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Observation Sentences Revisited

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Abstract. I argue for an alternative to Quine’s conception of observation sentences, one that better satisfies the roles Quine envisages for them, and which respects Quinean constraints. After reviewing a certain predicament Quine got into in balancing the needs of the intersubjectivity of observation sentences with his notion of the stimulus meaning of an observation sentence, I push for replacing the latter with what I call the ‘stimulus field’ of an observation sentence, a notion that remains ‘proximate’ but is shared between different language users. Throughout, I emphasize the epistemological role of observation sentences.

I shall suggest an alternative to Quine’s doctrine of the stimulus meaning of observation sentences. The proposal solves the puzzle of how observation sentences can be shared without their being referentially distal, thereby straightforwardly making good on their envisaged role in naturalised epistemology as well as their envisaged role in the theory of translation. After examining the shortcomings of Quine’s own treatment of the puzzle, I will specify the conditions in more detail that observation sentences ideally satisfy, outline the new strategy for meeting them involving the method of ‘stimulus fields’—sketching in some crucial details via examples—and finish by assuaging certain doubts and adding what I hope are some useful elaborations. I stress that I mean not to overstep Quine’s boundaries.

1. A Difficulty for Quine: Neurological Privacy

Observation sentences like ‘It’s raining’, as described in Quine’s introduction of them in *Word and Object* of 1960, have ‘stimulus meanings’. ‘Stimulus meaning’ is a technical term, bearing only a slight resemblance to ‘meaning’ in the ordinary sense. The positive stimulus meaning of an observation sentence is ‘the range of stimulations, any one of which would prompt the subject to assent to the sentence’, as Quine put it late on, in ‘Progress on Two Fronts’ of 1996 (p. 159)—where ‘prompted assent’ is a manifestation of the transitory disposition to assent to the sentence when asked. The negative stimulus meaning is the range that would prompt dissent, and the stimulus meaning *simpliciter* is the ordered pair comprising the positive range and the negative range. A stimulation, in turn, was ‘the near-simultaneous firing of some subset of the subject’s neuroreceptors’ (1996, p. 159).¹

Observation sentences are a type of occasion sentence rather than a type of standing sentence. Unlike standing sentences such as ‘Iron is magnetic’, they can change in truth-value without theoretical change, and equally they can be assented to one time and dissented from the next, again without changing one’s theory. Unlike private occasion sentences such as ‘I’ve got butterflies’, the matters with which they deal are intersubjectively available (1993, p. 109;

¹ Very late, in order to obviate the continuing awkwardness of using the term ‘stimulation’ in this way, Quine proposes in one of his ‘Responses’ to speak thenceforth of ‘neural intakes’ rather than ‘stimulation’ (1995b, p. 349). I take it that he wrote this after ‘Progress’ of 1996, despite the publication date’s being before ‘Progress’. ‘I, You and It’ of 2000 observes the new policy.

1992, p. 3). Nor are they like occasion sentences such as ‘Interest rates are rising’, dispositions to assent to which are not correlated with present states of sensory stimulation ([1960], p. 39).

For Quine, observation sentences so-conceived are central both to translation and to the learning of language. Since ‘[t]here is nothing in linguistic meaning beyond what is to be gleaned from overt behavior in observable circumstances’ (1993, p. 38), a Quinean translator looks to observation sentences, for they ‘hinge pretty strictly on the concurrent publicly observable situation’ (p. 39). They serve also ‘as the child’s entering wedge into cognitive language’ (1993, p. 109; also 1992, pp. 3, 37). Accordingly Quine envisages ‘correct translation of an observation sentence as preserving ... its stimulus meaning,’ (1996, p. 159). Stimulus meanings are the central aspect of the ‘objective reality that the linguist has to probe when he undertakes radical translation’ ([1960], p. 35).

This dovetails with his project of naturalized epistemology. The subject’s total evidence is a vast collection of ordered pairs each comprising an observation sentence and a time, where the observation sentence is among the sentences with which the subject is competent, and where the subject has, or did have, a disposition to assent to the sentence in question or its negation at the requisite time (obviously this is an idealisation; and it is not a definition or conceptual analysis but at most an explication of the word ‘evidence’; Quine 1981b, p. 28; 1992, pp. 16-18). If A and B are observation sentences, then Quine calls the conditional ‘If A then B’—itself not an observation sentence but a standing sentence—an ‘observation categorical’ (1981b, p. 27; 1992, p. 10). An example is ‘If it’s raining, then there are clouds’. The observation categoricals which are implied by a theory constitute the ‘empirical content’ of the theory (1981b, p. 28; 1992, pp. 16-18). They are the theory’s ‘empirical checkpoints’ (1995a, p. 44).

