Iconicity, analogy, and universal grammar

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Abstract

In this paper I shall consider the notion of structural iconicity (or isomorphism) as it is used to explain putative universals of language. Iconicity turns out to be a special case of the more comprehensive notion of analogy. The type of universal grammar based on analogy is contrasted with the one based on modularity.

1. Some historical background

The history of Western linguistics is to a large extent a history of *universal grammar*; this is one of the basic tenets of Itkonen (1991). This notion, implicit in Aristotle's thinking, becomes fully explicit in the doctrine of the medieval grammarians, the so-called Modistae. It was their stated goal to *explain* the language universals (= *modi significandi*) by showing how they have been jointly *caused* by the extralinguistic reality (= *modi essendi*) and the human cognition (= *modi intelligendi*). From the explainability of universal grammar they correctly inferred that it cannot be innate: "Notitia modorum significandi intellectui non est innata" (Pseudo-Albertus Magnus, 1977: 38).

The tradition of universal grammar continued uninterruptedly until the end of the 19th century (for details, see Itkonen, 1991: 5.4–5). There we meet Georg von der Gabelentz, who emphatically repeats the Modistic view that, rather than being declared innate, language universals ought to be explained: "Mit der Frage nach den angeborenen Ideen brauchen wir uns hier nicht zu beschäftigen. Eine Idee für angeboren erklären, heißt erklären, daß sie unerklärbar sei" (1891: 365).

Contrary to some current misrepresentations of history, the idea of universal grammar was alive also in the first half of the 20th century, for instance in the work of Otto Jespersen and, somewhat less explicitly, of Edward Sapir. And even Leonard Bloomfield did not deny outright the possibility of universal grammar.

In the sixties there were two competing approaches to language universals: Greenberg noted generally (rather than universally) valid correlations between various linguistic phenomena, without any systematic attempt at explaining them, whereas Chomsky practised some sort of 'universal grammar of English', taking the syntax of his native language to be an innate component of the human mind.

Since the late sixties and early seventies, there was growing discontent with Chomsky's innatism (or nativism); and since the beginning of the eighties, explicit and informative explanations of language universals have been offered in growing numbers. At least the following works deserve to be mentioned: Comrie (1981), Givón (1984), Haiman (1985a,b), Hawkins (1988).

2. Three different bases for explaining language universals: Ontological, cognitive, and social

Linguistic structure is a result of 'multiple causation'; and it is the linguist's task afterwards to disentangle the contributions made by different causally effective factors. These may be chosen and classified in various ways. For my part, I find it illuminating to divide them in three principal groups.

Ontological explanations refer to the way in which the structure of extralinguistic reality is reflected in linguistic structure, producing a relation of structural *iconicity* (or *isomorphism*) between the two.[1] It goes without saying that there can be no 'pure' ontology; rather, each ontology is already a result of conceptualization.

Cognitive explanations refer to the way in which a human being *relates himself* to what is ontologically definable. Precisely because there is no pure ontology, the difference between ontology and cognition, though real, can only be an approximative one. In a situation like this, it is important first of all to establish the *clear cases*: That one event temporally precedes another, is an *ontological* fact, although both 'event' and 'temporal precedence' are certainly results of human concept-formation. By contrast, either denying or inferring the occurrence of an event is a *cognitive* fact (more precisely, a cognitive operation), because, instead of being part of the extramental reality, it is directed toward this reality (more precisely, applies to mental representations of this reality).

Finally, *social* explanations refer to the *interaction* between human beings relating themselves to what is ontologically definable. It should be noted that the logical order in which the subject matter is presented here is the reverse of the temporal order in which one gets to know it. What is immediately given, is the general social fact of people interacting with one another, and it is only little by little that one realizes that it may be useful to see this fact as 'containing' the ontological and cognitive facts.

In what follows, I shall characterize very briefly these three types of explanation. They deserve of course a much fuller treatment, but this is not the place for it.

Isomorphism between states of affairs and sentences is instantiated by their respective constituents on the following dimensions: (a) number, (b) qualitative properties, (c) quantitative properties, (d) order, (e) cohesion.

