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VAGUENESS AND COHERENCE

Debates about the Sorites paradox usually concern alternative proposals for its solution. Some favour modifications to orthodox logic and others favour semantic revision; even those who agree on the general direction in which to find a solution usually disagree over the theoretical advantages of particular supervaluation systems or multivalued or fuzzy logics. A more radical idea, and one which has not been much discussed, is that the Sorites is a genuine, irresoluble paradox, and that no non-paradoxical logic or consistent set of semantic principles could adequately represent the workings of a vague language. An argument for this view can be found in the writings of Dummett[1] and Crispin Wright.[2] The argument is, briefly, that vagueness is both an essential feature of natural languages – one which is not to be "precisified away" or ignored by any adequate theory about them – and also an incoherent one; an inevitable source of paradox and contradiction. The paradox may be dissolved and language made to appear in perfect working order, but only at the cost of treating vagueness as if it did not exist. If, on the other hand, vagueness is taken seriously, it is argued that no coherent theory of the workings of natural language is possible.

These conclusions are bound to seem unacceptable, the motivation for the philosophical study of natural language being the desire to make systematic sense of the workings of those languages and so to dissolve paradoxes to which they appear to lead. Neither Dummett nor Wright seem willing to accept the conclusions of the argument, but it is not entirely clear in either case where they think it might be challenged. Dummett locates one source of the trouble in a tension between Frege's view that vagueness is a source of incoherence, to be eliminated from a logically perfect language, and Wittgenstein's view that vagueness is an essential feature of natural languages, and vague languages are perfectly in order as they stand. The degree of regularity and coherence evident in the use of natural languages supports Wittgenstein's claim; my argument will be that this coherence can be reconciled with vagueness.

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The following section starts with an account of the conception of vagueness Dummett and Wright inherit from Frege and traces its connection with the Sorites paradox and the thesis that natural language is radically incoherent. Section 2 concerns some difficulties with Wright's argument and generally with the notion of the series on which the Sorites paradox rests. These problems lead directly to the solution explored in section 3. Some consequences of this way out are discussed in sections 4 and 5.

1.

On the usual view, vagueness in a natural language is a matter of some of its expressions failing to exactly fit the world. It is primarily observational predicates which are considered vague on this view, and they are vague because the precise limits of their application are unclear. There are cases on the borderline where someone with a grasp of the meaning of the predicate may be uncertain as to whether or not it applies. Where this uncertainty is due to vagueness it is not to be dispelled by a more thorough investigation of the object or a survey of the linguistic habits of the speech community; it amounts to genuine indeterminacy. Frege's metaphor of a spatial area with a hazy boundary is often used to characterize vagueness of this kind. A vague expression corresponds, Frege says, to an area which lacks a sharp boundary line, and in places just fades off into the background.[3] As Dummett and Wright interpret this picture there is no room in it anywhere for a sharp division between things to which a predicate applies and its borderline cases, or between the latter and the things definitely excluded from the predicate's scope. The applicability of the predicate just fades off imperceptibly.

Frege considered vagueness of this sort to be a source of incoherence which should be eliminated from any language adequate to the expression of thought. Dummett and Wright agree that it is a source of incoherence, but argue that it cannot be removed; vagueness is an inevitable feature of any language used by creatures with our sensory abilities and limitations. Wright sets the argument in the context of what he calls the governing view of language. This apparently unexceptionable thesis has two parts. The first is simply that the correct use of language is determined by a set of rules. The second is a view about the correct methodology for discovering a certain kind of rule;

those he calls the *substantial* rules for the use of the language. These are supposed to capture our understanding of the specific senses of expressions and settle questions about their application to particular objects. Unlike more austere semantic rules they could be used to convey knowledge of the use of expressions to novice language learners. The methodology recommended by the governing view is simply one of consulting our intuitions and working knowledge of the language from the inside, as users of it. We can, for instance, consider the point of applying an expression, what justifies its application, and how it could come to be learned.

Substantial semantic rules for the use of predicates of a language will match features of the world – properties of objects – with those predicates. If considerations of the sort allowed by the second thesis of the governing view are permitted to decide which these features are, we will count as determiners of a predicate's application those properties of things which would be selected for the attention of learners of the predicate and whose presence would standardly be used to justify its application. In general, where we would feel that we no longer possessed a grasp of the sense of a predicate were we to suppose that drastic alterations in certain of an object's properties did not force us to withdraw the application to it of that predicate, then those properties are determiners of the application of the predicate. They are therefore candidate satisfiers of suitable clauses of substantial semantic rules for that predicate.[4]

Considerations of the kind permitted by the second thesis of the governing view lead, Wright claims, to the conclusion that lack of sharp boundaries is essential to the senses of many expressions. For the point of applying predicates such as "loud", "small", "sweet", "old", "red", etc. – predicates he calls observational – is to characterize things according to the way they appear to ordinary observers on causal examination. (Observational predicates are, for him, ones standardly applied in this way, without recourse to counting, measurement or the use of instruments). Since there are limits to our powers of sensory discrimination, there are bound to be real physical differences between things which go unnoticed. However, minute differences too small to be detected cannot affect the applicability of a predicate standardly applied at a casual glance. Also, observational predicates are learned ostensively, and it would not be possible to learn them in this way, Wright thinks, if differences too small to be discerned or clearly remembered by the novice language-learner affected their applicability.

We must conclude, he says, that these predicates are *tolerant to marginal change*; their applicability to an object always survives some small degree of real alteration in those features of the object which (according to the governing view) matter for the predicate's application. Size is certainly a determining feature for the predicate "heap", yet a heap remains a heap when its size is diminished by some very small amount. So "heap" is a tolerant predicate. Very small lapses of time make no difference to the applicability of the predicates "infant", "child" and "adult", though in each case larger differences of the same kind would alter their applicability. The application of the predicate "bald" survives the loss of a hair or two, though quantity of hairs is what determines its application, and larger losses of this kind make the predicate inapplicable. However, where a predicate is tolerant in this sense there are changes too small ever to matter.