Quine perceived an apparent flaw with this scheme, first described in the essay ‘Propositional Objects’ written in 1965 (published in 1969) and articulated with maximum sharpness only some thirty years later, in ‘Progress on Two Fronts’ of 1996 (it also featured in *From Stimulus to Science*, 1995a, and at more length in ‘I, You and It’, 2000). ‘Language’, declares the first sentence of the Preface to *Word and Object*, ‘is a social art’. Accordingly it stands to reason that a translator should primarily be concerned with what is in common to the various members of a given linguistic community’s use of language, and in particular with the individuals’ use of observation sentences. This commonality is why our agreement is often at its highest in our respective dispositions to assent or dissent to observation sentences. It is why they serve as intersubjective points of corroboration of theories. Yet we can safely presume that the stimulus meanings for a given observation sentence as characterized above vary substantially across a linguistic community, for no two of us have an exactly similar layout of sensory nerves, of neuroceptors; if not exactly private in Wittgenstein’s sense, the details of neurology are idiosyncratic. Not only can we not expect identity of neuroceptors—of course—neither can we expect their similarity or homology (1992, p. 40). Yet that ought not to matter, not only for an ordinary language user but for a translator. Quine, when speaking of *Word and Object* in ‘Progress on Two Fronts’:

Stimulus meaning was what, theoretically speaking, correct translation of an observation sentence preserved. This is uncomfortable theory, however. It calls for sameness of stimulus meaning of the native sentence for the native and the English sentence for the translator, and hence a sharing of stimulations by native and translator. Well, they cannot share neuroceptors, so we must settle rather for homology of receptors. Such homology is by no means to be expected, and anyway surely should not matter, as I remarked in a lecture five years later. (1996, p. 159)

In ‘Empirical Content’ of 1981 Quine apparently addressed this problem by first treating of observability for the individual: ‘If querying the sentence elicits assent from the given speaker on one occasion’, he writes, ‘it will elicit assent likewise on any other occasion when the same total set of receptors is triggered; and similarly for dissent’ (1981b p. 25); this ‘qualifies sentences as observation sentences for the speaker in question’ (p. 25). Some years later he reports himself as accordingly having held, at this period, that a sentence is ‘observational for a whole community when it [is] observational for each member’ (Quine 1992, p. 40).

But this is not the end of the matter. As Lars Bergström first pointed out in 1988,² and as Quine put it in *Pursuit of Truth* of 1990 and 1992—this doesn’t rule out that ‘a sentence could be observational for each of various speakers without their being disposed to assent to it in the same situations’ (1992 p. 41). Such sentences would seem not to be worthy of being called observation sentences because they would not underwrite the idea that language is a social art, a public system of communication.

In the years after 1988 Quine focussed on the apparent difficulty concerning two speakers who *are* disposed to assent to a given observation sentence in the same situations. In *Pursuit of Truth*—1990, 1992—Quine sketches the difficulty but does not hazard a solution, resting with a characterisation of an observation sentence as ‘an occasion sentence on which speakers of the language can agree outright on witnessing the occasion’ (1992, p. 3).³ Indeed at this stage he concluded that the problem does not demand a solution: ‘The view that I have come to, regarding intersubjective likeness of stimulation’, he writes, is ‘that we can simply do without it’. Of two observation sentences—the translator’s ‘Rabbit’ and the native’s ‘Gavagai’—‘the affinity of the two sentences is to be sought in the externals of communication’ (1992, p. 42).

This was presumably unsatisfactory, and partly due to an exchange with Gary Ebbs (Ebbs 2015) Quine came subsequently to formulate the problem with increased clarity:

Let me pinpoint the problem. A rabbit appears, the native says ‘Gavagai’, and the translator conjectures ‘Rabbit’. On a later occasion they espy another rabbit, the translator says ‘Gavagai’, and the native concurs. The two occasions were

² At a conference: ‘Perspectives on Quine,’ Washington University, April 9-13, 1988.

³ Unless you count Quine’s discussion of empathy, 1992 pp. 61-67. But Quine himself does not present it as a solution to the problem of observation sentences from earlier in the book; nor does he refer to it in later discussions of the problem. See Ebbs (1994), pp. 540-541.

perceptually similar for the native, by his subjective standards of perceptual similarity, and likewise for the translator by his independently testable subjective standards of perceptual similarity. Anatomic likeness of the native's receptors and those of the translator could have helped to account for this agreement, but that is out. What then does? (1996, p. 160)

Davidson (1993 [1990]) saw this unequivocally as supporting his own scheme, which posits a certain triangle between the translator, the person being translated, and some external object or event such as a rabbit or something resembling a rabbit. Rather than sticking with the proximate neural events, the stimulus meaning, Davidson's scheme goes with the distal cause, namely the rabbit itself, the referent that figures in such a sentence as 'It's a rabbit'.

Quine saw Davidson's scheme as assuming what it ought to be explaining—certainly what it ought to be explaining from Quine's naturalized epistemological point of view, which is very much concerned with the fine details of the situation. 'I remain unswerved,' he writes, 'in locating stimulation at the neural input, for my interest is epistemological, however naturalized' (1992, p. 41; also see 1996, p. 161). No one doubts that, at least in a significant proportion of cases, Davidson's triangle is involved in ordinary translation, communication, and language-learning. But for one thing, some observation sentences—notably some simple ones such as 'It's dark'—simply lack a conspicuous *object* of perception for the sentence to be about (1992 p. 161; 1993, p. 114). For another, to address that problem, the obvious tack of positing situations or (centred) states-of-affairs as the entities which the subject perceives and which observation sentences are 'about', is tantamount to invoking propositions or facts, something Quine famously resists. He is 'put off by the vagueness of situations', as he put it in *Pursuit of Truth*; 1992, p. 42; 'I am reluctant to settle for situations as points of reference' he wrote slightly later; they 'are of a piece with facts and propositions' (1993, p. 114; Quine's use of 'occasions' as in the above quotations from 'Empirical Content' and after, I take it, is merely the invocation of regions of space-time of the requisite size).

