independent world are truthful. Let us call ‘veridicalism’ the view that perceptual beliefs and observational reports are largely truthful. This paper aims to make a case for veridicalism by, among other things, examining in detail and ultimately deflating in import what many consider to be the view’s greatest threat, the so-called ‘theory-

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ladenness' of perception and/or observation.¹ In what follows, it is argued that to the extent that theoretical factors influence the formation of perceptual beliefs and observational reports, as theory-ladenness demands, that influence is typically not detrimental to their veridicality or at least not irreversibly so. Central to the defence of veridicalism are two principles: that of internal similarities and that of internal dissimilarities.²

2 Theory-ladenness

If veridicalism is to be upheld, various concerns need to be allayed about what goes on in the formation of perceptual beliefs and observational reports. It has long been argued under the rubric of 'the theory-ladenness of perception and/or observation', for example by Hanson (1958), that 'theoretical' factors influence the formation of perceptual beliefs and observational reports.³ Although many of these factors are not strictly speaking theoretical in character they are lumped together with theoretical ones. The concept of theory-ladenness is thus used to express one or more of the following ideas: that differences in sensory physiology, linguistic choices, conceptual resources, prior beliefs, theories and/or environmental cues affect and potentially distort what we perceive, believe and report and even how we assess scientific theories.⁴

Not everyone who endorses the idea that perception and/or observation is, by and large, theory-laden, endorses also the idea that it is non-veridical or that its veridicality is in doubt. Despite their overt veridicalism, early scientific realists (e.g. Maxwell 1962) mobilised theory-ladenness in their fight against logical positivism. To be specific, they suggested that perception and observation are normally theory-laden and that therefore no observational-theoretical distinction can be drawn to support the positivists' attraction toward observational posits and aversion toward theoretical ones. Theory-ladenness in those realist minds was harmless, at best correcting and at worst being neutral to the content of perception and observation reports. Clearly, their move was a gambit involving considerable risk. If scientists sponsoring different theories, say from competing paradigms, systematically perceive and report the world in a genuinely different manner, then such reports cannot form the basis for neutral adjudication between the said theories. Indeed this consequence has been endorsed by several anti-veridicalist philosophers, i.e. those

¹ The answer to the question whether observation is distinct from, though of course related to, perception is a topic of contention. I do not take a stance on this issue, though I do stick to the convention of branding beliefs 'perceptual' and reports 'observational'.

² I first encountered these principles in Russell ([1927] 1992) while carrying out research on structural realism. For more details on the role they play in structural realism please consult Frigg and Votsis (2011).

³ Contrary to popular belief, the term 'theory-ladenness' seems to have originated with Ryle ([1954] 1960, pp. 90–91), not Hanson.

⁴ A useful taxonomy of different types of theory-ladenness can be found in Brewer and Lambert (2001). Following others in the debate, including Brewer and Lambert, I label all such factors 'theoretical', knowing full well the differences that exist between them.

who deny or at least doubt veridicalism, and has become the main springboard for the claim that theories from competing paradigms are incommensurable (see, for example, Kuhn [1962] 2012).

The debate over the pervasiveness and significance of theory-ladenness has grown considerably since those early exchanges. I can only do justice to three select contributions here. The first one is Fodor (1984), who wrangles, among others with Churchland, over whether perception is cognitively penetrable by things like prior beliefs and theories. He argues that it is not, citing as a reason the claim that geometrical illusions remain so even in the face of contrary beliefs. Thus, in the well-known Müller-Lyer illusion, a subject continues to perceive the two lines as unequal in length even after they come to believe that their length is equal. Fodor's reasoning may seem paradoxical at first given that a case of non-veridical perception is employed to demonstrate that perception is impenetrable to cognition and hence is largely veridical. The paradoxicality fades away, however, if one acknowledges, like Fodor, that most perception is not beset by illusion. The second is Hacking (1985). Though not directly addressing the issue of theory-ladenness, Hacking raises a highly pertinent point in his defence of the validity of instrumentally-mediated observations against constructive empiricism. It is no accident, he argues, that instruments each of whose operation relies on theoretical presuppositions that are independent of those relied on by the others, e.g. optical versus electron microscopes, still manage to produce the *same* observation reports. The implication being that such reports are unperturbed by any differences in the theoretical presuppositions and hence likely to be veridical. The third is a short piece by Franklin et al. (1989) that questions the necessity of independence between the theory being tested and the theory behind the testing instrument. It draws attention to the fact that even without independence the observation reports produced by the testing instrument may still refute the theory under test. For example, although the transverse velocities of quasars depend on the special theory of relativity for their calculation, they are in principle allowed to be superluminal and hence to refute that theory (see Brown 1993).

There are undoubtedly various noteworthy facets to the theory-ladenness debate. I simply cannot discuss all of them here. Instead, I restrict my efforts in the following three ways. First, I primarily look at late stage items of the perception process, namely perceptual *judgments* and *beliefs* as well as observational *reports*. After all, what good would it do to establish that perception in its earlier stages, e.g. early vision, is entirely impermeable to distortion by 'theoretical' factors if in its later stages it ends up riddled with it?⁵ Second, my investigation concerns the potential distortion of the content of such late stage items on the assumption that the target domain is *attended*. Although theory-driven cases of inattention pose a hazard, as they may involve the neglect of evidentially relevant information, it is a hazard unlike the one I wish to address, namely whether the perceptually acquired

⁵ Having said this, not much later stage perception/observation would presumably be veridical if earlier stage perception were not. Thus, studies like Raftopoulos (2001), where it is argued that early vision perception is impermeable to prior knowledge about specific events and objects, are still useful in deflecting some objections to the potential veridicality of perception.

information about an object already adequately attended is indeed distorted.⁶ Third, I do not provide a full-scale analysis of perception but rather argue that whatever perception is, it must be subject to the principles of internal similarities and of internal dissimilarities. By proceeding this way, I side-line several undeniably important issues like the issue of how perceivers identify the same object in different contextual, e.g. lighting, conditions. Full-scale, or at least more complete, analyses of perception address precisely such questions. Dilworth (2005), for example, argues that perception has a double content, one part of which concerns the targeted object itself and the other concerns the object in all its contextual glory.⁷ How well such analyses fit my own is, alas, a topic that I must leave for another paper.