Non-observational predicates may not be tolerant with respect to marginal changes in properties relevant to their application. The predicate "six feet and two and a half inches" is not tolerant, since any alteration in the length of a thing to which this predicate applied would transport it outside the scope of the predicate's application. However, if the above considerations count, *strict tolerance rules* such as the following seem to be part of the senses of all observational predicates;

> If one thing is a heap and a second has just one less grain, the second is a heap also.
>
> If one person is bald and a second has one more hair than the first, the second is bald also.
>
> If one person is a child then any other indistinguishable from the first in terms of apparent maturity is a child also.

Wright has one further argument for tolerance, to do with predicates which he calls *purely observational*. These are predicates whose applicability to objects is always to be decided just by the use of the senses. If a predicate's application is determined on these grounds alone – by the way the thing looks or sounds, or feels or smells, etc. – then no other considerations could be allowed to undermine the judgement made about it by a competent observer. The argument is that these predicates at least must be tolerant, even if no others are. For if causal observers are to be the final arbiters, things they cannot tell apart must be judged the same; that is, as deserving of the same predicate. So if any predicate of this purely observational sort applies to one of a pair of things indistinguishable to the senses it must apply to the other also.

The object of these arguments is to establish that we could not use observational predicates as we do – to characterize things according to the way they appear – if they were not tolerant to marginal changes in determining respects. If two things are indistinguishable to the senses and one deserves an observational predicate then the other does also. There may be a small difference between them of a kind which, if it was larger, would justify applying the predicate to one but not the other, but since the predicate is tolerant there is some degree of difference too small to matter. So if a pair of things appear the same to normal observers in the conditions in which an observational predicate is usually applied, and the one object deserves the predicate, then the other must deserve it also. Tolerance, which is incompatible with sharp boundaries, is of course to be identified with vagueness of the sort Frege pictures.

However, where predicates are tolerant, and therefore vague in this sense, it seems that there is no escape from the paradox. If removing a single grain from a heap always leaves us with a heap, we can be forced by many small steps to apply the predicate to things which are mere pinches, or even to no grains at all. If in general a man with only one more hair than a bald man is bald also, we are driven to conclude that all men are bald. Worse, we must also admit that no one is bald. So if observational predicates really are tolerant, as the second thesis of the governing view leads us to conclude, paradox and contradiction seem inevitable.

There is an assumption here which will be discussed later in some detail. The argument assumes that it is always possible to find appropriate objects and arrange them in a series of a certain sort. Starting with someone clearly not bald we envisage a series of men, each with one less hair than the next, until we end up with someone who is completely hairless. Alternatively, we could imagine separate stages of a single person, who loses a hair at each stage. Another example consists of homogeneously coloured strips, each so similar in shade to the next that they seem to form a continuous band of colour ranging from red through to orange. If this assumption about the availability of the series is accepted, the argument can be represented as a mathematical induction on the property expressed by some observational predicate F. Suppose S is such a series, and the size of the difference from member to member in the determining respect for F is within the limits of tolerance for that predicate. Then we can say

(i) If any arbitrarily chosen member n of S is F, then the next member, $n+1$, is F also.

(ii) The first member of the series is F.

Therefore

(iii) Every member of S is F.

It seems to be generally accepted that the empirical assumption on which this argument rests cannot seriously be doubted. For there are, it seems, actual examples of such series in nature, where small variations, impossible to detect over a short period of time may add up to a large difference over a long stretch of time. Psychological testing of just noticeable differences uses series consisting of separate objects, and there seems no room for doubt that such series present an appearance of smoothly continuous change.

The source of the paradox is, according to Dummett, the nontransitivity of the relation "not discernibly different from". There may be some triad of things, a, b and c, where a is indiscernible from b in some respect of superficial appearance such as shade of colour, and b is indiscernible from c in the same respect, but it is just possible to discern a difference in this respect between a and c. Given the continuity of the world and the limits to human perceptual abilities, indiscernibility is bound to be a nontransitive relation. This is, he thinks, what makes the paradox inevitable. Any language devised by creatures with our perceptual limitations would be bound to contain expressions whose application conditions were insensitive to small alterations in determining respects; yet many small changes may add up to a difference to which we are sensitive.

The conclusion Dummett draws is that there can be no phenomenal properties.[5] If there were, they would be determined solely by our powers of discrimination, and these powers do not determine consistent sets of things. So if colours are phenomenal properties there are no colours; if which things are heaps is a matter determined just by appearances there are no heaps. There are only physical properties of things. This response does not resolve any of the problems in which we are interested. It depends upon the thesis that natural language is fundamentally incoherent and so leaves us with the puzzle of how we are able to understand that language and use it as consistently as we do. It also leaves us with the Sorites paradox which appears inevitable so long as we do continue to understand and use observational language.

An obvious solution would be to abandon the induction step of the argument – the first premiss in the version given above. It might look plausible in some cases to reject this premiss, and pick out from a gradually varying series some particular member which seems the best, on balance, to describe as the last member of the series to which F definitely applies. Then this member is F but its successor is not. But then the first premiss of the argument would still seem to be true of some more densely packed series: all we would need to do is insert suitable intermediate items between the members of the original series. Eventually, when the difference from member to member gets to be small enough, it seems we will arrive at a series for which the induction step holds.

It seems then, that the assumption about the series on which the Sorites argument rests should be stated in a form which employs an existential quantifier. The induction step holds provided it is assumed that for any vague predicate it is possible to find *some* series which exhibits apparently continuous variation in the respects that matter for the application of that predicate. If this is always possible then any intuitively plausible judgement about the limits of application of a predicate to the objects in a *particular* series may always be countered by moving to some more finely divided series. The plausibility of selecting some last member to which F applies will diminish when this move is repeated often enough. The claim then, is just that there will be *some* series for which the induction step holds, and this seems difficult to deny.

Furthermore, Dummett and Wright would argue that abandoning the induction step involves denying that the predicate being projected is in any proper sense vague. Drawing sharp limits to a predicate's application is incompatible with its vagueness, if vagueness is to be understood in terms of Frege's metaphor. So if, past a certain point, a predicate is intolerant to any further change, no matter how small, it cannot be genuinely vague. The connection then, between Frege's metaphor and the Dummett and Wright paradox is this: if vagueness is correctly represented by the picture of a predicate's application fading away by imperceptible degrees, there can be no point at which its applicability could be halted; no line drawn to correctly delimit its proper scope. There is no escaping the paradox if this is so, for in a sufficiently finely graduated series the applicability of the predicate always survives the transition from one member to its immediate neighbour.