But what is more fundamental, to *assume* the object of perception, the object of reference, does not explain how people manage to overcome their individual neurological idiosyncrasies to achieve reliable discourse 'about' the public, external objects. It just assumes that we do overcome it—preferring theft over honest toil, in Russell's words. Quine aims at an account of language which does not rest on what, in his view, are such unfocused and unexplanatory assumptions.

Quine's eventual response to the problem is quite different from Davidson's. In 'Progress on Two Fronts' he writes:

What we have is a preestablished harmony of standards of perceptual similarity, independent of intersubjective likeness of receptors or sensations. Shades of G. W. Leibniz, thus, but without appeal to divine intervention. The harmony is explained by a yet deeper, but more faltering preestablished harmony between perceptual similarity and the environment. (1996, p. 160; see also Quine 1995a, pp. 20-1; 2000, pp. 1-6;

Ebbs 2015 pp. 21-8; and Quine's responses in the same volume, Quine 2015a, pp. 29-32 and 2015b, pp. 33-5)

And then:

This, in turn, is accounted for by natural selection, as follows. We have, to begin with, an inductive instinct: we tend to expect perceptually similar stimulations to have sequels that are similar to each other. This is the basis of expectation, habit formation, and learning. Successful expectation has always had survival value, notably in the elusion of predators and the capture of prey. Natural selection has accordingly favored innate standards of perceptual similarity which have tended to harmonize with trends in the environment... Derivatively, then, through our sharing of an ancestral gene pool, our innate standards of perceptual similarity harmonize also intersubjectively. Natural selection is Darwin's solvent of metaphysics... Harmony without interaction: that was the subtlety. We take its ubiquitous effects for granted, not thinking them through. (1996, p. 161)

We agree because agreement has had survival value for our ancestors: Those who failed to be in perceptual lock-step with their fellows tended not to procreate as successfully as those who did. In particular—in compliance with the Darwinian outlook on the fundamental ability to expect 'like to follow like'—we gain advantage directly by the broad harmonization of our inductive dispositions with nature; and we gain indirectly by sharing them with one another, especially since the sharing makes language possible. Preestablished harmony does not occasion a change to the definition of observation sentence of the early 1990's; rather it shows that the definition is adequate because the standards of perception prevailing amongst people will in fact harmonise.

2. Observation Sentences and Reference; Desiderata

Preestablished harmony is undoubtedly real. Among other things, the idea comports with well-established psychological phenomena such as the tracking of objects in infants. I do not want to say anything against it. But I want to make a case for an alternative solution to Quine's problem, one that dispenses with the notion of stimulus meaning in the theory of language, yet without going distal or otherwise unscientific. The alternative does not itself involve a departure from Quine's socio-behaviouristic criterion of observation sentences—as ones that 'report intersubjectively observable situations, observable outright [such that] all members of the language community are disposed to agree on the truth or falsity of such a sentence on the spot.' (1995a p. 22) As pointed out parenthetically above, the notion of 'intersubjectively observable situations' can be cashed out naturalistically, as something like 'regions of space-time' (but nevertheless I will suggest in the concluding section that Quine's criterion might be replaced).

Before making a positive case for this adjustment, however, two sets of remarks need making.

First, I should make explicit a certain Quinean claim that I will be assuming, one that is very much connected with his response to Davidson lately described. It is implicit in its above characterisation that the stimulus meaning of an observation sentence is straightforwardly a causal matter: on a given occasion, the stimulus happens and the subject immediately acquires the causal propensity to assent to the sentence or dissent from it, end of story—whether or not the sentence is for example true on the occasion (at a rudimentary level, such expressions are akin to bird calls and ape cries; 1993, p. 109-10; 1995a, p. 20-2). The claim that I will assume is that semantical matters, and in particular the concept of reference, needn't, in principle, be invoked in accounting for observation sentences (and hence that they do not themselves portend an ontology).

To elaborate the claim slightly further. For Quine, mature observation sentences have a certain 'Janus-like' character, in that they can be conceived either 'analytically'—as being compounded of individual words and phrases which are governed by their respective semantical clauses, enabling one to fit theoretical language onto them—or 'holophrastically', considered as wholes—where an explanation of them in terms of their stimulus meanings is sufficient (1993, pp. 109-10). The former presupposes that the subject's language contains quantifiers, pronouns (or variables) and predicates; it is because of the need for fitting theoretical language onto a corpus of observation sentences that the observation sentence comes to be seen as involving reference, and thus as being infected with 'theoreticity', and its utterance as being corrigible (1993, p. 109-10; 1996, p. 162). But the latter does not. A creature whose language contained only observation sentences and observation categoricals would not be a fully-fledged referring creature.