3 The principle of internal similarities

I first encountered this principle in Russell ([1927] 1992, pp. 254–256). As a first approximation, the principle holds that internal sameness implies external sameness. By internal we mean something like fully-formed perceptions, perceptual judgments and beliefs, or even observation reports and by external something more distal like stimuli or physical objects. In its contrapositive, and hence logically equivalent, form the principle states that external differences imply internal differences. Once stated thus it is perhaps more intuitive to see that the principle amounts to an injective mapping from the set of external things to the set of internal things, $f: E \mapsto I$.⁸

In its current formulation the principle is too strong for there are clearly circumstances where internal sameness arises from external differences. Russell was aware of this problem and even offered his own counterexample: “If we are observing a man half a mile away, his appearance is not changed if he frowns, whereas it is changed for a man observing him from a distance of three feet” ([1927] 1992, p. 255). In such cases, Russell correctly noted, the kind of mapping under consideration is many-to-one, not one-to-one. Two options seem available in light of this criticism. We may either dismiss the principle or else attempt to curtail its range of application. Russell’s stance on this matter is unfortunately blurry.⁹ I opt for the latter option and offer a number of qualifications that make the principle more resistant to counterexamples.

Russell’s counterexample is instructive in that it presupposes that there are non-problematic cases where external differences disclose themselves in perception.

⁶ See Brewer and Lambert (2001, pp. S180–181) for more details on attention and theory-ladenness.

⁷ I’m quite sympathetic to the general spirit of this article. Notably, Dilworth and I share a fondness for representationalism, though I will not argue for it here.

⁸ Injective mappings are functions that preserve the distinctness or difference of elements. That is to say, different elements in the domain (in this case E) are mapped to different elements in the co-domain (in this case I).

⁹ For example, he asserts that “[t]his consideration makes all physical inference more or less precarious” (p. 255). But, at the same time, he seems willing to entertain methods through which external differences can be made discernible—see discussion below.

The principle breaks down, it seems, when the objects at stake are not at an appropriate distance. Moreover, it breaks down when the objects are too small. But even in such cases the breakdown is not total for the principle can still be put to work to correct its own misjudgements. Russell cites a commonly deployed correction technique: “We find often that indistinguishable percepts are followed by different effects—e.g. one glass of water causes typhoid and another does not. In such cases we assume imperceptible differences...” (p. 255). Though he continues to add that “microscopy may render [these differences] perceptible”, we needn’t appeal to instruments to surmount this problem. Russell would presumably not deny that typhoid symptoms are perceptible. Differences between typhoid-infused glasses and typhoid-free glasses are revealed in perception, though not of course as differences in the way the water contained in them looks, but rather as differences between individuals who, having drunk from the former type of glass, develop typhoid symptoms and those who, having drunk from the latter, do not. The trick is to observe enough such cases to notice the correlation. And all of this is done in accordance with our principle, though, admittedly, only when this principle is allowed a second pass, so-to-speak.

Distance and size are not the only sources of the principle’s breakdown. In fact, what counts as a sufficiently apt distance or a sufficiently apt size is determined by something more primary, namely the discriminating abilities, if any, of the sensory system under consideration and, of course, the physics at play.¹⁰ These abilities, if they have any potency, are limited. Even those who endorse the view that perception is largely veridical do not therefore expect all external differences to register in a sensory system. Indeed, they do not expect all individuals to be able to detect exactly the same external differences, though presumably they do expect that the detection abilities of two randomly chosen individuals are likely to be strongly convergent.

Another qualification that needs to be made concerns the notion of sameness. This notion is too restrictive in at least one sense. Nobody would deny the claim that at least a little ‘noise’ always creeps into perception. That means no two perceptions of one and the same thing are likely to be identical. The notion of sameness thus needs to be replaced with a more inclusive notion. That notion is of course similarity. Its adoption forces the parallel replacement of the notion of difference with the notion of dissimilarity. Two things are dissimilar if and only if they are not similar. It is one thing to talk about similarity and quite another to explicate what exactly it entails. As the well-known objection goes, anything is similar to anything else in some respect or other. What respects are relevant is thus crucial to salvaging the notion of similarity and ultimately the principles being discussed. We return to this very important issue in Sect. 11 below.

Yet another qualification concerns the choice between individual and inter-individual readings of the principle. I have already alluded to the fact that different individuals may possess different discriminating abilities. But suppose, for

¹⁰ The sensory system consists, roughly speaking, of all those parts of the body that play a role in the processing of stimuli into perceptions, including the sensory receptors, various neural pathways and parts of the brain.

argument's sake, that two individuals A and B possess the same discriminating abilities. Suppose, moreover, that they are presented with two dissimilar stimuli x and y that their sensory systems are capable of discriminating. Still the wiring of those systems may be such A and B form similar perceptions (to each other) when presented with x and y respectively. Under the inter-individual reading, the principle gets violated as similar perceptions in different individuals do not imply similar stimuli. The same fate does not befall the individual reading of the principle. For, by supposition, both A and B have the capacity to discriminate between x and y . Thus, in the hypothesised example dissimilar stimuli give rise to dissimilar perceptions in the *same* individual. Or, contrapositively, similar perceptions in the same individual arise from that individual's exposure to similar stimuli. This is not to say that the individual reading invites no further violations of the principle. Rather the inter-individual reading would not only have to contend with any such violations but also with the one just outlined. To put it another way, more can go wrong with the inter-individual interpretation of the principle.

The last qualification to be discussed concerns diachronicity. Supposing that the sensory system of a human being is, to some extent, dynamical, it is possible that dissimilar stimuli that initially give rise to dissimilar perceptions in the same individual may nonetheless begin to give rise to similar perceptions at some later point in time. Take the two dissimilar stimuli x and y again as well as individual A . Presented with x at time t_1 and with y at some subsequent time t_n (where $n > 1$), A may nonetheless form two similar perceptions. The more time intervening between t_1 and t_n the probability for something like that happening presumably increases. Having said this, it's highly doubtful that such changes take place regularly enough to be massively disruptive to the potential veridicality of perception. I will briefly try to motivate this claim in Sect. 5. For now suffice it to say that diachronicity-inspired difficulties need to be considered in our reformulation of the principle.

Taking the aforementioned qualifications into account, we can now propose the following reformulation:

Principle of Internal Similarities: For a well-delimited range of external things (determined by facts about the discriminating abilities of the human race), the formation of internal similarities in a randomly chosen individual over some time-interval is likely, and indeed increasingly likely the shorter the interval, to have been produced by exposure to external similarities, i.e. similarities that exist between the said external things.¹¹

I do not expect this reformulation to be the final word on the matter. I take it, however, that in its current state the principle is sufficiently robust to help me achieve the goals I outlined at the beginning of this essay. Note that my cautiousness is in part reflected by the probabilistic rendering of the relation between internal and external similarities.

¹¹ The well-delimited range includes much of what we call 'macroscopic' objects at an appropriate size and distance as well as their associated stimuli.