It might be objected to this that the practice of quite arbitrarily stipulating cut-off points to the applicability of observational predicates is surely compatible with their sense, for this is, after all, just what we do in ordinary situations when vagueness becomes a problem. When in practice the need arises to precisify a vague predicate, we do, as Quine points out,[6] stipulate boundaries in an ad hoc manner. Town planners announce that a certain population is to constitute a city, geographers prescribe limits to the scope of the words "mountain" and "tributary". It cannot be entirely inappropriate to treat them this way; at any rate it does seem to accord, as Quine says, with good scientific practice as well as good sense. This seems to be evidence that there are elements in the sense of observational predicates which allow sharp boundaries to be drawn.

To this Wright can reply that if tolerance principles are also essential to the meanings of observational predicates, those meanings must contain inconsistent and conflicting elements. We are forced by some elements in their sense to disallow sharp boundaries, and permitted by others to stipulate sharp limits in a fairly arbitrary fashion. To the question of how we could possibly operate with such conflicting rules the only possible answer would seem to be the one Wright suggests; that we do so inconsistently. Since individuals are capable of adopting contradictory beliefs from time to time, and changing the rules when it suits them, it seems just possible that the whole language-using population might have accepted a set of inconsistent linguistic rules. Then natural languages would contain deeply embedded inconsistencies and the Sorites would be an insoluble paradox.

The only way of avoiding these conclusions, Wright thinks, is to abandon the governing view. If language is to be seen as governed by rules the users of the language cannot be taken as experts on the nature of those rules. Intuitions about the senses of words and other knowledge available just to those who have mastered the language must be ignored in favour of a thoroughly behaviouristic methodology. However, to be told now to simply ignore the appearances of things and our working knowledge of the language is surely unsatisfactory. We are given no reason to reject tolerance rules apart from their paradoxical consequences (which we might just have to accept if language is genuinely incoherent), and so we have no reason for thinking the induction step false. This way out seems no better than those which, Wright claims, involve ignoring the fact that vagueness is an essential feature of natural languages.

2.

One of Wright's arguments made use of the premiss that there are purely observational predicates; ones whose application may be determined solely by the use of the senses whenever it can be determined at all. The argument was that these at least must be tolerant, since no other considerations could be allowed to undermine judgements about their application made by competent observers. Things such observers cannot tell apart must therefore satisfy the same purely observational predicates. But a language containing tolerant predicates must be radically incoherent, since those predicates ought to apply indiscriminately.

Wright's reasoning here could be reconstructed in the following way as a *reductio* of the notion of pure observationality. Suppose there were some purely observational predicates. They would by definition apply to things just on the basis of the way those things appeared to casual observers. Nothing else could undermine the judgement of a normal observer that such a predicate applied. Therefore they would be tolerant. Then applied consistently, they would lead to conclusions which conflicted with the judgements of those observers. (The tolerance rule for red would lead for instance to the conclusion that grass is red.) If a predicate really is tolerant, then if Wright's arguments hold, it must apply in cases where simple observation tells us it does not apply. To apply it in these cases would be to override the judgements of competent observers. So if Wright's arguments about tolerance are correct, there can be no purely observational predicates; if there were, they would be tolerant, and if they were tolerant they could not be purely observational.

A reductio argument designed to undermine the incoherence thesis might look to be in danger of providing further evidence for that thesis. If it is shown that Wright's claims lead to obviously false or contradictory conclusions there is always the reply available that this is further evidence of deeply imbedded inconsistency in the language. The incoherence thesis would then simply absorb this reductio argument as further grist for its mill. However, this reply is only possible once the incoherence thesis is made out, and the reductio argument above attacks a premiss on which the thesis depends: the premiss that there are purely observational predicates.

Wright's other arguments for the tolerance rules, the arguments about learnability and the limitations on our senses and memories, are meant to apply to all semi-observational predicates: those usually or standardly applied on the basis of appearances. The point of these arguments is to establish that two things could not appear the same to casual observers and yet one but not the other deserve one of these predicates. Appearances may be deceptive however; two things may be indistinguishable to causal observers and yet one but not the other deserve some observational predicate. Illusions and tricks of the light may make someone who is not bald look just as hairless as a genuinely bald person; one heap may look as large as another when the two are seen from certain angles and distances and yet the second may turn out to be much smaller, and perhaps not a heap at all. So the strict tolerance rules for which Wright argues do not seem to be true of observational predicates generally.

Differences that could not be detected just at a glance may also alter the applicability of a predicate such as "child". Suppose a twenty-year-old dwarf was so like his twelve-year-old nephew in appearance that they were always taken to be identical twins. One but not the other would be a child. Similar counterexamples can be found to the tolerance rules for the predicates "heap" and "bald". Where one thing in a smoothly varying series is a heap, the next may not be, even though it contains only one less grain. For shape determines the predicate "heap", as well as numbers of grains. If one member of a series consists of many grains "heaped up" in a single mass, and the next almost the same number raked out flat, the first will be a heap and the second not. Nor does shape alone determine the predicate, for in terms of just shape a pinch might be indiscernible from a genuine heap. We could also imagine circumstances in which one man is bald but a second with only one more hair is not. Suppose the first genuinely bald man has no hairs at all on the top of his head but quite a few around the sides and back. The second has only one more hair but has had a hair transplant, and his hairs are now distributed evenly over the top of his scalp. He is happily nonbald, despite having only one more hair than someone clearly bald.

So wherever a predicate has a number of independently varying determining properties, there will be counterexamples to the tolerance rule for that predicate. There could be a series which varied continuously with respect to ϕ, but where a predicate determined by this property was true of some member but clearly not true of the next. No matter how smoothly the series varied with respect to one determining property there could be large differences with respect to another; differences which would justify the drawing of sharp boundaries. These breaks are not always due to the partly theoretical nature of the predicates; the differences in some cases are easily observable. It seems possible that the same sort of objection might apply to Wright's claims about purely observational predicates, if there are any.