These five dimensions will now be illustrated. (More detailed evidence is to be found e.g. in Haiman, 1985b.) Ad (a): What is known about the cognition of pre-

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[1] In the sequel I shall prefer the latter term. In Itkonen (1970) I showed in some detail that isomorphism, in the sense of Wittgenstein's 'picture theory', is a feasible idea also for natural languages.

verbal children and of the deaf, indicates that they perceive the reality in the same way as those equipped with an oral language do. This fact *explains* why a sentence referring to an 'agent–action–patient' state of affairs generally contains three words. Ad (b): The ontological difference between thing and action produces the morphological difference between noun and verb, and as the former difference diminishes, the latter diminishes as well.[2] There is a similar, even if somewhat less clear-cut correspondence between agent and subject, and between patient and object. Ad (c): In the linguistic 'singular–plural' distinction the latter term is more complex, corresponding to greater ontological complexity. Also the 'concrete–abstract' distinction, reflected as that between lexical (= 'more') and grammatical (= 'less') belongs here. Ad (d): Temporal and causal order is reflected as linguistic order: in many languages sentences referring to what precedes must precede sentences referring to what follows; in no language is the inverse order obligatory. The preferred SO word order reflects the action 'passing over' from the agent to the patient. Ad (e): A person may have several types of relation to states of affairs, and as his causal power increases, the sentence referring to the state of affairs tends to be absorbed into the sentence expressing the relation. Because noun phrases and sentences refer to discrete extralinguistic entities, i.e. things and states of affairs, it is not permissible to move any constituents out of them, at least not far enough for the connection to become opaque. (This is the explanation of 'subjacency'.) For the same reason, when something is moved, it is moved as a whole. (This is the explanation of 'structure-dependency'.)

Cognitive explanations constitute a more heterogeneous group. As noted before, the underlying idea here is the person *adding*, or contributing, something to what is ontologically given, or ontologically definable. Accordingly, this is the place for the traditional *deicticity*, as expressed by grammatical persons, demonstratives, (in)definiteness, and spatial terminology. (Many examples are provided e.g. by Rudzka-Ostyn, 1988.) That is to say, deictic elements are seen here as explained by the 'positions' that the speaker and the hearer occupy vis-à-vis the ontological 'core' of the speech situation. Notice that deicticity is not reflected structurally in language: it is not the case that the sentence would somehow reproduce, picture-like, the relation of the speaker to what he is going to speak about. Rather, it is just a matter of this (deictic) relation finding, or producing, *some* linguistic expression.

Cognitive explanations range over a wide area of application. They start with general facts of human cognition, as contrasted with animal cognition (for instance, the *lack* of specific vocabulary concerned with smell). Moreover, the constitution of the

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[2]   Hopper and Thomson (1985) try to show that the justification for the categories of noun and verb is ultimately not ontological, but 'discourse-pragmatic'. To my mind, they fail for the following two reasons. First, when dealing with their actual examples, they invariably return to the ontological justification. Second, saying, in the Aristotelian terms, that the verb and the noun express, respectively, that which is said and that about which it is said is not a *justification*, but merely a *definition* of the two categories. And the connection between the definiens and the definiendum is too close to be explanatory. (While it is easy to imagine a noun not referring to a thing, it is impossible to imagine a (subject) noun *not* expressing that which is spoken about.)

human body conditions to a large extent which types of experience are deemed important, as shown by the copiousness vs. scarceness of corresponding lexical items (cf. Lee, 1988). A particularly important phenomenon is the 'figure–ground' distinction, which is based on the fact that what is small is, for obvious reasons, manipulated with respect to what is big, rather than vice versa, a fact reflected, among other things, in the use of case endings and prepositions (cf. Talmy, 1983). Metaphor is explained by showing that apparently non-personal and disembodied abstractions have their origin in the egocentric experience of the 'body-in-space' (cf. Johnson, 1987).

Here we have to face the difficulties involved in making the distinction between ontological and cognitive. Speech acts like questions and commands clearly express attitudes which 'flow from' the speaker. Once this is admitted, it becomes impossible to treat statements any differently. Thus, it turns out that ontological isomorphism is always embedded in a wider cognitive (i.e. deictic/attitudinal/actionist) context. We also realize that among the non-linguistic qualitative properties reflected in language (= point (b) above) there are those which, unlike the basic 'thing vs. action' distinction, are quite obviously motivated by practical considerations, as shown by studies on noun classification/categorization (cf. Craig, 1986). Also some quantitative properties (= point (c)) are clearly such as to result from mental operations; just consider the act of comparison vs. the lack of it involved in comparative/superlative (= 'morphologically more') vs. positive (= 'morphologically less'). Such operations as identifications, quantifications, negations, and inferences obviously have no ontological correlates; it also seems clear that they exist on a non-linguistic level, before being linguistically expressed.

Social or interactionist explanations concern phenomena which are broadly characterized as 'discourse-pragmatic'. I think it is fair to say that at present this type of explanation produces less reliable results than the other two, mainly because it often violates the principle 'same cause–same effect'.

3. Explanation-by-isomorphism: A closer look

Using isomorphism as an explanatory principle becomes more plausible when it is seen that such explanations are employed also outside the customary language-universals research. But first it is advisable to ask what, precisely, is being explained here.