Before we proceed to the next section it is worth clarifying that in several of the examples above the assumption that internal items map external items was only provisional. It was made to demonstrate the point that even from the perspective of those who argue that perception is veridical several qualifications must be in place before any claim about mapping can be put forth. In other words, I have not yet made the case why the principle of internal similarities holds. This will come in Sect. 5.

4 The principle of internal dissimilarities

Russell was more clearly keen to endorse another principle—what I will henceforth call ‘the principle of internal dissimilarities’. In its naive formulation, the principle states that external sameness implies internal sameness. Contrapositively, it states that internal differences imply external differences. The principle thus amounts to an injective mapping from the set of internal things to the set of external things, $f: I \mapsto E$.

As it turns out, the principle of internal dissimilarities has an illustrious pedigree but, contrary to what one would expect, its importance has gone largely unnoticed in the philosophical literature. The principle, or something very much like it, has been endorsed (seemingly independently) by a number of notable philosophers and scientists. Descartes, for example, asserted that “... as often as it [i.e. the brain] is affected in the same way [it] gives rise to the same perception in the mind...” ([1641] 1901, 6th Meditation). Half a century later, Locke similarly remarks, combining both contrapositive formulations in the process: “For that texture in the object, by a regular and constant operation producing the same *idea* of blue in us, it serves us to distinguish, by our eyes, that from any other thing” ([1689] 1996, Book II, Ch. XXXII, §14) [original emphasis]. Another half a century elapses before Hume presents a more generalised form of the principle, one that cites causes and effects instead of stimuli and perceptions, though it is clear from the enveloping discussion that the latter pair are but instances of the former: “Like causes still produce like effects” ([1739] 1978, Book II, Part III, §1). Mill continues this tradition when he asserts that “... when none but the same causes exist, the same effects follow” ([1843] 2009, Chapter XXV, §2). Helmholtz explicitly mixes the language of causes and effects with the language of perceptions and stimuli. It is worth quoting a longer passage:

What information, then, can the qualities of such sensations give us about the characteristics of the external causes and influences which produce them? Only this: our sensations are signs, not images, of such characteristics... A sign, however, need not be similar in any way to that of which it is a sign. The sole relationship between them is that the same object, appearing under the same conditions, must evoke the same sign; thus different signs always signify different causes or influences ([1878] 1971, p. 372).

I have already mentioned Russell’s endorsement. Now here is the quote: “... we assume that differing percepts have differing stimuli” (Russell [1927] 1992, p. 255).

Weyl, following in Helmholtz's footsteps, professes that the "... the absolute world must be isomorphic to the phenomenal one (where, however, the correlation needs to be unique only in the direction thing in itself \rightarrow phenomenon); for 'we are justified, when different perceptions offer themselves to us, to infer that the underlying real conditions are different' (Helmholtz, *Wissenschaftliche Abhandlungen*, II, p. 656)" ([1949] 2009, p. 26). More recently, Fodor announces his support for the principle, in the same article cited earlier, while also bringing the topic of theory-ladenness into the fold: "... given the same stimulations, two organisms with the same sensory/perceptual psychology will quite generally observe the same things, and hence arrive at the same observational beliefs, *however much their theoretical commitments may differ*" (1984, pp. 24–25) [original emphasis].

The current principle faces analogous qualifications to those we recruited for the principle of internal similarities.¹² Let us begin with the shift from the notions of sameness and difference to the notions of similarity and dissimilarity. Recall that no two perceptions of one and the same thing are likely to be identical. Thus it would not be prudent to generally infer different stimuli from perceptions that are minimally different. The solution is to switch to the notion of dissimilarity. That, of course, forces a co-relative switch from the notion of sameness to the notion of similarity.

Consider next the qualification concerning the discriminating abilities of a sensory system which, even if potent, are limited. Clearly, if the current principle has the slightest chance of being true its range of application must be significantly restricted. As already noted, it is unreasonable to expect all external dissimilarities to register in a sensory system. Thus internal dissimilarities are at best a guide to some but not all external dissimilarities.

Next in line is the individual (vs. the inter-individual) reading of the principle. Suppose that *A* and *B* are presented with the same stimulus. The wiring of their sensory systems may still be such *A* and *B* form dissimilar perceptions. Thus, under the inter-individual reading there is a violation of the principle, for similar, and in the case considered identical, stimuli do not give rise to similar perceptions in different individuals. As before, the individual reading of the principle evades this type of counterexample. All that matters according to this interpretation is that dissimilar perceptions track dissimilar stimuli in the *same* individual.

The last qualification concerns diachronic violations. Setting off, once more, from the supposition that a sensory system changes over time, it must be admitted that dissimilar perceptions in the same individual that initially arise from exposure to dissimilar stimuli may subsequently arise from similar stimuli. As before, the greater the intervening time the higher the probability, though not necessarily high enough, for something like that happening. Even so, it's highly doubtful that such changes take place regularly enough to be massively disruptive to the potential

¹² Indeed, the foregoing quotations betray some of these qualifications. Hume talks about likeness or similarity instead of sameness. Russell worries about diachronicity and thus stipulates, in at least some formulations, that the percepts in question must be simultaneous. For the record, I do not subscribe to this stipulation as it is plainly too strong.

veridicality of perception. This supposition will be briefly argued for in Sect. 5 as already promised.

Unsurprisingly, given the range of qualifications considered, our reformulation of the current principle mimics the reformulation of the principle of internal similarities.

Principle of Internal Dissimilarities: For a well-delimited range of external things (determined by facts about the discriminating abilities of the human race), the formation of internal dissimilarities in a randomly chosen individual over some time-interval is likely, and indeed increasingly likely the shorter the interval, to have been produced by exposure to external dissimilarities, i.e. dissimilarities that exist between the said external things.

Like the reformulation of the other principle, I do not expect this one to be the final word on the matter. Let me end this section by restating that I have not yet made the case why either principle holds. But I turn to that very issue now.

5 The principles grounded

An anti-veridicalist would surely deny or question the (approximate) truth of our two principles. But would they be warranted in doing so? In this section, I argue that they wouldn't by pointing out how absurdly fortuitous the world would have to be if these principles were not (approximately) true.

Suppose, for argument's sake, that for most individuals their internal similarities were not likely to have been produced by exposure to external similarities. Moreover, suppose, again for argument's sake, that for most individuals their internal dissimilarities were not likely to have been produced by external dissimilarities. The completion of simple tasks would then become ridiculously chancy affairs. Take the task of greeting a friend as opposed to a complete stranger. If dissimilar objects, i.e. a friend and a complete stranger, repeatedly produced similar perceptions in any such individual that individual would not be able to receive the desired cues from perception to greet their friend as opposed to a justifiably startled stranger. Or, take the task of attending a meeting at a pre-designated time, say 5:00 pm. If similar objects, e.g. various synched analogue clocks or even the same clock from one moment to the next, repeatedly produced dissimilar perceptions in any such individual, e.g. one perception showing the short hand on the dial at 5 and another (a millisecond later) at 10, that individual would not be able to receive the desired cues from perception to be at the meeting on time. Repeated success at any of these tasks would then become absurdly fortuitous. To account, in a non-absurdly-fortuitous way, for such success we must thus endorse the (approximate) truth of the two principles.