However, the objection to Wright's argument based on these counterexamples to the tolerance rules may seem both unfair and easily removed. It is clear that Wright's arguments are intended to apply just to situations where there is no detectable variation in *any* respects relevant to the application of a predicate, and these counterexamples seem to miss his main point, since they involve sudden alterations in particular properties. The problem produced by the multiplicity of determining features merely requires some adjustment to the formulation of the tolerance rules and a more careful account of the kind of series the Sorites argument is about. Surely the induction step should be understood as applying just to series whose members vary continuously only with respect to some one determiner, *all others remaining fixed*. It seems that when we imagine the series we do think of it in just this way; as varying smoothly in a single dimension, all other variables remaining constant.

There is one difficulty about this reply. For although we *vaguely* think we can imagine series which vary smoothly with respect to just one determiner while remaining fixed in all others, there are often lawlike connections between distinct determining properties for a predicate. If the series looks more orange as it is scanned from left to right, then it will also look less red (or less pink or yellow). A person could not change with respect to apparent maturity without also altering in more particular respects. (These will all count as distinct determiners on the criterion suggested in section 1.)

So it seems as though what is really needed to eliminate these counterexamples is the notion of a series which varies with respect to some *group* of interdependent determining properties. It will have to do so in such a way that no difference between one member and the next with respect to any of these could be discerned on a casual inspection. The series will have to either not vary at all with respect to other properties relevant to the predicate but outside of this group, or else not vary noticeably with respect to any of them. Properties are interdependent, let's say, when either there are lawlike connections between them (so a change with respect to one inevitably brings about, or is brought about by, a change with respect to the other), or one is supervenient upon the other in some situation.[7]

The tolerance principles which support the induction step must also be revised to protect them from these counterexamples. Strict tolerance rules must be replaced by principles of the following kind:

> If one thing is a heap and a second differs from it in containing only one less grain, and in any other ways dependent on this minor difference, *but the two do not differ detectably in any other respects relevant to the application of the predicate "heap"*, then the second is a heap also.
>
> If one person is a child and a second differs from the first only marginally in appearance with respect to physical maturity, and in whatever other respects are dependent on this, *but there are no other differences between them relevant to the applicability of the predicate "child"*, then the second is a child also.

Principles of this loose sort differ from the strict versions of the tolerance rules in containing an exception clause (italicized in the examples above). Perhaps we read the strict version of the rules as implicitly containing such a clause. The antecedents of natural language conditionals are often read as containing an implicit supposition that other things are to remain the same; that apart from the change introduced explicitly by the antecedent (and whatever else is dependent upon it), there is no relevant variation.

There are good reasons for supposing that it would not be possible to make these rules any more precise. To spell out exhaustively the ceteris paribus clause it would be necessary to determine all the respects which might count, in advance of all imaginable and unimaginable circumstances, for the application of the predicate. If observational predicates do have open texture (as is suggested by Waismann and others[8]), this task would not be possible. We do not have precise rules available to determine a predicate's application in all possible circumstances. This margin of uncertainty about the exact limits of application of empirical terms is, according to Waismann, one source of vagueness. So the loose rules cannot be made more precise.

Tolerance rules understood in this loose way are surely true. Minor differences between things which would go unnoticed in the circumstances in which a predicate is normally applied cannot matter for its application once all other relevant variation is excluded. If an observational predicate applies to the one member of a series it must also apply to the next if we cannot by observation discover any relevant difference between them. But now doubts begin to arise about the existence of such series, doubts about the assumption on which the Sorites argument rests. It is possible to find a series which meets the complex conditions we have seen to be necessary? The argument that it is not occupies the next section.

3.

A suitable series would have to be such that a predicate F applied at one end but not the other, where F is an observational predicate. We saw that the actual variation throughout this series would be with respect to some group of interdependent determining features, and it would have to be so gradual that no noticeable difference could be discerned by mere observation from member to member with respect to any property in this set. Obviously, indiscernibility has to behave nontransitively somewhere in the series, or F could not be true at one end and not at the other. Let us call the set of determiners C. Suppose some property ϕ is a member of C. Each member of a suitable series will of course be indiscernible from the next with respect to ϕ. Now consider the relational property of *being indiscernible with respect to* ϕ. This property will have to be a member of the set C also, for these two properties, of ϕ, and of indiscernibility with respect to ϕ, are interrelated in lawlike ways. If the colour of a thing changes this will alter its indiscernibility with respect to colour from other things, and vice versa. So where ϕ is a member of a set of determining properties for a predicate F, indiscernibility with respect to ϕ will be also.

However, if this is so then at some point in the series there must be an observable difference with respect to a determining property between one member of the series and the next. Let S_1 and S_n be the end members of the series, or of any portion of the series sufficiently long for S_1 and S_n to be discernibly different with respect to ϕ. Each member is of course indiscernible from the next in this respect. However, if the end members are to be discernibly different in this way, indiscernibility relations must behave nontransitively somewhere along the series. So for any series, or portion of a series, there must be adjacent members, S_i and S_{i-1} such that

(i) S_i is indiscernible from S_{i-1} with respect to ϕ.

(ii) S_{i-1} is indiscernible from S_1 with respect to ϕ.

(iii) S_i is just discernibly different from S_1 with respect to ϕ.