Ever since the Modistae, explanations-by-isomorphism have been formulated so as to suggest that, having grasped or conceptualized the extramental reality in a certain way, somebody goes on to verbalize it in a structurally similar way. Taken literally, however, such an account could only apply to the mythical 'creator of language', or *nomothetes*, as Plato calls him (see Itkonen, 1991: 5.1.1). To be acceptable, therefore, modern explanations-by-isomorphism must admit of some more realistic interpretation.

The explanandum here is linguistic structure, but this is just a shorthand expression for the fact that a child learns a language structured in such and such a way, and

later, as an adult, maintains it more or less in the same form. The latter point is crucial. If the language were not felt to be adequate to its purpose (here: to what it refers to), it would change in a random fashion. That it does not, i.e. that it changes only in ways which do not destroy the isomorphic relation to the extralinguistic reality, reveals, precisely, the explanatory role of isomorphism. This is the modern interpretation of the Modistic view that *modi significandi a modis essendi causantur*. (Analogous remarks apply to the other two types of explanations as well.) Notice, however, that the idea of 'isomorphism-as-creation' is not as spurious as one might think at first. Cases which come closest to genuine 'linguistic creation', namely home-sign systems and creoles, invariably exhibit strong degrees of isomorphism (cf. below).

The view that I am setting forth here presupposes that the child possesses a non-linguistic ontology with such notions as 'thing', 'action', 'causation', and the like, and that, while learning his first language, he is able to monitor the relation of linguistic categories to ontological categories. Current research seems indeed to bear out these assumptions.

Let us consider the cognition of preverbal children. Until recently, research in this area was hampered by the fact that the sensorimotor abilities of 4–6-month-old infants are quite undeveloped. (Animal tests, for instance, are based on behavioral reactions, but a 4-month-old child cannot be tested in the same way, because he exhibits no comparable behavior.) Piaget committed the mistake of defining the cognitive development in terms of the sensorimotor development. Instead of asking whether cognitive differences are caused exclusively by differences in sensorimotor abilities, he assumed this to be the case. (Whorf committed an analogous mistake: instead of asking whether differences between English and Hopi produce comparable differences in thinking, he just assumed that they do.)

The study of infant cognition entered a new phase when a systematic object of research was found, i.e. when one hit upon the idea of studying the *direction and the duration of the infant's gaze*. These are taken to indicate the amount of attention; and the so-called habituation hypothesis assumes that for an infant it takes a shorter time to look at what is familiar or comprehensible, and a longer time to look at what is unfamiliar or incomprehensible. A series of imaginative tests that provide detailed information about infant cognition have already been built upon this apparently slender foundation.

The physical world-view of 4-month-old children is in its basic structure already the same as that of speaking adults. Central to everything else is the notion of *thing*, which is characterized by cohesion, substantiality, continued existence, and continuity of movement. It is also important to note that the notion of thing is abstract enough to be independent of any particular sensory modality (e.g. vision or touch). The adult world-view is reached not by changing, but merely by enriching the infant world-view, for instance, by adding the operation of gravitation and the principle that things move at constant or gradually changing speeds (cf. Spelke, 1988). Causation is already at this age distinguished from mere spatiotemporal contiguity (cf. Leslie, 1988). The habituation method also shows that the concept-formation by infants is similar to the concept-formation by adults (cf. Cohen, 1988).

These results are of tremendous significance. They show that our standard notion of ontology comes into being without the aid of language. Language does not create reality, but merely reflects it. Plato and Aristotle were right, and those who were (or are) wrong, include nominalists like Ockham, romantics like Herder, linguistic determinists like Whorf, and postmodernists like Derrida.

In this context I cannot go into the eventual similarities between human cognition and animal cognition. From the linguistic point of view, however, it is quite interesting to note that a chimpanzee is able to identify such semantic (or 'thematic') roles as 'agent', 'patient', and 'instrument' (Premack, 1988: 60). So these must be nonlinguistic in origin (which of course makes perfect sense).

Let us now return to the role of isomorphism in language learning, as exemplified by what might be considered the paradigmatic case, namely the 'thing–action vs. noun–verb' isomorphism. It is well known that this isomorphism is more pronounced in children's speech than in adults' speech (cf. Brown, 1958: 243–253), a result which agrees with the general iconicity of the child language (cf. Slobin, 1985). This clearly shows that the child does become (subliminally) aware of the language–reality relation. He does not just learn the language of the adults. Rather, he also learns and uses language to satisfy his perceptual and cognitive needs. That he only later starts using nouns for non-things, is implicit proof that he thereby recognizes the distinction between the primary use and the secondary one.

The preceding account is directly confirmed by evidence from the study of home-sign systems, i.e. gestural means of communication invented by deaf children of hearing parents. These children use 'pointing gestures' to refer to things and 'characterizing gestures' to refer to actions and qualities (cf. Golden-Meadow and Mylander, 1990). The ontological justification of this distinction as well as its virtual identity with the noun–verb distinction is self-evident.