The stakes become higher when one thinks about matters of learning and survival. Take a simple case of learning first. That a fire can be started by rubbing a piece of dry wood against a dry and hard stone cannot be gleaned from one's perceptions unless those perceptions are similar whenever that individual performs the same or a similar action. And, of course, being capable of perceptually

differentiating between dry and wet objects is paramount to bringing that plan to fruition. Now take a case of survival. A previously unseen kind of animal that attacked and succeeded in killing one of our tribesmen cannot be recognised as a mortal threat unless the perceptions we form of that individual animal or animals of that kind are similar. Moreover, our ability to distinguish a berry that sustains and a berry that kills depends on the sensitivity of our sensory system to detect salient differences in our environment.

Whenever learning and survival are at play the hand of evolution is not far behind. Selection pressures ensure that a sensory system produces veridical output capable of tracking environmental similarities and differences that are pertinent to the survival of its host. Put otherwise, and as already suggested in the preceding paragraph, organisms whose sensory systems do not comply with the aforementioned principles are not likely to survive. That means they have little to no chance of procreating and, hence, the genes corresponding to their faulty sensory systems eventually disappear.

Finally, note that we would not be capable of successfully carrying out any of the tasks listed earlier, if the wiring of our sensory systems were not stable long enough to encode the targeted similarities and dissimilarities. In other words, pervasive worries about diachronicity subside as soon as one considers how vital the (approximate) truth of the two principles is to our everyday, not to mention our scientific, lives. This is not to deny that changes to the wiring of a sensory system never happen but rather to assert that their frequency must be low and/or the changes so subtle that there is, on average, no sizable undoing of the obviously successful way we track similarities and dissimilarities in the world.

6 Inter-subjective agreement

Suppose that the two principles do indeed roughly hold, i.e. are (approximately) true, as I argued for in the last section. How can inter-subjective agreement about external things be achieved, if, as suggested above, we rely on individual readings of the two principles? Let us break this problem down into two cases: similar stimulus and dissimilar stimulus agreement.

Take similar stimulus agreement first. Suppose that whenever two individuals *A* and *B* are exposed to the same stimulus *x* it gives rise to similar, i.e. a_I -like, perceptions in *A* and similar, i.e. b_I -like, perceptions in *B*.¹³ In other words, suppose that the sensory system of each individual satisfies the principle of internal similarities vis-à-vis stimulus *x*. Suppose moreover, to make things harder for any potential agreement between *A* and *B*, that a_I -like perceptions are dissimilar to b_I -like perceptions. Finally, suppose that *A* names the posited stimulus corresponding to her perceptions 'F' and *B* names hers 'G'. Despite their dissimilar perceptions and even their dissimilar choice of names, *A* and *B* can still come to recognise, when

¹³ The same stimulus supposition was chosen to simplify the example. The point I am about to make holds even when we suppose that the stimuli are merely similar.

stimulated by x in each other's presence, that their perceptions correspond to the same stimulus (or at least similar stimuli). That's because A undergoes a_1 -like perceptions and uses the term F to denote what she deems to be the corresponding stimulus exactly (or at least roughly) when B undergoes b_1 -like perceptions and uses the term G to denote what she thinks is the corresponding stimulus. So, after a while, it is sensible for them to conclude that the other individual's term denotes the same stimulus (or at least similar stimuli) to the term they use.¹⁴

Now take the dissimilar stimuli case. Suppose that whenever A and B are exposed to two dissimilar stimuli x and y , stimulus x gives rise to similar, i.e. a_1 -like, perceptions in A and similar, i.e. b_1 -like, perceptions in B while stimulus y gives rise to similar, i.e. a_2 -like, perceptions in A and similar, i.e. b_2 -like, perceptions in B . Suppose also that a_1 -like perceptions are dissimilar to a_2 -like perceptions and that b_1 -like perceptions are dissimilar to b_2 -like perceptions. In other words, the first two suppositions amount to the idea that the sensory system of each individual satisfies the principles of internal similarities and of internal dissimilarities vis-à-vis stimuli x and y . To make things harder for any potential agreement, suppose also that a_1 -like perceptions are dissimilar to b_1 -like perceptions and a_2 -like perceptions are dissimilar to b_2 -like perceptions. Finally, and again to make things harder, suppose that A names the posited stimuli corresponding to her perceptions 'F₁' and 'F₂' respectively and B names hers 'G₁' and 'G₂'. Despite the dissimilar perceptions between them and even their distinct choice of names, A and B can still come to recognise, when stimulated by x and y in each other's presence, that their perceptions discriminate between the same two dissimilar stimuli (or at least two dissimilar stimuli each of which is similar to what the other individual perceives). That this is so can be explained as follows. The names, F_1 and G_1 , are employed by their respective users to denote what they each deem to be the corresponding stimulus in exactly (or at least roughly) the same set of circumstances, call it 'C₁', namely whenever A undergoes a_1 -like perceptions which is exactly (or at least roughly) when B undergoes b_1 -like perceptions. Likewise, the names, F_2 and G_2 , are employed by their respective users to denote what they each deem to be the corresponding stimulus in exactly (or at least roughly) the same set of circumstances, call it 'C₂' where $C_2 \cap C_1 = \emptyset$, namely whenever A undergoes a_2 -like perceptions which is exactly (or at least roughly) when B undergoes b_2 -like perceptions. So, it is reasonable to expect that, after a while, the two individuals reach the same conclusion, namely that 'F₁' and 'G₁' denote the same or at least similar things that are themselves dissimilar to those same or at least similar things that are denoted by 'F₂' and 'G₂'.

To make things harder still, we could additionally suppose, though it is not necessary, that in the case of similar stimulus agreement the perceptions of A and B are so dissimilar that were we to subsequently put an a_1 -like perception in B 's

¹⁴ In such cases, some form of the causal (or a hybrid causal) theory of reference must hold true, at least in the sense that in the absence of a common language repeated pointing and uttering is necessary if individuals are to stand any chance of establishing agreement about the denotation of terms. Having said this, I do not wish to claim that *all* cases of successful reference must be subject to one particular theory of reference, causal or other. See Votsis (2011) for a pluralist approach to reference.

head and a b_1 -like perception in A 's head, both A and B would independently judge that a stimulus dissimilar to x were before them. In the case of dissimilar stimulus agreement the additional supposition would be that the perceptions A and B form are such that were we to subsequently transplant A 's perceptions in B 's head and vice versa, both A and B would independently judge that y is before them when presented with x and x when presented with y .¹⁵ The additional suppositions would make no difference to the conclusions we draw in either of the cases discussed above as the names given by each individual would still be used by them in exactly (or at least roughly) the same circumstances. And they would be so used because their sensory systems still satisfy the two principles.