Viewed developmentally, the capacity for reference emerges in time gradually with the advancing complexity of language in the individual—with recombination of the parts of sentences, with predication, individuatives (count-nouns) and truth-functions, and emerges full blown only with relative clauses, quantifiers and pronouns or variables, and with criteria of identity including the language of space and time (1981a, pp. 1-8; 1973, pp. 83-101). In short it emerges only with theory: '[R]eification of bodies across time is beyond the reach of observation sentences and categoricals', Quine wrote in *Pursuit of Truth*; '[s]ubstantial reification is theoretical' (1992, p. 25). From *Word and Object* of 1960 on he maintained the core of this view of observation sentences, even if some details changed over time.⁴

The second set of remarks expands upon the purpose and role of observation sentences. Certain desiderata may be invoked with respect to (holophrastically considered) observation

⁴In *Word and Object* of 1960, Quine thought of observationality as a matter of degree (p. 38), thereby accounting for corrigibility and 'theory ladenness' (pure cases being relatively rare). In *Pursuit of Truth* of 1992 (pp. 6-9) he changed to observationality's being absolute, and to observation sentences' being susceptible to theory as explained by a shift from the 'holophrastic' perspective to the 'analytic' perspective. In the paper 'In Praise of Observation Sentences' of 1993 he was back to a graded notion of observationality (pp. 108-9), retaining the holophrastic/analytic distinction in the same role; finally in 'Progress in Two Fronts' of 1996 it was back again to the absolute notion, now with theoreticity as an independent, graded dimension (pp. 162-3).

sentences. I'll list them in what I think is the order of importance for Quine's naturalistic epistemology, with the most important first (it may be impossible quite to satisfy them all).

1. Observation sentences should figure as a theory's sole empirical evidence (as described above). There are other criteria for evaluating theories—simplicity, degree of fit with other theories, and so on—but it is only through its observation sentences—in their roles as antecedents and consequents of observation categoricals—that a theory acquires its empirical content.
2. The account should make good on the idea that an observation sentence can in principle be acquired independently of any information pertaining to other sentences of the language.
3. The account should not make essential use of the concept of reference, in particular not the distal concept of reference
4. The account should describe an observation sentence in such a way that what it is for any two subjects to be competent with it should, in some clear sense, be the same.
5. The account should not present obstacles for an account of how an observation sentence can be assimilated to the neurological functioning of the subject.
6. The description of observation sentences should make manifest how they perform their envisaged role in translation and language-learning.

Quine's account and the one I shall present fare equally with numbers one, two and three (Davidson's idea falls foul of desideratum number five as well as number three). Quine struggles with number four, and perhaps it might be said that in the end, he abandons it. One provocative way of putting his final view is that preestablished harmony makes it seem as if one 'agrees' with one's compatriot, when more closely considered, at the level of the actual causal traffic, the agreement is only apparent; it is preestablished harmony, and not identity of subject-matter, that explains 'why ... the translator and the lexicographer [can] blithely rest with the distal stimulus, as indeed they can' (1996, p. 160). Or it might be said less provocatively that preestablished harmony explains what the agreement consists in. Such might be for Quine a don't-care case in the sense of *Word and Object* ([1960], p. 259). What is clear is that my account more straightforwardly satisfies desideratum number four. It might be thought to struggle with number five, but any shortcoming will prove to be of no great moment, as will emerge. As I will explain further near the end, Quine's account also struggles with number six, whereas mine does not.

3. Stimulus Fields Introduced

My suggestion follows a possibly inadvertent tip in *Word and Object*. Preparatory to his discussion specifically of observation sentences, Quine introduces the notion of stimulus meaning when considering the plight of a radical translator:

All the objective data he has to go on are the forces that he sees impinging on the native's surfaces and the observable behavior, vocal and otherwise, of the native.

Such data evince native ‘meanings’ only of the most objectively empirical or stimulus-linked variety. (p. 25)

And two pages further: ‘A visual stimulation is perhaps best identified ... with the pattern of chromatic irradiation of the eye’ (p. 27), with the ‘ocular irradiation patterns’ striking it (p. 28). Some years later he averred that what he intended all along was the bodily event of being impinged upon, in effect the neural firing, not the ‘forces ... impinging on the native’s surfaces’, not the ‘chromatic irradiation’ (1969 [1965], pp. 155-60). But I want to suggest we take it in this second way, the impinging forces way—that we focus on the cause, not the effect.⁵ Speaking somewhat vaguely to start, what is wanted is the total forces active at the sensory envelope of the subject’s body at a given interval of time. Speaking more figuratively, imagine the scene involving a subject’s body, then imagine that exact scene but vacated by the body, as in a lost wax casting. The sensory envelope is the region immediately outside the region where the body (the wax) had been. The total forces at a given interval are those present at the envelope during that interval.

Temporally, the sensory envelope need include only a final momentary phase of such spatio-temporal processes as the sound of a goat’s bleating (that travels across the farmyard and strikes the ears of our subject). Accordingly, we are interested spatially only in a very thin region of such processes. I’m content to leave it open exactly how thick the envelope must be, especially because of complexities introduced below when the sense of touch is considered, but for heuristic purposes, and for the other senses, we can consider it to extend out from the body—including the eyes and ears—to a distance of one centimetre, like a thickish glove or body suit.

For our purposes we must abstract away the forces which one cannot sense as well as any forces which one can sense but are irrelevant to observation sentences, leaving only the ones relevant to observation sentences, and we must refine the comparatively vague if suggestive notion of the ‘sensory envelope’. For this I will introduce a technical term—the ‘stimulus field’ associated with a given observation sentence and later the ‘overall stimulus field’ and the ‘total stimulus field’—and will describe in more detail how the stimulus fields are built up in the remainder of this section and the next. The stimulus field is four-dimensional—three spatial dimensions plus a unit of time, the interval. It would be most welcome if the stimulus field were the same for everyone, but we have to deal with a small degree of variance from subject to subject—for example you might call some things red which I would not, or have more sensitive hearing than I do, or be bigger or fatter than me. This will be dealt with in the next section. Less tricky is the matter of what Quine called the ‘modulus’ of stimuli, which on the present scheme is just the time dimension of the stimulus field. I will include the modulus at certain points in the following exposition, and also in the concluding remarks.