If the iconic nature of home-sign systems is obvious, the same is no less true of such well-established sign languages as the American, or the British, or the Finnish sign languages.[3] Even if the iconic origin of particular signs may have become opaque, the structure of the entire language is nevertheless based on the idea of modelling the reality which is spoken about. That is, the space in front of a signer is a miniature model of the world, and 'place-holders' for real-life entities are first put in it, and then pointed at and moved around in accordance with the exigences of the story to be told. Moreover, the iconic roots of grammatical (rather than lexical) morphemes are often evident also to people with no previous knowledge of signing. This is vividly illustrated by the fact that, when asked to manually express such aspectual notions as 'momentaneous', 'iterative', 'durative' and the like, non-signers produce gestures that closely resemble the corresponding grammatical markers of standard sign languages (cf. McNeill, 1987: 248).

The preceding account may be summed up by saying that oral languages and sign languages have come to look very much alike, once it has been realized that the former are more iconic, and the latter more conventional, than was previously thought

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[3]   My discussion of sign languages has been influenced by Rissanen (1985) and Haukioja (1991).

to be the case. Therefore it is not surprising that scholars of quite different persuasions agree that oral languages and sign languages issue from a common linguistic capacity (cf. e.g. Kyle and Woll, 1985, on the one hand, and Poizner et al., 1987, on the other). The implications of this general agreement must be clearly understood. It is impossible to deny that sentences uttered in a sign language give a 'picture' of the events spoken about; this 'picturing relation' is an isomorphic relation, or a relation between two (visual) structures. Now, if oral languages and sign languages do share a common origin, as is generally agreed today, then isomorphism must play an equally central, and equally explanatory, role in oral languages as it does in sign languages.

To me it is quite clear that home-sign systems too are an outgrowth of the same general capacity as oral languages and sign languages; and I do not think that this position would be contested by very many people. What is more controversial, however, is the status of spontaneous gestures that accompany, rather than replace, speech. McNeill (1985) notes that one part of such gestures 'iconically' replicate the semantic content of speech, while another part replicate the rhythmic pattern of speech. On the basis of this remarkable parallelism, McNeill argues that both speech and gestures simultaneous with it derive from the same capacity: they express the same conceptual content in different ways, gestures being the more primary mode of expression. For my part, I find McNeill's argument quite convincing. It remains to be seen how far this 'semiotic' competence ultimately extends.

Ever since Furth (1966), it has been known that there is no noticeable difference between the cognition of hearing subjects and the cognition of deaf subjects. Some people might wish to explain this fact by the common origin of oral languages and sign languages. This interpretation, however, is ruled out by the fact that preverbal children already exhibit the same type of cognition. Thus, as noted above, language has nothing to do with it.

The preceding discussion supports Kosslyn's (1980) view that at least some part of mental representations is imagistic, rather than propositional, in character. A rising hand movement representing the rising movement of an airplane is literally an *image*, or a picture, of the latter; and it is natural to think that the two instances of this movement are mediated by a mental-imagistic representation of the same movement. It would be less parsimonious to assume that the extramental movement has to be encoded in a mental-propositional form. (Notice also that the conceptual difficulties connected with 'images in the head' are no more serious than those connected with 'sentences in the head'.[4])

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[4] To be sure, Wittgenstein's cautionary remarks against the use of 'mental images' should not be forgotten: an image (e.g. a map) always needs an instruction for its use or interpretation; and how is *this* to be represented? (Cf. Blackburn, 1984: 45–50.) It seems to me, however, that this is exactly the same problem as the one that Searle (1980) has raised concerning the mental language with his 'Chinese room' puzzle. Thus, as I noted in the text, mental images and mental sentences involve the same problems.

4. Isomorphism as a special case of analogy

Most contributors to Helman (1988) define analogy as 'structural similarity'. Given that this is also the standard definition of isomorphism, it is natural to ask what is the relation between these two notions.

Analogy, or analogical thinking, may be taken either in a dynamic or in a static sense. Taken dynamically, analogy means inferring something new from something old on the basis of a similarity between the two. Taken statically, analogy pertains to the results of previous analogical inferences. It means mastering a body of knowledge on the basis of similarities that hold within it.

In a typical analogy, Hesse (1963) detects the dimensions of contiguity (or co-occurrence) and of similarity. Table 1 reproduces her example from p. 68.