The scenario just outlined, now known as 'the inverted spectrum' scenario, was first suggested by Locke, who recognised that it would have no effect on the ability of individuals to map distinct external things.

Though one man's idea of blue should be different from another's. Neither would it carry any imputation of falsehood to our simple ideas, if by the different structure of our organs it were so ordered, that the same object should produce in several men's minds different ideas at the same time; v.g. if the idea that a violet produced in one man's mind by his eyes were the same that a marigold produced in another man's, and vice versa... For all things that had the texture of a violet, producing constantly the idea that he [i.e. one such individual] called blue, and those which had the texture of a marigold, producing constantly the idea which he as constantly called yellow, whatever those appearances were in his mind; he would be able as regularly to distinguish things for his use by those appearances, and understand and signify those distinctions marked by the name blue and yellow, as if the appearances or ideas in his mind received from those two flowers were exactly the same with the ideas in other men's minds. ([1690] 1975, Book II, Ch. XXXII, §15).

Observe that it doesn't matter whether such inversions are realisable. Generally speaking, differences in the qualities of perceptions are not going to have an effect on inter-subjective agreement so long as the principles we are currently discussing hold. This would be true even in cases where the physiological constitution of the two individuals is so different, think of a human vs. an alien from Alpha Centauri, that the said perceptions are as different as can be.

7 Gavagai and the common ontological denominator

Doesn't Quine's famous gavagai argument (1960) stand in the way of such inter-subjective agreement? The short answer is 'no'. Allow me to quickly recap Quine's argument before I explain why. An English speaker and a native attempt to communicate. The native utters 'gavagai' when (and only when) a rabbit is present

¹⁵ Notice that if this second type of transplantation were true, it could no longer be true that a_1 -like perceptions are dissimilar to b_1 -like perceptions and a_2 -like perceptions are dissimilar to b_2 -like perceptions, i.e. each pair would of necessity be similar.

and points to it. The English speaker takes ‘gavagai’ to mean rabbit but, in matter of fact, the native speaker means undetached rabbit parts. According to Quine, neither speaker can uncover the intended meaning, ontology and reference of the other. This is because not all differences in what is being intended show up as differences in the perceptual evidence. Otherwise put, perceptual evidence underdetermines a speaker’s intended meaning, ontology and reference. In light of this predicament, speakers ought to resign themselves to the inscrutability of meaning, ontology, reference, translation and, by extension, inter-subjective agreement.

Several critical questions can be, and indeed have been, raised about the inscrutability theses. I will not dwell on these questions here. Instead, I will reason that even if we accept the above argument, and hence the inscrutability theses, the conclusion we ought to draw is largely harmless to the main claims advocated in this paper. Take similar stimulus agreement first. It is in fact a central presupposition of Quine’s argument that ‘gavagai’ and ‘rabbit’ are prompted by the *same* set of stimuli. As Quine notes, time and again, ‘gavagai’ and ‘rabbit’ “have the same stimulus meaning” (p. 33). Stimulus meaning, roughly speaking, is the ordered pair of affirmative and negative stimulus meaning, which in turn is understood as the class of all stimulations that would prompt a speaker’s assent to a sentence like ‘Gavagai!’ and the class of all stimulations that would prompt their dissent to that sentence respectively. Having the same stimulus meaning is thus a stronger condition than sharing the same stimulus. It is stronger because it supposes that the two speakers not only share the class of all stimulations that prompt their actual assent to ‘gavagai’ and ‘rabbit’ but also the class of all stimulations that *would* prompt their assent to those terms and, furthermore, the class of all stimulations that *would* prompt their *dissent* to the said terms. The last of these just means that they can discriminate between a ‘gavagai’ and ‘rabbit’ inducing stimulus on the one hand and various other stimuli on the other. It is thus safe to conclude that Quine’s argument does not affect the ability of speakers to agree that they are talking about similar stimuli or about the same dissimilar stimuli.

Quine’s argument is directed at undermining inter-subjective agreement about intended objects, meaning and reference, *not* stimuli (see 1960, §11–12). Note that, up to now, I have restricted most of my comments on inter-subjective agreement to stimuli, not objects. The reason I stuck to stimuli is that I am well aware of the difficulties one faces when objects are brought into the mix. If perceptions are once removed from stimuli, they are twice removed from objects and who knows how much farther removed from intended objects. In other words, inferences from perceptions to stimuli are generally safer than those to objects and both types of inferences are safer than those to intended objects. Having said this, since in my conception of external, distal, things I included not only stimuli but also physical objects I would like now to briefly argue how inter-subjective agreement can be reached regarding these also.

First off, observe that Quine’s argument affects the ability of speakers to justifiably agree that they are talking about the same objects but has hardly any effect on their ability to justifiably agree that they are talking about distinct objects. He sets up the argument in such a way that it could not be the case that the native intends ‘gavagai’ to mean ‘undetached φ parts’ where φ stands for some (almost

any) thing other than a rabbit, e.g. an elephant or ‘gavagai’ in the native’s vocabulary. If that were the case, the two speakers would not be fooled into thinking that ‘gavagai’ and ‘rabbit’ mean the same thing—they would, rather, be fooled into thinking that ‘gavagai’ and ‘elephant’ mean the same thing. Quine’s argument presupposes that the speakers are capable of perceptually discriminating between virtually all pairs of objects they are confronted with, at least those in everyday life, e.g. rabbits and monkeys, rabbits and elephants, monkeys and elephants, etc. Thus, the two speakers justifiably come to agree that they are talking about two distinct objects when in the presence of most pairs of objects their sensory systems can detect. And that’s sufficient to establish the desired inter-subjective agreement about distinct objects.