Thus S_i and S_{i-1} are just discernibly different with respect to their *indiscernibility* from S_1. Since indiscernibility relations are members of C, there will be a difference in a determining respect between adjacent members of any suitable series. Where there is an observable difference however, between some neighbouring pair in a respect relevant to the application of some observational predicate, then that predicate may quite consistently be applied to one of the pair but not the other.[9]

The same argument can, of course, be used to show that there will, in any series, be a pair of adjacent members, S_j and S_{j-1}, which are indiscernible from each other, but which are such that S_j is indiscernible from the last member of the series (S_n), while S_{j-1} is just discernibly different from S_n.[10]

It may be felt that some further argument is required here to establish the relevance to the predicate F of the relational property of indiscernibility with respect to ϕ. For despite the argument that where ϕ is a member of C, indiscernibility with a respect to ϕ must be a member of C also, it might be felt that it is just how a thing looks with respect to colour which decides whether the predicate "red" applies to it, not its relation to other things. The further arguments for the inclusion of these indiscernibilities as relevant to the application of a predicate are just those arguments Wright gives for tolerance, arguments we have accepted as establishing loose tolerance rules, rather than Wright's strict ones. The arguments for tolerance principles are meant to establish that comparisons with other objects do matter to the application of a nonrelational observational predicate; things that look the same ought to get the same observational predicates. What those principles assert is that indiscernibilities between pairs of objects in respects relevant to the application of a predicate force the application of the predicate to both objects or to neither. If this is so these indiscernibilities are themselves relevant respects; respects which determine the application of the predicate. The plausibility of this has not been denied. All I am claiming is that the tolerance rules must be interpreted as loose rules, and when they are the paradox may be resolved. Anything indiscernible from a red thing is red also, provided there are no other relevant differences: there is a relevant difference when one but not the other differs in colour from a third thing.[11]

Let us see first how this might work in a particular case, and then consider an objection to the general strategy used above. Suppose S_j is some strip towards the middle of the colour series, and an observer has judged all the previously examined strips, up to and including S_{j-1}, to be red. Now that observer notices that S_j has a property that all these previously examined ones lacked; it is indiscernible in colour from a further strip, S_n, which looks orange. Since S_j is indiscernible both from this one and from one the observer had decided to call red, (S_{j-1}), they may decide that S_j is a borderline case, and so deserving of neither predicate.

Alternatively, S_j might appear indiscernible in colour from something which is clearly a borderline case, deserving of neither the predicate "red" nor the predicate "orange". Is the observer forced to say that S_j is a borderline case also? Or are they forced to say it is red, on the basis of its exact resemblance to S_{j-1}? The point of the argument just given is that observers are not constrained by any rules of sense to which they can reasonably be seen as committed, to say either of these things. They are free to go either way, or even to refuse to say anything at all. So tolerance rules cannot force us to paradoxical conclusions. Provided they are interpreted as loose rules containing an exception clause, they allow scope for individual judgement about exceptional cases. Something which looks as much like its red neighbours as its orange ones differs at least in this respect from both, and this difference, being a relevant one, justifies the refusal to apply either predicate.

One possible line of objection to our claims about (i)–(iii) consists in denying the claim that there must be a first member of the series which fails to be indiscernible from an end member. What if indiscernibility itself is vague? Whether or not two things are indiscernible in some observable respect may perhaps be thought to be an indefinite matter sometimes. There might be some pairs of things which cause observers to hesitate and refuse to be committed either way when they are asked to say whether or not they are indiscernible in some easily observable respect. If this is so it can be argued that the relational property of being indiscernible from S_1 can always be made to fade away gradually, without there being any particular member of the series which is definitely the first to be just discernibly different from S_1. Then there will, it seems, be no sharp break in terms of any determining concept between one member of the series and the next. For whenever a pair of adjacent members of a series differ in respect to their indiscernibility from an end member it must be possible to find a suitable intermediate item to insert between them to smooth over the division. Then in a sufficiently finely gradated series there would be no sharp breaks anywhere in terms of indiscernibility from the end members: indiscernibility from the first member of the series fades away into just discernible difference.

This objection need not carry with it a commitment to the rejection of nontransitivity of indiscernible difference. If the end members of a series are to be just discernibly different from each other with respect to ϕ, then indiscernibility in that respect cannot behave transitively at every point throughout the series. It seems possible to imagine series in which definite cases of nontransitive indiscernibility are to be found only between *widely-spaced* members, with no instances anywhere of immediate neighbours differing in their indiscernibility from any third thing. So anything indiscernible in the relevant respect from one member of such a series would also be indiscernible in that respect from that member's immediate neighbours, even though one but not another of a pair of widely spaced members might be indiscernible from an end member of the series.

Nevertheless it is possible to show that the objection fails. The objection is that the vagueness of indiscernibility guarantees that sharp divisions between one member of a series and the next can always be smoothed over by inserting intermediate items. For if indiscernibility is genuinely vague it must be possible to find suitable things to insert between members which differ in their appearance of indiscernibility from an end member. Eventually we will have to admit, (so the claim goes), that no member differs in this respect from its immediate neighbours. Let us suppose then that S_i and S_{i-1} are adjacent members of a series and are indiscernible with respect to ϕ but differ in that S_{i-1} is also indiscernible in the same respect from S_1 and S_i is not. Let $S_{i-0.5}$ be some further item, indiscernible with respect to ϕ from both S_i and S_{i-1}, and suppose it is inserted between them. What could an observer say about its relation to S_1? They might say $S_{i-0.5}$ is indiscernible from S_1: they might say it is just discernibly different from S_1: or they may dither, and say that it does not seem right to say either of these things. In the first case $S_{i-0.5}$ will differ significantly from S_i. If it is just discernibly different from S_1, it will differ in a significant respect from S_{i-1}. And in the third case it will differ significantly from both its immediate neighbours. For S_{i-1} does look indiscernible from S_1, and S_i does not. Further intermediate items could always be inserted where there is a difference of one of these three kinds between $S_{i-0.5}$ and its neighbours. However, the same questions would then arise and the answers would justify further divisions in the series.

There may of course be scope for higher order uncertainties concerning these three responses; we may, for example, doubt whether an observer is really unsure about $S_{i-0.5}$'s relation to the others. Then it is an indefinite matter whether or not $S_{i-0.5}$ is indefinitely indiscernible from S_1 or not. Further uncertainty may be possible about this pronouncement. But higher order vagueness of this variety surely comes to an end at some level, for there are limits to the fine discriminations we are capable of making.

We have shown above that indiscernibility with respect to ϕ is a determining property relevant to the application of any predicate for which ϕ is a determining property. Wherever a determining property for a predicate extends to one thing and it is an indeterminate matter whether or not it extends to a second thing, there is a difference between the two in a respect relevant to the application of that predicate. When all other determining factors are equal this difference may leave an observer unsure whether to apply the predicate to the second thing; it would be at least reasonable to say that it is a borderline case. Whether or not the observable difference is a large enough one to warrant the determinate refusal to apply the predicate is a matter to be weighed up by individual observers.