Table 1

	Similarity	
	BIRD	FISH
Contiguity	wings	fins
	lungs	gills
	feathers	scales

Table 1 represents a (static) body of knowledge held together by analogical relationships, but it can be 'dynamicized', for instance, by adding 'legs' to the 'bird' properties, and then inferring that the 'fish' counterpart is 'tail'. Notice in particular that there is no necessity for the 'vertical' relation of contiguity to be binary, as is the case in the traditional 'proportional analogy'. For convenience, however, I shall mainly deal with binary vertical relations. As for the 'horizontal' relation of similarity, it must always be taken in a structural sense, i.e. as holding between two (or more) *relations*. But depending on the case at hand, it may also be taken in a material sense. (In our example, lungs and gills are materially similar.)
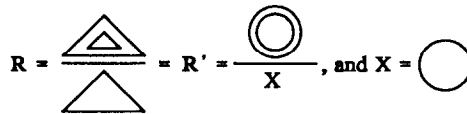

Fig. 1

An example taken from Kedar-Cabelli (1988: 73–75) (see Fig. 1) illustrates well the sense in which an analogical inference is also a *generalization*. Symbols in Fig. 1 read as follows: R='remove the small triangle from inside the large triangle', and R´='remove the small object from inside the large object'. The generalization consists in moving from R to R´.

Next I shall give examples of how analogy operates in three distinct areas, namely within extralinguistic reality, between extralinguistic reality and language, and within language.

4.1. Extralinguistic reality

The properties of co-occurrence and succession, and in particular the causal properties, of things and events are learned on the basis of analogy. Consider the knowledge that all ravens are black, that the day is always followed by the night, and that (every instance of) fire is hot. This knowledge is acquired in two steps. First, we *infer* from the present case to the next one:[5]

> raven–1/black–1=raven–2/X, and X=black–2
> day–1/night–1=day–2/X, and X=night–2
> fire–1/hot–1=fire–2/X, and X=hot–2

Second, we perform an analogical (or 'inductive') *generalization*: All ravens observed so far are (have been) black → All ravens are black; and similarly in the other cases.

Once analogical operations like these have been performed, their results simply constitute our knowledge of the external world. It is important to realize that the same pattern of thought applies both to what is the most simple and to what is the most complex. Just compare the above examples with the following:

> stimulus/process/response=input/program/output
> mind/brain=software/hardware
> sun/planets=atomic nucleus/electrons

It is also well known that the world views of so-called primitive cultures can be summed up as long chains of oppositions between which some analogical relationships, often of a purely arbitrary or normative nature, are perceived. Consider (part of) the Chinese opposition between *yin* and *yang*:

> *yang/yin*=light/dark=man/woman=up/down=front/back=convex/concave=...

Similar normative analogies obtain also in Western thought, for instance:

> father/children=state/citizens
> animal/human=human/God

Finally, the ubiquitousness of analogical thinking is well illustrated by the analogies between distinct ontological categories, for instance:

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[5] In presenting proportional analogies, I shall often use the following space-saving notation.

two miles/four miles=two hours/four hours=two dollars/four dollars

Similarly, the urge to analogize (as it might be called) is particularly evident in the analogies between distinct sensory modalities, for instance:

rising movement/falling movement='rising' tone/'falling' tone

There are an innumerable number of similar examples. Just think of warm vs. cold drinks or voices or colours. Thus, *metaphor* is a prime example of analogy.

4.2. Extralinguistic reality and language

It is a well-known fact that, in the beginning, children learn the meanings of only those words whose referents are present when they hear (or see) the corresponding word-forms.[6] This fact can be readily represented by means of an analogical inference, as in Fig. 2; and what is more, this is the *only* way that it can be represented.

$$\frac{\text{cat-1}}{\text{cat-1}} = \frac{\text{cat-2}}{X}, X = \text{cat-2}$$

Fig. 2

This is how the first lexical morphemes are learned; and the grammatical morphemes are learned in the same way, except that, instead of holding between co-occurring referents and word-forms, the relation of similarity now holds between relations of co-occurrence between referents and word-forms, as in Fig. 3.

$$\frac{\text{cat}}{\text{cats}} = \frac{\text{book}}{X}, X = \text{books}$$

Fig. 3

The distinction between present and past, for instance, although more difficult to picture, is learned in the same way.

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[6] Because of its hostility towards the associationist learning theory, Chomskyan psycholinguistics is incapable of accommodating this simple fact.

Next, let us see how the distinction between the major word-classes, i.e. noun and verb, is learned. The ontological justification for this distinction is not in serious doubt (cf. Brown, 1958: 243–253).[7] The isomorphism between a prototypical state of affairs and a schematic sentence structure might be represented as in Fig. 4. (The circles in Fig. 4 stand for things and the arrow stands for an action.)

$$O \longrightarrow O$$
$$| \quad\quad | \quad\quad\quad |$$
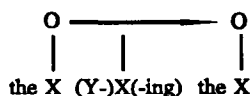$$\text{the X} \quad \text{(Y-)X(-ing)} \quad \text{the X}$$

Fig. 4

That is, a noun, i.e. the word referring to a thing, is whatever is preceded by *the*, and begins or ends the sentence, whereas the verb, i.e. the word referring to an action, is whatever occurs in the second position and may or may not be preceded by something (= Y, or auxiliary verb) and followed by *-ing*.