The associated stimulus field for an individual, for a given observation sentence, is an ordered pair of classes of partial stimulus fields—the first member corresponding to what

⁵Once in later years Quine briefly recognised only to dismiss the possibility of this, speaking of ‘bombardments’; Quine 1995b, p. 349.

Quine referred to as the positive stimulus meaning of an observation sentence, and the second member corresponding to the negative. Members of the positive stimulus field are those for which the subject is disposed to assent to the queried sentence, and similarly for the negative and dissent. Occasions when the subject has no such disposition—for whatever reason—do not factor into the stimulus meaning. The *overall* stimulus field for the individual will be the class of stimulus fields, positive and negative, for all observation sentences with which the subject is competent.

Aside from the appeal to dispositions to assent—no more problematic than Quine’s own appeal to dispositions⁶—the idea is to devise an extensional surrogate for common-sense empathy (the same goes for the translator’s judgement on ‘witnessing the occasion’). By adverting to (nearly) matching stimulus fields, the translator deals with straightforwardly objective entities, entities which can in principle be shared across different subjects (satisfying desideratum four), and is thereby enabled to find a translation if it exists (satisfying desideratum six). It does not require explanation in terms of preestablished harmony in order to secure intersubjectivity, yet it remains proximate, and without immediate repercussions for ontology or reference.⁷

4. Stimulus Fields in Detail

I have so far spoken somewhat airily of the sensorily relevant ‘forces’ of the stimulus field, not saying what sort of forces I have in mind and how exactly they are to be delivered. I will now attempt to make this more precise. The sensorily relevant forces are all those detectable by the human senses. But for manageability I will consider only a certain subset of the traditional senses—vision, audition, smell, taste, and touch. I will set aside the sense of (gustatory) taste and the vestibular system (the sense of balance), will treat only of a small but representative portion of the tactile sense (the sense of touch), and will consider only a few examples of vision, audition, smell, and taste. The lion’s share of the relevant data will concern the head, but not all of it. I include types of molecules and compounds floating in

⁶ Quine denies that the appeal to dispositions undermines his commitment to extensionalism, for he conceives dispositions as promissory notes for underlying structural traits describable by extensional language, even in cases where the trait is unknown and hence the description unavailable ([1960], p. 30, §46 pp. 203-7; [1965], p. 144).

⁷ Exactly why proximate? The distinction between proximate and distal pertains to spatial, temporal and causal relations. In the spatial sense, ‘proximate’, according to the Oxford English Dictionary, means ‘neighbouring,’ *viz.*, ‘immediately adjacent to’. Similarly for the other senses. Assuming the dictionary definition, my scheme is proximate since that is precisely the relation in which one stands to one’s stimulus field, to one’s sensory envelope. Some including Davidson have characterized Quine’s stimulus meaning as proximate, but according to the O.E.D., that is incorrect, since one’s sensory nerves are not ‘immediately adjacent’ to oneself any more than my sister’s kitchen is adjacent to her house. Quine’s scheme might more properly be characterized as ‘internalist’ as opposed to ‘externalist’—so long as that is understood literally, spatially—but on the other hand my scheme is not happily characterized as ‘externalist’, evoking as it does the notion of distal reference.

the air as among the ‘forces’ impinging on the body, since many of these are detected by the senses.

I first describe the stimulus field as built up for a single subject. Each unit of data the sum of which collectively represent an (individual) stimulus field will be of the form of an ordered n -tuple, for example an ordered quadruple, ‘ $\langle O, L, f, v \rangle$ ’, where O is a queried observation sentence, L is a location, f is a force present at L , and v is a verdict, affirmative or negative.⁸ Sometimes I will require more entities than four, sometimes fewer. L will be a centred location, defined by reference to the subject’s body—to be precise, we could define it in terms of the three spatial coordinates with, say, the tip of the subject’s nose as the origin, but I will let the details be tacit. Also generally tacit is the time at which the unit of data is taken, and the modulus as mentioned.

The idea is that enough units of data will suffice to describe the stimulus field of a given observation sentence for an individual (thus the class of all these for an individual, it will be recalled from the last section, is the overall stimulus field for that individual). Do the same for many individuals, and find the common currency of these—where a simple way of defining the common currency is to identify it with a stimulus field $\langle O, L, f, v \rangle$ valid for a minimum of (say) 95% of the test subjects across the community, except L for one subject must be replaced by L of another in the obvious way. We are thus vouchsafed the stimulus field of a given observation sentence simpliciter. Form the union of all the stimulus fields for all observation sentences with which the group is competent to get the *total* stimulus field.

Here then are some representative examples of the envisaged data.

Olfaction, smell. Just below the nostrils, we capture a sample of air and subject it to chemical analysis, and combine the result with the other items as in: ‘ \langle Rotten eggs?, the nose, Hydrogen sulphide, affirmative \rangle . Other locations are possible but superfluous.