Now take inter-subjective agreement about the same objects. Obviously, this agreement could not be about the same *intended* objects, otherwise we would be contradicting one or more premises in Quine’s argument, which we here decided to take for granted. But it could be about the same objects in the world. Here’s how to achieve this. So long as their intended ontologies are grounded by the same or similar stimuli, one can almost always find a ‘common ontological denominator’ between the English and the native speaker. In the case at hand, it is the collection of mind-independent objects in whose presence similar stimuli are produced which in turn give rise to ‘rabbit-like’ and ‘gavagai-like’ perceptions in English and native speakers respectively. Restricting inter-subjective agreement to common ontological denominators may sound like a weakness, given that we’re not capturing what the speakers fully intend, but it is in fact a major strength. By doing so we avoid assuming anything controversial about these objects, e.g. whether they are whole or constituted by undetached parts, in much the same way as the Ramsey sentence can help avoid reference to pesky theoretical posits. After all, these are assumptions for which, Quine tells us, *no evidence is even in principle available*. In sum, the speakers can justifiably come to agree they are talking about the same physical object, qua common ontological denominator.

8 Theory-ladenness: linguistic choices and sensory physiology

We now possess all the ammunition we need to address the problem of theory-ladenness. Actually, in so far as theory-ladenness emerges from differences in linguistic choices or sensory physiology, we have already said enough to nullify the threat this poses to veridicalism. Recall that in establishing inter-subjective agreement between individuals we supposed, to make things harder, that both the names initially given by each individual to the posited stimulus as well as the perceptions each formed were dissimilar to the names given by, and perceptions formed in, the others. These two suppositions serve the function of incorporating different linguistic choices and different sensory physiologies, respectively, into our thought experiment. The result is that, so long as the sensory systems of those individuals obey the two principles, inter-subjective agreement remains unaffected. That is, individuals manifesting those differences can justifiably come to agree that they are talking about similar or dissimilar objects precisely because the two

principles (roughly) hold, i.e. are (approximately) true. We can therefore conclude that such differences, though real, fail to distort the veridicality of those individuals' perceptual beliefs and observational reports.

It goes without saying that the differences in sensory physiology I have in mind *do not* contradict our two principles. More accurately, on the condition that the sensory systems of individuals satisfy the two principles vis-à-vis a range of stimuli then no differences in their sensory physiology can obstruct the warranted establishing of inter-subjective agreement about that range of stimuli. It is thus not an objection to the establishing of this agreement to say, as some may be tempted to, that one individual's sensory system, as opposed to another's, may be wired such that it is incapable of discriminating between two stimuli. If it is so wired then clearly it does not satisfy the principle of internal dissimilarities regarding those stimuli.

9 Theory-ladenness: environmental cues, prior beliefs, conceptual resources and theories

What about the threat posed by the kind of theory-ladenness that emerges from differences in environmental cues, prior beliefs, conceptual resources and theories? Can the aforementioned principles be of use here? In what follows I address the first of these questions by answering the second in the affirmative.

Let me admit from the outset that environmental cues, prior beliefs and the like occasionally 'trick' perception. There are plenty of experiments and studies in psychology demonstrating that such factors affect what subjects perceive or at least what they believe and report. Quite a few of these are priming experiments, where a stimulus is given prior to a perceptual judgment in order to affect its content. A well-known priming experiment is that of Leeper (1935). Subjects are primed by being given an unambiguous picture of either a young or an old woman and then asked to decide whether an ambiguous figure of a woman is young or old. It turns out that the subjects overwhelmingly follow the priming they receive in judging the ambiguous figure, e.g. a young woman prime leads to a young woman judgment. Other priming experiments involving ambiguous figures include the rat-man figure (see, for example, Bugelski and Alampay 1961) and the 13-B figure (see, for example, Balci and Dunning 2006).

Not all studies involve priming. Some merely test the effects of naturally-occurring factors, e.g. age, sex and ecological origin, on perception. A prominent study of this kind is that of Segall et al. (1966). The study conjectures that differences in the ecological origin of a subject, e.g. urban as opposed to forest dwellers, lead to different 'visual inference habits' that affect the subject's susceptibility to geometrical illusions, including the Müller-Lyer illusion. The data gathered, indicating more susceptibility to the illusions in westerners (vs. non-westerners), seems to be consistent with this conjecture.¹⁶ Other non-priming

¹⁶ The source of the susceptibility to the various illusions is often contested by further studies. For example, a comparison of the potential sources of susceptibility to the Müller-Lyer illusion can be found in Bery (1971).

studies include the Delboeuf illusion (see, for example, Sjoström and Pollack 1971) as well as the Poggendorff Illusion (see, for example, Declerck and de Brabander 2002).

Anti-veridicalists tap into these results to spread their message that perception is not veridical or at least that its veridicality is questionable.¹⁷ It would be foolish to deny that these experiments and studies teach us a great deal about the limits of cognition and perception. They do not, however, supply a systematic challenge to the veridicality of perceptual beliefs and observation reports. This is because they impose conditions that we do not normally find in the domains of everyday life and science. Take a random priming experiment. Such an experiment tends to require the presence of a constant priming factor (on at least one group of subjects) before any perceptual judgement is made, a short intervening time between the priming and the allocated task, a relatively short time-frame in which to complete the task, and other such conditions that are not natural or ever-present in everyday life and in science. Similar quirks lie behind the non-priming studies. Indeed, what the priming and non-priming studies have in common is that the solicited judgments typically concern contrived stimuli uncommon to those one encounters outside the psychology lab. As Brewer and Lambert rightly remark, the stimuli in various such experiments and studies are “either ambiguous, degraded, or requir[e] a difficult perceptual judgment” (2001, p. 179). It is no wonder then that most psychologists, being careful about what can be concluded from such experiments and studies, do not peddle their results as evidence that there is a large-scale undermining of the veridicality of perception. And it is no wonder that these results do not supply a systematic challenge to the veridicality of perceptual beliefs and observation reports, given that, as we already saw in Sect. 5, success at numerous tasks would be absurdly fortuitous if the principles of internal similarities and of internal dissimilarities were not (approximately) true.

10 Unlading perception and observation: the stimulus exchange procedure

The illusions and other mind-traps that are such popular topics of study in the psychology of perception are branded so because we are fully aware that they mislead. Crucially, the reasons for our awareness have a perceptual grounding too! For example, to correct our judgment concerning the Müller-Lyer illusion all we need to do is cut off the inward pointing and outward pointing arrow parts of the lines (without cutting off the lines themselves) and reconsider their length. Or we can approach the issue from the opposite direction. Start with two lines of equal length and add the corresponding arrow parts to their endpoints. Perception may be hoodwinked occasionally but it is such a formidable tool that it also helps expose those regrettable occasions.

¹⁷ Ironically, anti-veridicalists fail to recognise that to get real traction from these experiments and studies one needs to endorse their veridicality.

