1. Introducción

The ability to use a natural language belongs more to the study of human biology than human culture. [...] *It would be natural, then, to expect everyone to agree that human language is the product of Darwinian natural selection. The only successful account of the origin of complex biological structure is the theory of natural selection, the view that the differential reproductive success associated with heritable variation is the primary organizing force in the evolution of organisms.* But surprisingly, this conclusion is contentious. Noam Chomsky, the world’s best-known linguist, and Stephen Jay Gould, the world’s best-known evolutionary theorist, have repeatedly suggested that language may not be the product of natural selection, but a side effect of other evolutionary forces such as an increase in overall brain size and constraints of as-yet unknown laws of structure and growth.

2. El rol de la selección natural en la teoría evolutiva

Gould y Lewontin (1979: 147-149):

“Spandrels\(^1\) -the tapering triangular spaces formed by the intersection of two rounded arches at right angles- are necessary architectural by-products of mounting a dome on rounded arches. Each spandrel contains a design admirably fitted into its tapering space. [...] The design is so elaborate, harmonious, and purposeful that we are tempted to view it as the starting point of any analysis, as the cause in some sense of the surrounding architecture. But this would invert the proper path of analysis. The system begins with an architectural constraint: the necessary four spandrels and their tapering triangular form. They provide a space in which the mosaicists worked; they set the quadripartite symmetry of the dome above. Such architectural constraints abound, and we find them easy to understand because we do not impose our biological biases upon them. ... Anyone who tried to argue that the structure [spandrels] exists because of [the designs laid upon them] would be inviting the same ridicule that Voltaire heaped on Dr. Pangloss: "Things cannot be other than they are ... Everything is made for the best purpose. Our noses were made to carry spectacles, so we have spectacles. Legs were clearly intended for breeches, and we wear them". **Yet evolutionary biologists, in their tendency to focus exclusively on immediate adaptation to local conditions, do tend to ignore architectural constraints and perform just such an inversion of explanation**".

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\(^1\) Un spandrel (lo he visto traducido como “pechina”) sería esto:
The Gould and Lewontin argument could be interpreted as stressing that since the neo-Darwinian theory of evolution includes nonadaptationist processes it is bad scientific practice not to test them as alternatives to natural selection in any particular instance. However, they are often read as having outlined a radical new alternative to Darwin, in which natural selection is relegated to a minor role.

The key point that blunts the Gould and Lewontin critique of adaptationism is that natural selection is the only scientific explanation of adaptive complexity. "Adaptive complexity" describes any system composed of many interacting parts where the details of the parts' structure and arrangement suggest design to fulfill some function.

The essential point is that no physical process other than natural selection can explain the evolution of an organ like the eye. The reason for this is that structures that can do what the eye does are extremely low-probability arrangements of matter. [...] It is absurdly improbable that some general law of growth and form could give rise to a functioning vertebrate eye as a by-product of some other trend such as an increase in size of some other part.

What, then, is the proper relation between selectionist and nonselectionist explanations in evolution? The least interesting case involves spandrels that are not involved in any function or behavior, such as the redness of blood. [...] Much more important are cases where spandrels are modified and put to use. However, in such cases of modified spandrels, selection plays a crucial role. Spandrels, exaptations, laws of growth, and so on can explain the basic plans, parts, and materials that natural selection works with -as Jacob (1977) put it, nature is a tinkerer, not an engineer with a clean drawing board. [...] When such parts and patterns are modified and combined into complex biological machines fulfilling some delicate function, these subsequent modifications and arrangements must be explained by natural selection. The real case of evolution without selection consists of the use of unmodified spandrels. The real case of evolution without selection consists of the use of unmodified spandrels.

3. Diseño en el lenguaje

3.1. Función

A. There is an obvious advantage in being able to acquire such information about the world second-hand: by tapping into the vast reservoir of knowledge accumulated by some other individual, one can avoid having to duplicate the possibly time-consuming and dangerous trial and error process that won that knowledge. Furthermore, within a group of interdependent, cooperating individuals, the states of other individuals are among the most significant things in the world worth knowing about.

B. We would want to be able to refer to individuals and classes, to distinguish among basic ontological categories (things, events, places, times, manners, and so on), to talk about events and states, distinguishing the participants in the event or state according to role (agents, patients, goals), and to talk about the intentional states of ourselves and others.