Audition, sound. A microphone is placed at each ear, the subject is asked, e.g., ‘Barking?’, and a verdict is recorded for various sounds including the null sound. Sounds are to be represented by their graphs. For example a simple sound, a pure pitch at 440hz and 80db with a given modulus, would be represented by a sine wave at the appropriate frequency, intensity and duration (say, in a pdf). So for example, if Φ is the sound-graph in question and the modulus is tacit: ‘ \langle Barking?, left ear, Φ , negative \rangle .’⁹

⁸ The native equivalent of saying ‘yes’ or ‘no’ must be converted to an actual verdict; i.e., these too have to be translated. The trick is to observe for example which native sound goes, for example, with the native disposition to ‘Gavagai’ in the presence of a rabbit; see [1960] pp. 26-7.

⁹ To cope with the directionality of sound—for a crude approximation and doing it with speakers rather than microphones—we could rig up a constellation of speakers around each ear, attach a pointing gesture to ‘Barking’, tack on ‘right ear, Ψ ’ to the ordered list, and include the loudness of each speaker in Ψ and Φ ; viz., ‘ \langle Barking’-pointing-at-30°/0°, left ear, Φ , right ear, Ψ , negative \rangle . (By ‘30°/0°’ I mean ‘30° left of dead ahead, 0° from level’).

Vision, light. This is more complicated. By the ambient optical stimulus I mean the incident light prevailing at the cornea, which is understood as being oriented in a certain direction. But the eye constantly moves, controlled by the extraocular muscles. Should the movement be taken into account, for our purposes? The amount of incoming light is controlled by the pupil, and the cornea and the lens act to focus the incoming light on the retina. Should the effect of the iris, which controls the pupil, and the action of the ciliary muscles, which control the lens, be taken into account, for our purposes? And how should we account for the changes in visual information induced by variations of focus? And for the mutual interplay between the two eyes? What about the differences of acuity depending on the degree of centrality within the visual field? And still more complexity is introduced by the action of visual stimuli in the immediate past on the action of the eye in response to present stimulation.

Rather than delve into such complexities, I will propose a simple model that is not guaranteed to yield useful results in all cases, but will serve as an approximation.

I will take the light-detector to operate much as a pinhole-camera does, with a device featuring a tiny aperture set Cyclops-style between the two corneas, oriented in the same general direction as the corneas and sensitive to a horizontal field of let us say one hundred eighty degrees, and to a vertical field of say one hundred twenty degrees, projecting the image onto an active pixel sensor. This will largely eliminate the issue of focus and will be insensitive to the degree of centrality of the object of vision. The light itself is any electromagnetic radiation of ≈ 380 to ≈ 740 nanometers striking the light-detector, the range the human eye can detect. (Again I'm leaving the modulus tacit; see Quine [1960], p. 28.) The light-detector will thus be insensitive to a situation where the salient visual information is overwhelmed by other, concomitant visual information, as when one focuses on a small, distant event, but one's visual field is dominated by a large protest sign held up by one's neighbour. However repeated trials on the same observation sentence will tend to reveal such cases as noise.

Coping with binocular vision would be necessary only to account for the relatively fine differences brought in with depth of field, the relative distances from the observer of objects seen. These do have corresponding observation sentences, but I will pass over them. Thus, if the pattern of light striking the light-detector for the given modulus is Γ , we have, for example: <'Rabbit?', midway between the two corneas, Γ , affirmative>. Γ will be an MP4 file or some equivalent.¹⁰

Touch (thermal, and haptic or active). This is yet more complicated, not least because of the diversity of systems making up the category known as touch. Because of this, to an even greater extent the sketch will be rough and partial, yet longer than the others.

David Armstrong once distinguished the modes of touch that are 'mediate' from the 'immediate' ones (1962, p. 4f). Mediate modes of touch include those that give information

¹⁰ Why not simply stimulate the subject actively, rather than having to wait for the stimulation to occur; e.g. the experimenter could play recordings for the subject of the sounds through earphones, dispensing with the microphones? This only is a thought experiment, not a practical proposal.

about objective phenomena outside the body—sensations of temperature inform one of the molecular vibration of external bodies or substances; sensations of pressure, solidity and texture inform one of the corresponding properties of bodies and other features of the environment. Immediate modes of touch inform one at most only of events or states of one's own body. Indeed—though Armstrong argues the opposite—one naturally thinks of itches, pains, and tingles as non-representational despite having normal causes, in that unlike mediate modes of touch, it seems that there is little room to distinguish the feeling from what the feeling is about, the sensation from the property.

Armstrong's distinction is by no means universally accepted, but for my purposes the accuracy of Armstrong's picture does not matter too much. I will confine the discussion to the mediate modes of touch. Still we are faced with the diversity of mediate tactile modes of perception. Sometimes they involve not only the sensory receptors at the surface but also nerves deeper within the body, and in the case of the proprioceptive sense, such nerves dominate—it primarily involves receptors in the muscles, tendons and joints. Proprioception remains a mediate mode of perception, but in order to secure intersubjectivity, facility with observation sentences must be a public affair. Thus the only mediate tactile modes of perception that should primarily interest us are those involving the 'exteroceptors', those for which observation sentences can serve without apology as data for a theory.

I will take two rather unlike examples of observation sentences that pertain to mediate tactile modes of perception, and that undoubtedly satisfy the requirement of intersubjectivity.