Besides tapping into psychological results, anti-veridicalists also offer more ‘anecdotal’ reasons in support of their view. They argue that an expert’s trained eye presumably sees different things to a layperson’s because what one experiences through one’s senses or even through an instrument is a function of among other things what one brings along with them, namely prior beliefs, conceptual resources and theories. This, according to them, is not a claim about the interpretations we slap onto perception post hoc but about the content of perception itself. A quote from Hanson, who despite appearances to the contrary is not himself an anti-veridicalist, is indicative of this attitude: “... one does not first soak up an optical pattern and then clamp an interpretation on it... theories and interpretations are ‘there’ in the seeing from the outset” (9–10). I will now illustrate why this type of reasoning leads the anti-veridicalist nowhere.

Consider an image of what are presumably sub-cellular details of organic matter taken with an electron scanning microscope. An expert distinguishes several characteristics which they identify with parts of cells, including the nucleus and mitochondrion. A layperson has no such story to tell. Yet, a layperson is able to recognise the same patterns of features in the images as the expert. That this is so can be demonstrated by asking an expert and a layperson, both in possession of decent drawing skills and normal perception, to each draw a faithful, i.e. no detail spared, reproduction of the image first and then to judge whether the other individual’s drawing is faithful to the original image.¹⁸ If, as I expect it to be the case, they both answer in the affirmative, we can reasonably conclude that the two recognise the same patterns of features in the images.

We can push this line of thought further by proposing the following experiment. Take a non-negligible number n of experts from the same scientific field, each of whom, again, possesses decent drawing skills and normal perception. Ask the experts to jointly select ten instrument-produced images from their field that are unambiguous and clearly dissimilar, i.e. no grey cases. Then ask each of them, but also each of an equal number of laypersons with comparable drawing and perceptual skills, to faithfully reproduce all the images by hand with no detail spared. That is to say, instruct them that no detail is too small for inclusion. Gather all the drawings together, those of the experts and of the laypersons, in one box and in random order. Then sequentially ask each individual, expert or layperson, to judge (while in isolation from the others) which drawings are similar to which original images. More precisely, ask them to sort the drawings into 10 piles, leaving no drawings unsorted, i.e. each pile containing $2n$ drawings.¹⁹ Whenever an individual completes

¹⁸ Normal perception requires sensory systems that satisfy the principles of internal similarities and of internal dissimilarities for a specific range of stimuli. That range depends on the particular species under consideration. On a different note, Hanson (1958) briefly considers such a drawing test but surprisingly fails to properly evaluate its importance in solving the theory-ladenness problem at hand.

¹⁹ To make things harder, we may even ask that which drawing goes into which pile should also be determined by which drawings are similar to which other drawings so long as there are $2n$ drawings in 10 piles. This is harder because similarity is an intransitive relation. That is, two drawings that are judged to be similar to an image *may* not be similar to one another. Note that intransitivity does not mean anti-transitivity! The stronger the notion of similarity employed the less likely that two things that are similar to a third are not also similar to each other.

the task, record their choice and put the drawings back in the box in random order. Repeat until all the individuals have completed the task.

My conjecture is that there should be perfect or near perfect convergence in the test subjects' perceptual judgements. That's because assuming that the drawings are indeed faithful reproductions of the originals and that the originals are indeed dissimilar, it is reasonable to conclude that the drawings, independently of any sorting, give rise to 10 dissimilar classes of similar stimuli. That is to say, each class contains $2n$ similar stimuli as members and any member of a class is a dissimilar stimulus to any member of another class. But we know, from our two principles, that in any given individual similar perceptions are likely to have been produced by exposure to similar stimuli and dissimilar perceptions are likely to have been produced by exposure to dissimilar stimuli. Thus the test subjects should converge on the same perceptual judgments, even if their prior beliefs, conceptual resources and theories are divergent.²⁰ Put more neutrally, but also more generally, my conjecture is that experiments of this type will, on the whole, result in convergence.

It may be objected that without an expert's prior beliefs, conceptual resources and the like, the perceptual judgements and corresponding observation reports that a layperson can make about patterns of features in scientific images have no evidential relevance for the hypotheses being tested. This objection fails for the simple reason that the information contained in such perceptual judgements and observation reports is deemed evidentially relevant even by the experts themselves. That this is so can be demonstrated by considering how the experts' confirmation judgements about the hypotheses under test would change if those patterns and hence that information were sufficiently different.

This is not to deny that the experts' prior beliefs, conceptual resources, etc., play a major and oftentimes legitimate role in the testing of hypotheses. Since hypotheses talk about entities and their properties, i.e. not patterns of features in images, experts need bridge principles that connect the former to the latter.²¹ For example, if a hypothesis asserts that a mitochondrion is expected to have such-and-such properties and the image contains a blob with certain properties, then depending on what the relevant bridge principle asserts, it may or may not be the case that the blob properties correspond to the mitochondrion properties and hence confirm or disconfirm the hypothesis (plus any auxiliaries) in question. But, crucially, the content of these bridge principles *can* be kept separate from the content of the observation reports that the layperson and expert converge on. And it makes good *epistemic* sense to keep them separate since the two may have different truth-values.²² After all, a bridge principle will typically be more conjectural than a

²⁰ By divergent conceptual resources I do not, of course, mean individuals with significant intelligence handicaps.

²¹ Needless to say, laypersons in relation to a scientific field will not be in possession of bridge principles associated with that field.

²² Having said this, it must be granted that it is usually more convenient for scientists to formulate their observation reports in a way that talks directly about entities and their properties. For example, it is more expedient for an observation report to assert that the nucleus of a cell is undergoing mitosis instead of asserting that the blob in the image splits into two blobs, etc.

layperson-accessible observation report and hence more likely to be revised in the future.

What I described in my little experimental proposal can be turned into a procedure, which we can call the ‘stimulus exchange procedure’, through which perceptual judgements and observation reports can be *unladen* from an expert’s prior beliefs, conceptual resources and theoretical prejudices. That is, if asked what counts as the unadulterated content of a perceptual judgement or observation report targeting a given domain our answer should be: That content for which convergence can be reached by individuals whose sensory systems satisfy the principles of internal similarities and of internal dissimilarities vis-à-vis the given domain.²³ Thus, even if most actual perceptual judgments and observation reports were indeed laden with ‘theory’ the unadulterated content contained within them could always be recovered by appeal to the stimulus exchange procedure.

The procedure can be put to work to treat cases of theory-ladenness across the board. Let us consider two examples, one from Kuhn and the other from Hanson. Kuhn claims that “[l]ooking at a bubble-chamber photograph, the student sees confused and broken lines, [while] the physicist a record of familiar subnuclear events” ([1962] 2012, p. 112). Following our procedure, the relevant observation report both physicist and student converge on is that there are some distinct lines in such photographs with specific characteristics, some of them are straight, others diagonal and others still spirals. Of the two types of observers, only the physicist has a concrete bridge principle in mind, connecting the behaviour and interactions of subatomic particles with the specific characteristics of the lines in the photographs. For example, a spiralling line is a sign of the passing through of an electron or anti-electron. The presence of a subatomic particle notwithstanding, both student and physicist are capable of discriminating the spiralling line from the other lines in the photograph and that is all we need to unladen the given observation report.

