Three Networks: Similarity, Implication, and Membership

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This essay addresses the problem of how to account for our meeting of minds, for our being able to linguistically express agreement regarding external events despite wild dissimilarity of our nerve nets. An explanation is provided based on the instinct of induction, the instinct of similarity, and natural selection. There are three networks at play in the meeting of minds: *perceptual similarity*, the intersubjective harmony of similarity standards and thus the relation structuring the intake of perceptions; *implication*, the relation expressed by the universally quantified conditional and structuring our system of the world; and *class membership*, the relation structuring the domain of pure mathematics.

Language is for communicating with our fellows about matters of mutual concern. Its focus is not the private sensations that are our evidence for what is happening around us; focus is rather the things and events out where we all can jointly observe them. As I wrote on page one of *Word and Object*, "entification begins at arm's length; . . . the points of condensation in the primordial conceptual scheme are things glimpsed, not glimpses."

Our awareness of these external events, still, is due to causal chains leading from those external events to our sensory receptors and then continuing through our nervous systems. One would expect a pretty faithful homology between your nervous system and mine. How else could we account for the intersubjective agreement of our reports on

external events that we jointly observe? Cameras similarly situated show similar agreement. Why shouldn't we?

But no. The cameras are made alike; clearly we are not. Darwin reported in *The Origin of Species* that even two simple insects from the same swarm have widely dissimilar neural hookups. Let me quote more at length from *Word and Object*:

> Different persons growing up in the same language are like different bushes trimmed and trained to take the shape of identical elephants. The anatomical details of twigs and branches will fulfill the elephantine form differently from bush to bush, but the overall outward results are alike.[1]

So we are left with the problem of accounting for our meeting of minds. We keep finding ourselves in agreement regarding external events despite wild dissimilarity of our nerve nets. That is the problem. In *Word and Object* I coped lamely with it. I reflected that when I view a landscape, points in it do obviously trigger correspondingly placed receptors in my retina. If you and I view the landscape side by side, then each point in the landscape will trigger roughly corresponding receptors in your retina and mine. We might then be regaled with pretty homologous scenes, however dissimilar the intervening neural processing may be. I fondly hoped that somewhat analogous considerations might account also for intersubjective agreement in audition and other sense modalities.

This makeshift accommodation lingered in place for thirty-five years, from *Word and Object* in 1960 to *From Stimulus to Science* in 1995, when the fog lifted. The explanation of our meeting of minds is circuitous; through instincts and natural selection. I shall now try to sketch it without trying your patience.

One of the two instincts is that of induction. It is the tendency to expect any two similar perceptions to be followed respectively by two more perceptions that are in turn similar to each other. This tendency is the basis of conditioning, and hence of all learning, and hence cannot itself have been learned, so it must be instinctive.

Since it depends on some standard of similarity of perceptions, some such standard must be instinctive too. Our standard changes with experience, but has to begin in instinct in order to implement induction. So we have an instinct of similarity and an instinct of induction. So far so good; let me go on.

Our expectations by induction are overwhelmingly more successful than random guessing. Philosophers have wondered why. The answer is natural selection, which shapes our instinctive standards of similarity and therewith our inductive expectations. Natural selection has favored

the survival of animals whose standards of perceptual similarity mesh well with trends in the environment.

This, then, is the instinctual background of our meeting of minds. The rest of the explanation comes naturally. Since our ancestors' similarity standards were warped into harmony with a shared environment, one person's standards end up in harmony with another's. Thus we end up inheriting a harmony of similarity standards with our contemporaries.

All this is accounted for, we see, without assuming any direct similarity between your sensations and mine. It is a pre-established harmony, in Leibniz's phrase, but pre-established by natural selection.

Perceptual similarity, in its intersubjective harmony, is the life blood of language. Consider the mother teaching her infant the word 'dog'. The dog enters, the mother says the word, the child repeats it, and the mother manifests approval. Next day the dog enters again, the child says 'dog', and the mother again approves. The dog's two appearances were perceptually similar for the child and perceptually similar for the mother. The sounds of the word 'dog' as spoken by the mother on the first occasion and by the child on both occasions were all perceptually similar for the mother, and again all perceptually similar for the child. All this harmony is essential to this modest transaction. But there is no assumption of direct similarity between the child's perceptions and the mother's.

For simplicity I have been treating perceptual similarity as one-dimensional, a simple scale. Patricia Churchland has protested that the comparisons diverge into respects. However this may be, I think my present account holds in essentials. The more complex relation can surely be accommodated if it is needed.