The examples from section 2 that testify to the isomorphic relation between language and extralinguistic reality may now be reformulated in analogical terms as follows:

(a) Number: thing–1/action/thing–2=word–1/word–2/word–3
(b) Qualitative properties: thing/action=noun/verb; agent/patient=subject/object
(c) Quantitative properties: one/many=zero morph/non-zero morph; ontological entity/its opposite=lexical (i.e. long) morpheme (traditionally, *categoremata*)/ grammatical (i.e. short) morpheme (traditionally, *syncategoremata*).
(d) Order: first event/second event=first clause/second clause; where the action starts (i.e. agent)/where the action ends (i.e. patient)=preceding word (i.e. subject)/following word (i.e. object)
(e) Cohesion: A causes B/A does not cause B=tight construction/loose construction; ontological whole/ontological part=expression that can be moved/ expression that cannot be moved

Finally, it may also be interesting to see how Aristotle's very influential view of the 'language–mind–reality' triad is expressed analogically:

written language/spoken language=spoken language/mind=mind/reality

In the three cases, the vertical relation, which is tantamount to 'A expresses B', is taken to be identical, and not just similar.

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[7] Gordon's (1985) experiments on count vs. mass nouns in English merely show that the child is also capable of learning such 'formal' analogies like 'a N/(some) N-s = (some) N/more N', instantiated e.g. by 'a boy/(some) boys = (some) water/more water'.

4.3. Language

The identity of phonemes is established on the basis of analogy, although this may not be obvious at once. The following examples give an idea of the analogical relationships that underlie the distinctive features, which, taken together, constitute the phoneme /b/ (cf. Householder, 1971: 65–67); that is, /b/ is contrasted with /p/, /d/, and /f/ in different environments:

bet/pet=bad/pad=...; bin/din=bow/dough =...; bill/fill=base/face =...

Moreover, the coherence of a phonological system consists in an effective use of *correlations*, which were defined by Trubetzkoy (1958: 64 [1939]) as "privative *proportional* one-dimensional oppositions". As this terminology indicates, correlations are based on the idea of (proportional) analogy: on the one hand, /p/ is to /t/ what /b/ is to /d/; on the other, /p/ is to /b/ what /t/ is to /d/.

It is obvious that analogy in phonology qualifies as 'formal'. There is formal analogy in morphology as well, as shown by the following example:

(A) le lion/les lions=la lionne/les lionnes
(B) le N-on/les N-ons=la N-onne/les N-onnes

The schema (B) is generalized out of particular cases like (A), and subsequently it is applied to nonsense words even in the presence of conflicting semantic cues (cf. Karmiloff-Smith, 1978; see also note 7).

It is a general truth, however, that linguistic forms have an obvious ontological/semantic justification. This truth is somewhat obscured by the common practice of leaving meaning implicit, like here:

boy/boys=girl/girls

What is wrong with this (traditional) manner of presentation becomes evident from the following nonsensical analogy:

boy/boys=enjoy/enjoys

This analogy is unacceptable because of meaning, not because of form. (In effect, there is a remarkable formal, or material, similarity between units on both sides of the equality sign.) Therefore meanings, more precisely, *grammatical* meanings, must be made explicit, like this:

$$\frac{\frac{\text{Noun sg.}}{\text{boy}}}{\frac{\text{Noun pl.}}{\text{boys}}} = \frac{\frac{\text{Noun sg.}}{\text{girl}}}{\frac{\text{Noun pl.}}{\text{girls}}} \neq \frac{\frac{\text{Verb}}{\text{enjoy}}}{\frac{\text{Verb sg.}}{\text{enjoys}}}$$

This example, simple as it is, suffices to show that outside of phonology it is misleading to speak of an 'intralinguistic' point of view. 'Noun' and 'verb' are grammatical meanings that are expressed by corresponding forms; but we have seen above that these meanings are ontologically motivated in that they correspond to the categories of 'thing' and 'action'. Therefore a purely 'intralinguistic' point of view is an illusion. The extralinguistic reality necessarily forces its way into language. (This is not to deny that linguistic form, or 'syntax' in a wide sense, can be treated *as if* it were autonomous. All one has to do is remember that this is a case of make-believe. Syntax *is not* autonomous, but for descriptive purposes we can *pretend* that it is.) What is true of noun and verb, is even more obviously true of such grammatical meanings as 'singular' and 'plural', because they are *identical* with, and not just motivated by, ontological categories.