A further objection which is bound to be raised at this point is that this solution (like all the others) eliminates the problem by ignoring or arbitrarily stipulating away the vagueness of natural language. The original dilemma posed by Dummett and Wright was that attempts to resolve the Sorites paradox and refute the incoherence thesis inevitably fail to take vagueness seriously. The way in which we might be thought to have failed to come to terms with the real problem is by making use of an artificial model of an observer of a series and an idealized notion of judgement and assertion. The complaint would be that we have assumed that for any series there is a determinate right answer to questions about what observers can and cannot discriminate. On the opposing picture, indiscriminability from S_1 gradually fades into discernible difference without there being any right answer to questions about where one ceases and the other begins. This picture challenges the idea that there must in every case be some correct determinate judgement of the relation of a member of the series to the first. If there is some such determinate right answer at each stage to the question of whether an observer discerns a difference from S_1, then those answers must of course start to vary somewhere; an observer has to start saying something different at some point. It may be objected though that this will hold only if observers' judgements are imagined to have an artificial determinacy which in real life they do not have. Since the Sorites paradox only arises because natural languages contain genuine indeterminacies it can only be avoided by ignoring that feature of them.

The indefiniteness of noticing might seem to provide support for the objection that the above solution merely eliminates vagueness. Surely the question "When did you first notice a difference from S_1?" might admit of no correct answer in some cases. For an observer might only answer: "Somewhere along there", gesturing vaguely towards some section of the series. It would be absurd to ask exactly which members of the series were meant to be included in that gesture. Therefore it is also absurd to insist that there is a first member within this section which is definitely different from S_1.

Just because a vague answer may be given to a question sometimes, there need be no reason to suppose that it does not admit of a precise answer. When we can and when we cannot discern a difference between two things is something we can guess at as well as check. We would surely expect a determinate answer if an observer is asked to carefully consider each member of a series in turn and say whether or not it is discernibly different from the first. Checking here consists just of considering each member in turn and reporting verbally. The Sorites argument, as originally set up, asks us to suppose that such a process can take place, and to make the assumption that an observer can definitely say, of each member in turn, that it is indiscernible from the member before it with respect to determining concepts for the predicate being projected. For unless the observer is forced to admit that the first strip in the colour series is red *and that each is indiscernible in colour from the next*, they cannot be led to any paradoxical conclusions. All we have assumed in resolving this paradox is that the observer can see other indiscernibility relations also. If they have to be able to see that S_i is indiscernible from S_{i-1} for the paradox to be set up, there can be no objection to the idea that they can see that S_i is just discernibly different from S_1. So the Sorites argument itself relies on the possibility of making determinate judgements about indiscernibility, and this is all we need.

There seems, moreover, to be no artificiality involved in taking a person's verbal reports as giving a correct determinate answer to questions about what they find indiscriminable from what. Psychologists are content with their subjects' reports when studying just noticeable differences. From individual reports of this kind they arrive at statistical averages which are accepted as describing the limits of discernibility. Some artificiality is inevitable here. The objection to taking a single subject's verbal report as the criterion for their noticing a difference, on the grounds that this would introduce illegitimate and artificial precision into the account of the relation of language to the world cannot be right, for this criterion is the natural one we usually accept in ordinary contexts. If we want to know whether someone notices a difference between two things, we ask them. So the test of seeing what people say, when asked to compare two things, is acceptable both to the working psychologist and to the layperson.

There may sometimes be a certain amount of arbitrariness involved in meeting the standard expected in ordinary situations where we have to apply or withhold some description and the object is a genuine borderline case. There may even be an element of stipulation involved in some cases in deciding what to say. Such stipulations do not however conflict with tolerance rules, if the arguments given above are correct. The view of judgement implied by these arguments does not involve imposing on language any unnatural determinacy which did not exist there all along.

We can conclude therefore that convention, judgement, stipulation and facts about the way things look determine the limits of an individual observer's application of predicates of natural languages. We need not pretend that these languages have a mysterious precision and a level of accuracy beyond the grasp of their users in order to solve the Sorites paradox. Thus we may reject the original dilemma which seemed to force us either to accept the view that the relation of words to the world has a precision not of our making, or to accept the incoherence thesis.[12]

4.

Only strict tolerance rules lead to paradox. However, it should be clear by now that these cannot be true, even where the predicates are highly observational, and there seems to be only one dimension to appearances. For suppose someone judges that *a* is red and *b* matches it perfectly in colour. They are committed by the strict rule for "red" to saying that *b* is red also, *whatever else may be the case*. But *b* may be indiscernible from *c*, and they may judge *c* to be nonred. On strict tolerance rules they would be committed to contradictory conclusions over the colour of *b*. This only shows that strict tolerance rules are incoherent. For it is only possible to apply those rules consistently if it is admitted that *b*'s match with other things, apart from *a*, may be relevant to establishing its colour; just as relevant as its match with *a*. But then if the match with *a* is not the only thing which matters, it does not force the application of the predicate "red" *no matter what*. Multiple aspects of a thing's appearance with respect to colour must be allowed to count. Given the complexity of appearances, which can, in particular cases, be brought out by comparisons of this kind, various indiscernibilities may have to be weighed up. If indiscernibility is to matter at all in determining a thing's colour, it must do so according to loose rules. For "red" we will have:

> If one thing is red, and a second is indistinguishable from it in colour, then provided there are no other relevant differences between the two, the second is red also.

Where the two are paradigmatically red there will not be any dissimilarity between them in terms of the indistinguishability of one but not the other from something marginally orange, or pink, or some other colour. Where there *is* a difference of this kind we are justified in doubting that both are red.

What about highly observational predicates, such as "looks red"? It might be argued that if a and b look exactly alike, then (whether or not one matches something else the other fails to match) both look red just if either do. For they look the same. Therefore any description of the way one looks (to a single observer at some moment) must also fit the way the other looks (to that observer at that moment). Thus it could be claimed that strict tolerance rules apply at least to the most observational predicates, and that paradox reigns here. To reinforce this conclusion, there is the puzzle for the sense data theorist, which Dummett claims demonstrates the impossibility of phenomenal properties. Suppose a', b' and c' name phenomenal patches of colour and a' and c' are just barely discernible in shade, but the shade of b' cannot be discriminated from that of either of the others. The conclusion (unavoidable on strict tolerance rules), must be that b' is two distinct phenomenal shades at the same moment.