The subject himself of course is not presumed to have any notion of his standards of perceptual similarity; it is a relation that the experimental psychologist can abstract from the subject's behavior under the reinforcement and extinction of responses. Speaking of his *standards* of similarity thus gives a wrong impression of self-consciousness. But I am at a loss for a better phrasing.

In daily discourse we all do indeed persistently declare things to be similar in various degrees, and a definition of that relation is notoriously lacking. It is an unconscious projection of perceptual similarity.

Perceptual similarity, we have been seeing, weaves the web of language in early childhood. What weaves the web of our increasingly scientific theory of nature, however, is rather *implication,* expressed by the universally quantified conditional '$\forall x\ (Fx \supset Gx)$': 'Whenever this, that'; 'Wherever this, that'; 'If ever this, that'. This accommodates cause

and effect. Moreover it marks the advent of the bound variable, and hence of reification; for to be is to be the value of a variable.

In speaking of the advent of reification I am doing logical reconstruction, not history. The small child learns words of animals and other things and early man did likewise. But where to draw the line between the denotative and the syncategorematic use of a word is moot or arbitrary at the level of radical translation, and often even at home. In our own vernacular, objective reference seems most clearly intended in the use of the relative pronoun; and when we switch to symbolic logic it is unmistakable in the bound variable.

Implication, expressed by the universal conditional '$\forall x\ (Fx \supset Gx)$', generates structure generously, establishing an instance of 'Gx' for every established instance of 'Fx'. In particular it expresses causal connections, and accommodates the time dimension. My familiar example is 'If a cat eats spoiled fish and sickens, it thereafter avoids fish'. The pertinent value of the variable in this universal conditional is perforce an enduring creature, the same cat early and late. Such are the universal conditionals that reify enduring objects and accommodate temporal differences.

Deductive exploitation of one and other established universal conditionals takes us step by step downward to one or another observation categorical, we hope, which can then be subjected to experimental test. This is where science lines up for inspection. It is where the scientific network of implication, or universal conditionals, measures up to the perceptual network of similarity.

Such is the overwhelming utility of the universal conditional: it weaves the web of science, it binds it to its empirical evidence, and through its bound variable it determines our very ontology.

I would venture more: the universal conditional embodies the very *raison d'etre* or survival value of ontology itself. What matters for the biological survival value of science is not what ontology it reveals, but what life-supporting and life-threatening events it conditionally predicts, ultimately in observation conditionals. For this purpose the ontology does not matter except numerically: any one-to-one correlates would serve as well. It is just a matter of isomorphism, as I have dramatized by proxy functions. I called it indeterminacy or inscrutability of reference.

So much for concrete objects. What of abstract ones? Where might occasion first arise for quantifying over abstract objects as values of variables? One thinks of biological taxonomy—species, genera, and their ilk. However, these can be treated as concrete objects if we construe physical objects generously as all occupants of space-time, however discontinuous. A species, then, can be arbitrarily identified with the

mereological sum of its members, and a physical object then qualifies as a member of a species if it is an organism and a part of the species. Similarly for genera and other taxa.

A domain that does seem inescapably to call for quantification over abstract objects, however, is that of numbers. Counting does not require quantifying over numbers, but other uses of number do require it, and applied mathematics abounds in such uses. Numbers, for all their abstractness, must accordingly be accounted an integral part of our theory of the world.

Research in the logical foundations of mathematics, most voluminously by Whitehead and Russell, has shown that all of classical mathematics can be translated into pure set theory, and that set theory is translatable into elementary logic plus a single two-place predicate, that of class membership. It is a startling economy, but it leaves us with quantification over classes, which are abstract objects. So I see no hope of nominalism.

Just as perceptual similarity emerged as the relation structuring our intake of perceptions, and implication as expressed by the universal conditional was the relation structuring our system of the world, so we see class membership emerge as the relation structuring the domain of pure mathematics.

I take my resulting commitment to classes lightly, for all their abstractness. An exclusively concrete ontology would be welcome for its economy but little more, in view of the purely structural character of ontology's service to science. What I find more imperative is extensionality which condones reification of classes but challenges that of properties. The urgency of extensionality arises from the demand for individuation: no entity without identity. Thus it is that I reify classes but not properties; for we cannot satisfactorily distinguish two properties if they have the same extension.

I have no sense of loss as regards properties, but I was stopped by the idioms of propositional attitude; for these fail of extensionality but are indispensable—I have arrived at an accommodation here also, but must refer you to my latest thin book, *From Stimulus to Science.*

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1. W. V. Quine, *Word and Object*, (Cambridge: Technology Press of the Massachusetts Institute of Technology, 1960), 8.