Next, take Hanson’s claim, that while “Tycho and Simplicius see a mobile sun, Kepler and Galileo see a static sun” (1958, p. 17). Following our procedure, both pairs of individuals converge on the same observation reports, namely those that describe the slow semi-circular motion of a bright ball against the horizon going from left to right. And this is despite the fact that each pair endorses a different bridge principle that connects their theoretical beliefs, mobile vs. static sun, with the bright ball’s motion. The further fact that both bridge principles are strictly speaking false, though Kepler’s is admittedly more accurate than Tycho’s, serves to illustrate the point about the utility of keeping bridge principles separate from the convergent content of observation reports.²⁴ The true story behind the sun’s motion notwithstanding, both pairs of scientists are capable of discriminating the motion

²³ I do not expect scientists to adopt this form of expressing what is evidentially of merit for it is obviously too cumbersome to explicitly split observations sentences into two parts. As I already mentioned, I don’t think scientists have to worry about theory-ladenness in most situations so there is generally no harm in continuing to express themselves the way they do so now.

²⁴ Kepler’s bridge principle is strictly speaking false. We know since Newton’s time that the sun is not static as, among other things, it not only pulls other planets with its gravitational field but also gets pulled by their own gravitational fields.

of the bright ball from other things in their field of view and that is all we need to unladen the said observation report.

To sum up, it is only when perceptual judgements or observation reports are burdened with additional information that suspicions of ‘theoretically’-sourced distortion arise. But even in those cases where the suspicions are justified, i.e. where ‘theoretical’ factors do indeed distort, the epistemic worth of the resulting judgments and reports is not beyond salvation. To unburden them of their theoretical ‘sins’ we need only apply the stimulus exchange procedure.

11 A few thoughts on similarity

As we saw earlier, sameness clearly won’t do. Many of our perceptions of even one and the same static thing are not identical but have at least subtle variations. That’s why we need the more inclusive notion of similarity. The tricky part is how exactly we should conceive of similarity. This is not a topic that can be adequately addressed here. Even so, I would like to offer three observations that hopefully throw some light on the kind of notion of similarity that is vital for the current project to get off the ground.

The first observation is that similarity judgments should possess a predominantly objective grounding. The existence of considerable inter-individual and inter-cultural convergence would go a long way in buttressing this claim.²⁵ It may be objected that convergence within a group or culture is explainable in terms of shared conventions brought about by the process of enculturation. Those who offer such an explanation ignore the fact that for conventions to be shared some information must be accurately communicated and received and this requires the use of stimuli on behalf of the ‘speakers’ that will be appropriately identified and discriminated by the sensory system of the ‘hearers’. But to so identify and discriminate the stimuli the hearers must already be capable of making similarity (and dissimilarity) judgments akin to those of the speakers.

There is further reason to reject the enculturation explanation. This explanation would not even get off the ground if considerable inter-cultural convergence were the case, assuming, of course, that the different cultures developed their similarity metrics independently. Some evidence is beginning to emerge that supports this type of convergence. For example, the Ketengban tribe of Indonesian New Guinea, which was isolated from westerners until recently, has an extensive classification system for local birds that corresponds ‘for the most part on a one-to-one basis’ to the western scientific one (Diamond and Bishop 1999, p. 41). Much more evidence is undoubtedly needed to establish the inter-cultural convergence thesis so it is premature to draw any sturdy conclusions. I just want the reader to recognise that at the very least the same is true of the opposite, i.e. inter-cultural divergence, thesis.

²⁵ Let me stress that the inter-individual and inter-cultural convergence mentioned here is about judgements of similarity and dissimilarity not about perceptions themselves. As we saw earlier, perceptions are allowed to vary considerably between individuals.

The second observation is that for the similarity–dissimilarity dichotomy to have epistemic import it is not essential to be able to judge each and every pair of perceptions as similar or else as dissimilar. So long as there are many clear cases of each, the existence of grey cases need not be a big thorn in our backside.²⁶ Moreover, if being grey is an interim phase, then the more grey cases are ‘turned’ the less of a challenge the remaining class of grey cases poses. There is in fact good reason to believe that grey cases are increasingly being ‘turned’ through technological development. The history of scientific instruments is the history of revealing more and more details about target domains, details that facilitate the production of unequivocal similarity and dissimilarity judgments.

The third and final observation is that part of the trouble with pinning down similarity is the unreasonable expectation that there exists a universal measure of similarity for all domains of inquiry—a ‘one shoe fits all’ sort of thing.²⁷ It’s fairly obvious that this expectation cannot be met. Recall the well-known objection that anything is similar to anything else in some respect or other. Clearly, identifying what respects are relevant is vital to successfully evading this objection. But what respects are relevant is something that *varies* from domain to domain and determined by *local* matters of fact. For example, similarity judgments in bubble chamber photographs concern lines but not dots since the former suggest the presence of subatomic particle tracks while the latter suggest only the presence of noise. In much of astronomy, by contrast, similarity judgements concern also dots as these often suggest the presence of stars and other celestial objects, i.e. not just noise.²⁸

12 Conclusion

In this paper, I addressed a central challenge to veridicalism posed by the theory-ladenness problem as this applies to late stage items of the perceptual process, i.e. beliefs, judgments and reports, when the target domain is attended. To defuse this challenge, I acquainted the readers with two principles and offered refined versions thereof. I then argued for the (approximate) truth of these principles, pointing out how preposterously fortuitous the world would be if that were not the case. Following this, I argued that their (approximate) truth allows us to establish that different individuals, whose perceptual judgments and observational reports comply with the principles, are able to track the same distinct things across the mind-

²⁶ Incidentally, this is the way van Fraassen defends his notion of observability against accusations of vagueness.

²⁷ Inter-individual and inter-cultural convergence do not require a universal similarity measure for all domains of inquiry. Such convergences would hold even if each domain of inquiry necessitated its own similarity measure so long as the totality of those measures were shared by the different individuals and cultures.

²⁸ This kind of emphasis on locality has been promoted, quite correctly in my view, by Norton (2003), who argues that the problem of induction arises out of an unreasonable expectation to find a universal schema of induction.

independent world. This is another way of saying that perception and observation are largely veridical. And this in turn means that, the content of perception and observation is, generally, free of substantial distortion by ‘theoretical’ factors. But even in those cases where the content is indeed distorted there is little to no reason for despair as help is at hand in the form of the proposed stimulus exchange procedure.

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