The first will be 'It's warm'. We place a thermometer at a certain location just outside the subject's body, take a reading and ask the subject 'Warm?'. We record the result, and do this at a representative range of temperatures, and for a representative range of other locations just outside the subject's body (in the case of 'Warm', variations at different locations around the stimulus field will not typically be dramatic; by 'just outside the subject's body' I mean at the smallest feasible nonzero distance from the surface of the body). We get for example <'Warm', Left cheek, 32°C, affirmative>. It would however yield a more reliable guide to objective thermal properties to conceive the thermal sense in terms of a relation—'x is warmer than y', where x and y can take as values different locations on the body, or better, the same location but at slightly different times. Switching from ordered quadruples to ordered sextuples, this might be handled by writing, for example, <'x is warmer than y', left cheek at t, 32°C, left cheek at t', 11°C, affirmative>. (The modulus must include t and t'). Relative warmth escapes the difficulty that the sensation of absolute warmth depends partly on the present thermal state of the body or part of the body subject to the stimulus. So far as absolute warmth is concerned, the same stimulus may feel cool to the subject's left hand and warm to the subject's right as discussed successively by Boyle (1966 Vol. 2 p. 481), Locke (1975, II.8, §21) and Berkeley (1960 p. 208); but so long as t and t' are fairly close together, the two hands will agree on relative warmth (for the left hand, the subject returns a negative verdict for 'x is warmer than y', and the same for the right).

Now take the second example: 'Solid'. Solidity is capable being felt, and when present aligns with the subject's disposition to assent to 'Solid'. The variety of touch involved is

haptic or active touch: in order for the relevant sensation to occur we need a certain sort of action—say, the subject’s reaching out to feel a baseball (or an event such as the baseball’s striking the subject). Therefore we must add a suitable condition to the testing protocol, that the subject performs an action (or suffers an event) of a certain kind. Then for example we can write an ordered triple as in <‘Solid’, the subject seizes O with the right hand, affirmative>, where ‘O’ describes an object of the envisaged type, in our example a baseball.

A test for perceived thermal properties of liquids and bodies can be devised from a combination of this approach with the approach for ambient heat just described.

5. Further Matters; Conclusion

I have ignored some sensory modes—taste and balance as mentioned and also types within the sense of touch such as the ability to feel texture, smoothness, or shape. I have given only the beginnings of certain stimulus fields; mapping out in fine detail an actual stimulus field would be unremunerative as well as beside the point. My suggestion is only hypothetical, designed to provide assurance that the thing is possible. It involves a basic change to the procedure outlined in Chapter Two of *Word and Object*, but very much in the spirit of that great thought experiment. My suggestion is to replace Quine’s stimulus meaning of an observation sentence with the stimulus field associated with an observation sentence, the physical phenomena that impinge on the subject’s sensory surfaces—for example the ambient heat; or chemicals; or matters of optics. With certain exceptions considered immediately below, *this is the same for all subjects, all observers*. What I am calling the stimulus field is the thing doing the stimulating, not the thing which is stimulated.

One problem for touch is the problem of the different sizes and shapes of our bodies. I proceeded with the somewhat ludicrous idealization that we all have the same size and shape bodies. A solution is as follows. Partition the individual overall fields into classes of fields with similar body shapes and sizes, of whatever fineness of grain is thought necessary. In the way described above, take the common currency of the fields within each size-and-shape class. Then project each common currency size-and-shape onto each other—left cheek to left cheek, belly-button to belly-button, and so on. Then check for significant discrepancies: Are there non-minimal differences with respect to a given observation sentence—say ‘Warm’—at a given bodily location, depending on size and shape? In the vast majority of cases, I take it the answer will be negative; the positive cases we can simply throw out. We are left with common currency size-and-shapes which can now be recombined, yielding a total stimulus field. The total stimulus field contains a common-currency stimulus field associated with each observation sentence. Strictly speaking there is thus a degree of relativisation, but it is decidedly marginal. Only for the sake of accommodating certain examples of touch, the relevant stimulus field includes the relativisation to the particular shape and size of the body as described. But we can regard these simply as variations within the self-same field, somewhat as players can all wear the same uniform, even though different players require different sizes.

Whether or not a certain force goes into an individual stimulus field does depend on whether or not the neural events are in fact triggered. But such details are not strictly relevant for translation. For the neo-Quinean linguist, in particular for the construction of an individual stimulus field, the criterion for whether a given type of force-event passes muster is simply the corresponding behaviour. The event is taken up by the stimulus field if and only if the force-event is correlated with a disposition to assent to an observation sentence (or dissent from one). Likewise, it is irrelevant that the neural receptors of two speakers may be arranged differently. Only the stimulus which gets the same response with respect to different subjects will go into the total stimulus field (the field across subjects). So far as stimulus fields go, the linguist is concerned only with whether or not the response is positive (or negative), not with the particular layout of receptors. The relation between the stimulus field and the verbal response is of interest but the physiological details of how it comes about, of the particular neural mechanisms that realise it, do not matter. There may be some marginal differences which are traceable to the different sensory layouts, but again these will not survive the construction of the total stimulus field. There is no *a priori* guarantee that there will be stimulus fields which trigger the various idiosyncratic receptors whose activation are requisite for the same verdict across subjects, but this state of affairs is tantamount to there being no observation sentences, none which get the same responses from the various subjects. That is always in a sense possible, but the possibility being envisaged is that the creatures might, despite perhaps initial appearances, have no language, at least none that they communicate with. The key thing, again, is that there is no explicit reference in the proposed account to anything neural or otherwise idiosyncratic. Many patterns of light and so on—of course not all of them—will in point of fact give rise to the same verdicts across different subjects. The neural triggerings are as they may be.