But although it may not be possible to save the sense data theorist's phenomenal properties from this argument, the paradox is not yet of Sorites proportions. For the example demonstrates the complexity of perception even where the application of the most observational predicates is at issue. If nonphenomenal objects can be such that one thing b can simultaneously impress observers as matching something a, deserving of the predicate "looks shade-P_1", and as matching something else c, which deserves "looks shade-P_2", then in those aspects of its appearance which we could (nonexperientially)[13] single out as its P_2 aspect and its P_1 aspect it differs from both a and from c. For each is perceived by the observer as lacking one of these dimensions. If so, that observer would be entitled to refuse one or other predicate of shade to b, on the grounds that it differed significantly from both a and from c. There is certainly the potential for inconsistency here, for they need not refuse to apply either predicate. It should not be surprising, however, to find some inconsistency in natural language; it is the view that it contains massive incoherence which is difficult to accept. We need not accept it if we take Wright's arguments as establishing only loose tolerance rules, for these allow an observer to call a halt at some point to the application of observational predicates. They are justified in doing so on the basis of how things appear. Thus, tolerance rules for a predicate such as "looks red" ought to be stated in the form

> If one thing deserves the predicate "looks red" and a second is indistinguishable from it in shade, then provided there are no other relevant differences between the two, the second deserves the predicate "looks red" also.

Rules of this loose sort have a good claim to be counted as the substantial rules Wright is looking for; the ones which settle specific questions about the applicability of observational predicates. For given the sort of considerations to which he draws attention, to do with limitations on our senses and memories, these rules will surely have to be rough ones of the sort for which we have argued. They will have to be rough to allow for judgement about the degree and kind of resemblance which matters, since these can never be precisely and exhaustively specified. When teaching someone the use of an observational predicate, loose rules are all we have to give them; no strict mechanically applicable rule could be given to novice language learners to enable them to correctly apply a predicate such as "heap" in all possible circumstances. All that can be said is, "Those things are heaps, and anything pretty much like them in size and material constituents and so on, and which does not differ from these in any important respects is a heap also".

These rough rules are, of course, no substitute for training of the usual unsystematic sort we all had, consisting of example, test and correction. Suitable rules do help to guide the developing practice along the same lines as the practice of the rest of the community. There is a continuum of rules, ranging from the roughest of guidelines, of the form "Do it this way!", followed by practical demonstration, through to the strictest kind. Rules for the manipulation of mathematical and logical symbols will be at this strict end, where the least amount of judgement is required. Some linguistic rules are located near these, but the substantial rules for the use of observational predicates will not be near the strict end of the spectrum.

Wright's substantial rules for the use of observational predicates were supposed to be ones which could be given to novice language learners to guide their developing mastery of the use of those expressions. The language learning, of which these rules form an indispensible part, is certainly an inductive matter, though it is usually supposed that the rules which express the conditions for the correct application of the expressions are strict semantic rules. If, however, the above arguments are correct, substantial rules which could guide the novices' developing practice must be like inductive rules in certain respects: they will contain ceteris paribus clauses and require judgement in their application. The judgement involved concerns whether or not this case is enough like ones to which the predicate has been extended in the past, and judgements of this sort are surely inductive ones. The question of whether to apply an observational predicate to a newly encountered object, or to re-apply it after some object has changed, is not a matter to be determined by any strict, purely mechanical rules. Loose guiding principles, which remain sensitive to further evidence, are the kind of rules which could plausibly be grasped and conveyed to others, and so are the best candidates for substantial rules of the sort Wright is after.

5.

What should we conclude, finally, about Dummett's and Wright's arguments? It does not seem that any of the *explicit* premisses of their arguments need to be rejected. However the view of language as exhibiting open texture, and as lacking any purely observational part, and the claim that no strict mechanically applicable rules could specify definite necessary and sufficient conditions for the application of observational predicates are all theses closely associated with holism. It would take us too far afield to examine the extent to which Dummett's and Wright's antiholism might make this way out of the dilemma unacceptable to them. The actual premisses of the arguments for tolerance rules may be accepted, at any rate, and also the arguments that tolerance is an essential feature of the meaning of vague expressions and an inevitable consequence of the limitations on human perceptual abilities. Our conclusion is just that these arguments do not lead to the conclusion that natural language is incoherent and the Sorites an insoluble paradox.

The solution suggested here does not require us to reject as invalid any of the reasoning involved in the usual statements of the Sorites paradox. It does not provide grounds, therefore, for questioning the validity of modus ponens or mathematical induction. We can also keep our intuitions about the tolerance of observational predicates, provided tolerance principles are formulated as loose rather than strict rules.

The source of the problem lies at the assumption about the series on which the Sorites reasoning is based.[14] *There are no series of the kind required for the paradoxical argument to work*. The reason why the assumption about the series on which the argument is based is false has to do with two incompatible features which such series would be required to have. To fit the argument a series would have to exhibit perfect continuity in *every* respect relevant to the application of the predicate to be projected, and also nontransitive indiscernibility in all those respects from member to member. But those indiscernibilities are themselves relevant to the application of the predicate, and nontransitivity inevitably produces breaks in the continuity of the series. How things compare with other members of the series matters for the application to them of observational predicates, and the nontransitivity of indiscernibility guarantees that there will be observable differences from member to member in this respect.

Is the induction step true? It is a claim about series of a certain kind, and there can be no series of that kind. If there were, it would of course be true, for it is true of any series which has the first of these two characteristics. Where each member of a series is perfectly indiscernible from the next in *every* observable respect which matters for the application of some observational predicate, then if that predicate applies to any arbitrarily chosen member of the series it will apply to its successor also. There are certainly series of this kind, but they do not exhibit the gradual variation necessary for the predicate to be true at one end but not the other. (If F is true at one end of such a series of objects it is true at the other also; there is no significant alteration.) However, any series which actually *varies*, however smoothly, in the way required for the Sorites reasoning to apply to it, will also exhibit discontinuities. If adjacent members did not differ discernibly in their relations with other members, the predicate could not apply at one end but not the other. Thus the induction step does fail for actual series, but then these are not the ones to which the argument properly applies.