In linguistics, the best known applications of analogy have traditionally been in inflectional morphology, both in synchronic and in diachronic studies. Here the vertical relation typically holds between the grammatical cases (eight in Sanskrit, three in Classical Arabic, for instance) or between the grammatical persons (nine or six, depending on whether or not the language in question possesses the dual). The horizontal relation, in turn, holds between the different declensions and, within each, between singular (and dual) and plural, or between the different conjugations and, within each, between the different tenses and/or modes. This aspect of analogy has been insightfully studied in Anttila (1977: ch. 2).

In syntax, analogy establishes both the basic units (i.e. phrases and clauses) and the operations performed thereupon. In its first-mentioned capacity, analogy is indistinguishable from the traditional 'substitution test'. I give here only what might be called the paradigmatic example:

$$\frac{\text{John}}{\text{ran away}} = \frac{\text{My oldest brother}}{\text{has bought a new house}} = \dots \text{ or } \quad \frac{\text{NP-1}}{\text{VP-1}} = \frac{\text{NP-2}}{\text{VP-2}}$$

The role of analogy in syntactic operations may be illustrated by converting assertions into questions:

$$\frac{\text{A did B}}{\text{What did A do?}} = \frac{\text{C did D}}{\text{What did C do?}} = \dots \text{ or } \quad \frac{\text{assertion-1}}{\text{question-1}} = \frac{\text{assertion-2}}{\text{question-2}}$$

Or by showing how pairs of simple clauses are converted into compound sentences:

$$\frac{\text{S-1, S-2}}{\text{if S-1, then S-2}} = \frac{\text{S-3, S-4}}{\text{if S-3, then S-4}} = \dots$$

Our discussion has so far vindicated the traditional line of thinking (represented by Paul, von der Gabelentz, de Saussure, Jespersen, Sapir, and Bloomfield, among others) according to which both the learning of existing linguistic structures and the creation of new ones are based on analogy:

"Bei dem natürlichen Erlernen der Muttersprache ... hören [wir] nach und nach eine Anzahl von Sätzen, die auf dieselbe Art zusammengesetzt sind und sich deshalb zu einer Gruppe zusammenschließen ... und so wird die Regel unbewußt aus den Mustern abstrahiert."   (Paul, 1975: 109–111 [1880])

"La création qui ... est l'aboutissement [de l'analogie] ne peut appartenir d'abord qu'à la parole; elle est l'oeuvre occasionnelle d'un sujet isolé. ... L'analogie nous apprend donc une fois de plus à séparer la language de la parole; elle nous montre la seconde dépendent de la première ... Toute création doit être précédée d'une comparaison inconsciente des matériaux déposés dans le trésor de la langue où les formes génératrices sont rangés selon leurs rapports syntagmatiques et associatifs [= paradigmatiques]." (de Saussure, 1962: 227 [1916])

"... we feel that the two sentences ... are analogous, that is, they are made after the same pattern... Now, how do such [sentence] types come into existence in the mind of a speaker? ... from innumerable sentences heard and understood [the child] will abstract some notion of their structure which is definite enough to guide him in framing sentences of his own, ..."   (Jespersen, 1965: 19 [1924])

"New words may be consciously created from these fundamental elements on the analogy of old ones, but hardly new types of words. In the same way new sentences are being constantly created, but always on strictly traditional lines. ... The fact of grammar, a universal trait of language, is simply a generalized expression of the feeling that analogous concepts and relations are most conveniently symbolized in analogous forms."   (Sapir, 1921: 37–38)

"... the speaker who knows the constituents and the grammatical pattern, can utter [speech forms] without ever having heard them; ... A grammatical pattern ... is often called an analogy."   (Bloomfield, 1933: 275)

We have also found support for Householder's (1971: 75) view of a "vast network of analogies which is sparking in our brain every time we speak". Given the ubiquitous character of analogy, there is only one plausible option, namely to accept the conclusion that "language is one manifestation of the *innate faculty of analogizing*, shown clearly by children even before they have acquired language" (Anttila, 1989: 105 [1972]; emphasis added).

5. Analogy vs. modularity

The Chomskyan approach entertains a notion of universal grammar that strongly differs from the one presented above. This disagreement also entails quite dissimilar views concerning the makeup of the human mind. Thus, this discussion goes beyond linguistics, and should ultimately be seen as part of *cognitive science*. Having justified my 'analogist' notion of universal grammar, I shall conclude with a few critical remarks on the alternative Chomskyan notion.