Should anyone be so curious, mapping the correlations between the stimulus field and an individual's idiosyncratic layout of sensory receptors would still be of epistemological interest, but it would be a matter for the study of perceptual systems—vision science, auditory science and so on—more narrowly conceived. The general doctrine of the preestablished harmony of perceptual similarity—in answer to desideratum number five—is not forsworn, but it is now properly regarded as a matter squarely within the evolutionary theory of neurology, quite independent of matters of translation or empirical content (neither is what Quine called 'stimulus meaning' forsworn, even if the justification for Quine's late change of its name to 'neural intake' is redoubled; 1995b, p. 349). The general doctrine might now be thought of as containing a certain critical component, a matter of the causal traffic from stimulus field—typically brought into being by features of the distal environment—to stimulus meaning (to neural intake).

I said earlier that the method of stimulus fields does not itself involve a change to Quine's social-behaviourist criterion of observation sentences. It involves rather a swap of stimulus meaning for stimulus fields in the characterisation of their 'meaning'. But I suggested that an emendation of the social-behaviourist criterion is conceivable. On Quine's scheme, the idea of 'jointly witnessing the occasion' is needed to separate the genuine observation sentences off from occasion sentences generally. On my scheme, observation sentences might be

defined simply as those sentences which are correlated with some particular range of forces active within the sensory envelope—say certain patterns of light—in particular those that prove valid for all or most subjects in the community. I take it that it would be an improvement, however marginal, to free the definition from reliance on the notion of ‘jointly witnessing the occasion’.

A word about desideratum number six. A translator could make little use, just in itself, of the Quinean stimulus meaning of an observation sentence. It would merely tell the translator that this particular individual is disposed to assent to the sentence just when a certain combination of his or her sensory nerves is activated, but nothing about the stimulus-meanings for the sentence in other individuals, and indeed nothing in itself about the subject-matter of his or her utterance such as rabbits. It would normally be useless not least because what sort of ‘appearance’ is heralded by such an activation depends on events further up the neural chain, which are not contained in the Quinean stimulus meaning. At the very least, it depends, for example, on the complex events in the visual cortex which take place when one sees a rabbit. Now as Quine says, in practice a translator of human beings would dispense with stimulus meaning and would presume to enjoy the situation of the subject via empathetic projection, ‘would just guess his translation of the native’s observation sentence in the obvious way’ (1996 p. 159; in 1992, pp. 61-67, Quine says more about the objective basis of empathy). Stimulus meanings ‘were never meant to figure in the practice of translation or language teaching’; they were ‘my business, my theory of the translator's activity’ (2015, p. 34).

By contrast, the utility for the translator of the stimulus field associated with a given observation sentence is straightforward, if limited to beings of our sensory stripe. Not only is the stimulus field more or less invariant across subjects. If, at least, the subject is human, then provided that the stimulus patterns can be reproduced by some lab setup, one can experience, for example by putting one’s head at the appropriate place or by donning VR goggles, the rabbit-appearance. By means of repeated trials with different sets of stimuli positively correlated with assent to the given observation sentence, and similarly with dissent, one can winnow down the irrelevant aspects that accompany each rabbit-appearance to reach the conclusion that the rabbit-appearance was indeed the salient phenomenon—or rather that ‘Rabbit!’ is a sentence the speaker of the target-language is disposed to assent to in just those circumstances (ignoring collateral information). In this way, the stimulus field associated with, for example, ‘Gavagai!’ will itself guide its translation.

The scheme can be tailored to any sense-modality, can in principle be applied to any sensory detector for any force, chemical or physical property. It is straightforward to apply to aliens—there is no extra-sensory perception—but with alien senses the fields may be very different and must first be identified, and there is no chance of using the short-cut of ‘how things look from there’ (what would constitute the aliens’ ‘sentences’ and ‘assent’ would also have to be identified). In principle, the stimulus field potentially comprehends *all* forces active at the subject’s sensory envelope—x rays, magnetism, and so on—but most of these will be found irrelevant in building up the stimulus field in actual cases. In the extreme case, the case of aliens which have only senses not possessed by us, there is strictly speaking no possibility of intersubjective checkpoints, on either Quine’s method or the method of

stimulus fields. But whereas Quine's method cannot as a matter of principle identify an alien-specific meaning-phenomenon that is shared across alien subjects—it can identify only the sensory wiring triggered in the individual alien—the method of stimulus fields can do so. To *translate* these aliens, under the method of stimulus fields, would be a painstaking business of determining which events in the environment are responsible for, say, those fluctuations in the prevailing magnetic field which have been found to be correlated with the alien's disposition to assent to an observation sentence. Not that success in this would in every case be guaranteed, but unlike the method of stimulus meaning, which would shed no light at all on the translation of such aliens, the method of the stimulus field at least outlines the steps required.

Stimulus fields underwrite an alternative account of observation sentences that better satisfies the desiderata I have identified than Quine's own account based on the notion of stimulus meaning. Most significantly, this alternative straightforwardly accounts for intersubjective agreement in naturalistic and extensional terms without a hint of an appeal to unexplanatory notions of empathy of the translator, or the judgements of the translator. And it is no small thing for the Quinean Naturalized Epistemologist that two investigators now can have the very same evidence, or at least substantially the same evidence. And as before observation sentences still serve, in their roles as the antecedents and consequents of observation categoricals, as the intersubjective checkpoints of theory.¹¹

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