Can Theory-Laden Effects be Removed?

A Proposal for an Experiment

Ioannis Votsis

Düsseldorf Center for Logic and Philosophy of Science

Philosophy Department, New College of the Humanities

votsis@phil.hhu.de / ioannis.votsis@nchum.org

1. Introduction

Observation plays a central role in our everyday and scientific lives. Safeguarding its objectivity is therefore of paramount importance. Let us call 'veridicalism' the view that observational reports are largely truthful and that there exists a great deal of inter-subjective agreement concerning their content. Perhaps the biggest threat to this view is the so-called 'theory-ladenness' of perception and/or observation, an idea that has long been studied by both philosophers and psychologists. Roughly speaking, this is the idea that 'theoretical' factors influence the content of perceptual beliefs and observational reports. Such factors, it has been suggested, are most obviously found to be operating in divergence when we compare the observational reports of experts to those of laypersons.

This paper (and talk) proposes the design of a type of experiment whose aim is to determine whether differences in the content of expert vs. layperson observational reports, where these do indeed exist, can be removed under controlled conditions. Clearly, if such differences could be removed at least sometimes, theory-ladenness of this sort would pose less of a threat to inter-subjective agreement on, and ultimately to the objectivity of, observational reports. We conjecture that such differences are indeed within our ability to expunge. What is more, we argue that the content of the resulting observational reports does not lose any of its evidential relevance. Our hope is that through discussing these issues with fellow philosophers and psychologists we will be able to refine the design of our experiment prior to actually carrying it out.

2. Existing Results and their Significance

Several types of theory-ladenness have been discussed in the literature – for a classification see Brewer and Lambert (2001). In this essay we refrain from considering all the alleged kinds of theory-ladenness and focus instead on the kind that emerges when individuals with divergent prior beliefs and/or theories proceed to report what they observe in different ways. This section touches upon a selection of existing experimental results and offers some tentative reflections on their significance

to the debate over the objectivity of observational reports.[1]

Plenty of experiments and studies in psychology demonstrate that prior beliefs and/or theories 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, Balcetis 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. nonwesterners), seems to be consistent with this conjecture.[2] Other non-priming studies include the Delboeuf illusion (see, for example, Sjostrom and Pollack 1971) as well as the Poggendorff Illusion (see, for example, Declerck and de Brabander 2002).

Anti-veridicalists, like Kuhn (1962), tap into these results to spread their message that perception is not veridical or at least that its veridicality is questionable.[3] 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.

[1] A selection of philosophical essays on theory-ladenness includes Brown (1993), Fodor (1984), Franklin et al. (1989) and Raftopoulos (2001).

[2] 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 Berry (1971).

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

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 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. Having said this, the results do make the possibility of such large-scale undermining a more grounded worry. It is for this reason that experiments need to be conducted testing not only the pervasiveness of such effects in observational reports but also how much such effects are entrenched and whether they can be eliminated. That's where the current proposal comes in.

3. Can Theory-Laden Effects be Removed?

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'' (1958, pp. 9–10).

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, it may be argued that a layperson is able to recognise the same patterns of features in the images as the expert. That this is so can be tested by asking an expert and a layperson, both in possession of decent drawing skills and normal visual 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.[4] If, as we 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

[4] What counts as normal visual perception would have to be quite broad so as to exclude only cases where a given condition, say glaucoma, are obvious impediments to the detection of objects in the test subject's environment. On a different note, Hanson (1958) briefly considers such a drawing test but surprisingly fails to properly evaluate its importance in addressing the theory-ladenness problem at hand.

images.

We can push this line of thought further by injecting more details into the proposed experiment. Take a non-negligible number *n* of experts from the same scientific field, each of whom, again, possesses decent drawing skills and normal visual 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 2*n* drawings.[5] Whenever an individual completes 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.

Our conjecture is that there should be perfect or near perfect convergence in the test subjects' perceptual judgements in spite of the divergence in their prior beliefs and theories.[6] Put more generally, we expect that experiments of this type will, on the whole, result in considerable convergence.

4. Evidential Relevance

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. In our view, this objection would fail to get off the ground if, as conjectured above, experiments of the aforementioned type result in perceptual judgment convergence. That's because the information contained in such perceptual judgements and observation reports would presumably be deemed evidentially relevant even by the experts themselves. That this is so could 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.

[5] 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.

[6] By divergent conceptual resources we do not, of course, mean individuals with significant intelligence handicaps.

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.[7] 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 perceptual judgments observation reports that the layperson and expert converge on. And it makes good epistemic sense to keep them separate since the two may sometimes have different truth-values.[8] After all, a bridge principle will typically be more conjectural than a layperson-accessible observation report and hence more likely to be revised in the future.

5. Conclusion

We hope that in discussing the material presented above to a mixed audience of philosophers and psychologists we will have a better chance of pre-empting and ironing out problems relating to the proposed experiment and its significance, prior to actually carrying it out. We aim to conduct a pilot study in the months following ESPP 2015.

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

[8] 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.

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