This is not to say that there are no continua in nature. The complexity of appearances, and the fact that there may be continuities in certain dimensions of appearance but not others, means that creatures with our perceptual limitations could never apply strict tolerance rules consistently. Only loose rules could allow us to cope with unforeseen complexities and continuities in nature, since these rules allow us options when confronted with difficult or borderline cases. This scope which exists in any natural language for inductive judgement, expertise and stipulative decisions provides the way out of the paradox.

Thus Wittgenstein's view of vagueness may be vindicated. Vagueness of the kind connected with tolerance may be argued to be an essential feature of natural languages, and those languages may also be seen to be in perfect order, provided that tolerance (and therefore vagueness) is seen to be a more complex matter than had been thought.

NOTES

[1] M. A. E. Dummett: 1975, 'Wang's Paradox', *Synthese* **30**, 301–24.

[2] Crispin Wright: 1975, 'On the Coherence of Vague Predicates', *Synthese* **30**, 325–65.

[3] *Grundgesetze der Arithmetic*, Vol. II, section 56.

[4] I have deviated here from Wright's terminology of determining concepts since his definition of these appears to introduce some unnecessary difficulties into the account.

[5] Dummett: 'Wang's Paradox', p. 323.

[6] In *Word and Object*, ch. IV, section 26 and in 'What Price Bivalence?', *The Journal of Philosophy* **78**, (1981), 90–5.

[7] Differences in apparent maturity will, for example, supervene upon more particular differences, though there may be no direct lawlike connections.

[8] See Waismann's article 'Verifiability', in *Proceedings of the Aristotelian Society*, Supp. Vol. 19, (1945), pp. 119–50 for further remarks on the connection between vagueness and open texture.

[9] The series in which we are interested are all finite, since the Sorites argument depends upon the supposition that it is possible to get from one end to the other by always moving to an adjacent member. This would not be possible in an infinite series.

[10] It would be possible to present the observer of the colour series with strips in discrete pairs, so that no observable differences in terms of indiscernibilities from other things are evident. Suppose the pairs are shown in random order, or with such large breaks in between that there is no possibility of the observer comparing the colours of the strips

accurately in memory. We could imagine that indiscriminably coloured pairs are flashed onto a screen, one pair at a time, in such a way that the left-hand member of each pair is identical with the right-hand member of some other pair. At some point an observer will refuse to apply a colour predicate to some pair, perhaps despite having applied it to a previously seen pair having a member in common with this one. This presents no difficulties, for according to our argument the inconsistencies stop here. The observer can only be forced, by Sorites arguments, to conclude that inconsistent predicates apply indiscriminately *throughout* the series, if further members are introduced in the same visual context, so that indiscernibilities from other members of overlapping pairs is evident. In that case they could also find *differences* from member to member which would permit them to avoid those wide ranging contradictions. The appearance of visually isolated pairs may vary from context to context: it is only where the visual context is one of smoothly continuous change that the observer may be led by Sorites arguments into contradictions.

[11] This may raise the further worry that although the observable differences from member to member in terms of indiscernibilities from further members of the series are relevant to questions about the colour of each, they are too small to matter in deciding those questions. To warrant a break in the applicability of a predicate, there would have to be a sizeable difference in some relevant respect; here the difference is a barely discernible one. Where the difference between one thing and the next is admitted to be discernible the problem is to say how large it must be to be sufficient to justify the application of the predicate to one but not the other. There is something odd about this problem however, since it coincides with the following question: How great must the similarity be between two things if we are to classify them as falling under the same observational predicate? There is no answer to this except the uninteresting one that resemblances and differences between things are large enough to matter in this way when they are large enough to be noticed and taken to matter to the applicability of the predicate by most observers. (How red do things have to be to be red? Red enough for most people to count them as red. Alternatively, distinguishably redder in colour than everything taken to be orange.) The best explanation of an observer's refusal to apply a colour predicate past some point in a series is surely that after this things start to resemble too closely clear instances of the opposing colour predicate. Since previously examined members of the series had not been judged to have this degree of resemblance to things falling under the opposite predicate, the difference must be large enough to matter. In many cases small observable differences do not matter: why they do matter when they do has no philosophically interesting general explanation other than that they add up to a difference large enough to oblige a different classification.

[12] Putnam, in a recent article entitled 'Vagueness and Alternative Logic', (*Erkenntnis* **19**, 1983, 297–314) provides another reason for arguing that solutions of the kind suggested in this section merely eliminate the problem by introducing artificial precision. He points out that approaches of this kind to the problem involve counterfactuals, since they appeal to the notion of what someone would say, if they were asked. The best theories of counterfactuals involve considerable vagueness, since they fail to specify in a general way, what goes along with the explicit antecedent in arriving at the consequent. Goodman's co-tenability problem still awaits a satisfactory answer. Nevertheless, what is being assumed by the utterer of the counterfactual along with the actual antecedent in

some particular context is often quite obvious to everyone concerned. What is still unclear (and so vague in a different sense from that being discussed here), is which general formula will satisfactorily capture these intuitions of ordinary users of counterfactuals. The philosophical problem – the problem of co-tenability – need not import vagueness of the Fregean kind into judgements. We do in fact know what goes along with the supposition that an observer of some series is asked whether some member is indiscernible from the first: what is being assumed in the Sorites set-up is that they are a normal observer (not colour-blind, for example), that they are concentrating on each member in turn, and that they are able to recognize the property ϕ (whatever that is), and also indiscernibility with respect to ϕ.

[13] These aspects are not supposed to be apparent in experience of the object, in the way the switches of aspect from duck to rabbit are in Wittgenstein's example. They are evident on reflection on experience as essential features of the structure of the perception of *b*.

[14] The solution being offered to the Sorites consists in the claim that an assumption on which the paradoxical reasoning rests is mistaken. There are (and can be) no series of the sort needed for the argument to work. This is a familiar way of dealing with paradoxes: it is usually agreed, for instance, that the right response to Russell's paradox about the barber who shaves all and only those who do not shave themselves is that there can be no such barber.

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