Fodor (1983) argues for a dualistic model of the mind: on the one hand, innate domain-specific input systems or 'modules' (e.g. vision or language) which are 'informationally encapsulated' in the sense of operating independently of other modules; on the other hand, the central system which manipulates the information provided by the modules and is, above all, characterized by *analogical reasoning*. It is Fodor's claim that only the modules can be (or become) objects of scientific investigation. Because the central system is responsible for creative thinking, it will always

remain a mystery: "The more global a cognitive process is, the less anybody understands it. *Very* global processes, like analogical reasoning, aren't understood at all" (1983: 107).

Fodor is merely giving here some content to Chomsky's (e.g. 1980) view that language is just one 'mental organ' among others. Moreover, the distinction between the modules and the central system is just a reformulation of Chomsky's (1976) distinction between 'problems' and 'mysteries'.

It has been noted even by adherents of the modularity hypothesis that Fodor seems to have a rather unprecise idea of what modules are really like. It does not make sense to contrast vision and language, because this would mean that reading and writing (not to speak of sign languages) are not part of 'language'. Moreover, language cannot be identified with an input system, for the simple reason that people also speak, i.e. produce output.

In any event, it is clear that if the conception outlined in the four preceding sections is correct, it refutes the modularity hypothesis. Language cannot be modular, if it is motivated from outside, i.e. if, as I put it somewhat figuratively, 'extralinguistic reality forces its way into language'. For the same reason, language cannot be innate; being innate is incompatible with being causally explained by something else, as the Modistae clearly understood.

Fodor ignores all the evidence that was adduced (or alluded to) in the preceding sections. In addition to refuting the modularity hypothesis, this evidence shows that the existence of analogy, or of analogical reasoning, is incontestable. The modularist still has the option of postulating several domain-specific analogical capacities, but it would be unnecessarily uneconomical to do so. (Shacter et al. (1988: 269) use the same argument to postulate a common mechanism for conscious experiences of perceiving, knowing, and remembering.)

It may be added that Fodor is no less one-sided in presenting his own evidence for the modularity hypothesis. He depends heavily on Liberman et al.'s (1967) thesis that hearing speech is a capacity distinct from hearing other sounds. This thesis, however, has been disconfirmed by recent research (cf. Schouten, 1980, and Kuhl, 1981).

If analogy really is as pervasive as I have claimed here, how is it possible that Chomskyans have been able to do without it? The answer is that they haven't. Jackendoff (1987) admits that both the extralinguistic reality and language exemplify the same kind of structure, which he calls 'headed hierarchy'. But he fails to see that this just amounts to the claim that there is a relation of isomorphism between the extralinguistic reality and language.

Furthermore, he postulates the existence of 'preference rule systems' which have to decide whether, given the entities X and Y, a new entity Z is *similar* to X or to Y (i.e. whether it belongs to the category 'X' or to the category 'Y').

"Once the basic nature of preference rule systems has been isolated, it is possible to recognize them everywhere in psychology. The content of the preference rules varies widely from one domain to the next, but the characteristic computational interaction appears in every case."   (Jackendoff, 1987: 145)

"Thus, preference rule systems appear to be an important building block of mental computation that cuts broadly across domains of all sorts, irrespective of the actual content of the domains."   (ibid.: 253)

It is immediately evident that what Jackendoff is really speaking of here is *analogy*, or analogical reasoning. The conclusion of any instance of such reasoning is precisely the choice (i.e. analysis or action) which the situation at hand makes preferable to other possible choices.[8] Because of Chomsky's long-standing hostility towards analogy (see e.g. Chomsky, 1986: 12), Jackendoff is forced to invent a neologism like 'preference rule system'. This is reminiscent of how, in the generative analysis of linguistic change in the early seventies, the term 'analogy' was replaced by the conglomeration of such terms as 'distinctness condition', 'levelling conditions', and 'paradigm coherence' (cf. Anttila, 1977: 98–99).

Finally, Jackendoff (1987) rechristens metaphor as 'cross-field generalization'. He misses a generalization, however, since he fails to see that 'headed hierarchies', 'preference rule systems', and 'cross-field generalizations' are just different aspects of a unitary phenomenon, namely analogy. In these respects, Jackendoff (1990) contains no improvement.

Nothing of what I have said so far is meant to deny that the sensory system performs very specific or, in this sense, 'modular' functions. Remember, however, that four-month-old children already possess a notion of 'thing' which is abstract enough to be independent of particular sensory modalities. It is at *this* level (and then, of course, at higher levels) that I claim analogy operates. As a consequence, when a child perceives the analogy between extralinguistic structure and linguistic structure, this is in a sense an 'abstract' analysis. But it would be nonsensical to argue, with Fodor, that this analysis, just because it relies on analogy, is so abstract or 'mysterious' that nothing can be known about it.

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[8] It may be added that Bates and McWhinney's (1988) 'competition model' deals, in the domain of syntax, with exactly the same phenomenon.

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