C. The vocal-auditory channel has some desirable features as a medium of communication: it has a high bandwidth, its intensity can be modulated to conceal the speaker or to cover large distances, and it does not require light, proximity, a face-to-face orientation, or tying up the hands. However it is essentially a serial interface, lacking the full two-dimensionality needed to convey graph or tree structures and typographical devices such as fonts, subscripts, and brackets.

Thus grammars for spoken languages must map propositional structures onto a serial channel, minimizing ambiguity in context, under the further constraints that the encoding and decoding be done rapidly, by creatures with limited short-term memories, according to a code that is shared by an entire community of potential communicants.

3.2. Diseño complejo

A. -Grammars are built around symbols for major lexical categories (noun, verb, adjective, preposition). [...]. These distinctions are exploited to distinguish basic ontological categories such as things, events or states, and qualities.
B. Major phrasal categories (noun phrase, verb phrase, etc.) start off with a major lexical item, the "head," and allow it to be combined with specific kinds of affixes and phrases. The resulting conglomerate is then used to refer to entities in our mental models of the world. This mechanism enables the language-user to refer to an unlimited range of specific entities while possessing only a finite number of lexical items.

C. Phrase structure rules (e.g., "X-bar theory" or "immediate dominance rules") force concatenation in the string to correspond to semantic connectedness in the underlying proposition, and thus provides linear clues of underlying structure.

D. Rules of linear order (e.g., "directional parameters" for ordering heads, complements, and specifiers, or "linear precedence rules") allow the order of words within these concatenations to distinguish among the argument positions that an entity assumes with respect to a predicate, distinguishing Man bites dog from Dog bites man.

E. Case affixes on nouns and adjectives can take over these functions, marking nouns according to argument role and linking noun with predicate even when the order is scrambled.

F. Verb affixes signal the temporal distribution of the event that the verb refers to (aspect) and the time of the event (tense). [...] Languages employ an ingenious system that can convey the time of an event relative to the time of the speech act itself and relative to a third, arbitrary reference time- [...] Verb affixes also typically agree with the subject and other arguments, and thus provide another redundant mechanism that can convey predicate-argument relations by itself or that can eliminate ambiguity left open by other mechanisms.

G. Auxiliaries, which occur either as verb affixes or in one of three sentence-peripheral positions, convey relations that have logical scope over the entire proposition (mirroring their peripheral position) such as truth value, modality, and illocutionary force.

H. Languages also typically contain a small inventory of phonetically reducible morphemes -pronomns and other anaphoric elements- that by virtue of encoding a small set of semantic features such as gender and humanness, and being restricted in their distribution, can convey patterns of coreference among different participants in complex relations without the necessity of repeating lengthy definite descriptions.

I. Mechanisms of complementation and control govern the expression of propositions that are arguments of other propositions,

And this is only a partial list, focusing on sheer expressive power. One could add to it the many syntactic constraints and devices whose structure enables them to minimize memory load and the likelihood of pursuing local garden paths in speech comprehension.

4. El proceso evolutivo del lenguaje

For universal grammar to have evolved by Darwinian natural selection, it is not enough that it be useful in some general sense. There must have been (i) genetic variation among individuals in their grammatical competence. There must have been (ii) a series of steps leading from no language at all to language as we now find it, each step small enough to have been produced by a random mutation or recombination, and each intermediate grammar useful to its possessor. (iii) Every detail of grammatical competence that we wish to ascribe to selection must have conferred a reproductive advantage on its speakers, and (iv) this advantage must be large enough to have become fixed in the ancestral population.

(i) here are documented genetically-transmitted syndromes of grammatical deficits. Lenneberg (1967) notes that specific language disability is a dominant partially sex-linked trait with almost complete penetrance (see also Ludlow and Cooper, 1983, for a literature review). More strikingly, Gopnik (1990b) has found a familial selective deficit in the use of morphological features (gender, number, tense, etc.) that acts as if it is controlled by a dominant gene.
No single mutation or recombination could have led to an entire universal grammar, but it could have led a parent with an n-rule grammar to have an offspring with an n+1 rule grammar, or a parent with an m-symbol rule to have an offspring with an m+1 symbol rule. It could also lead to a parent with no grammatical rules at all and just rote associations to have an offspring with a single rule. Grammatical rules are symbol-manipulations whose skeletal form is shared by many other mental systems. Indeed discrete symbol manipulations, free from graded application based on similarity to memorized cases, is highly useful in many domains of cognition, especially those involving socially shared information (Freyd, 1983; Pinker and Prince, 1989; Smolensky, 1988). If a genetic change caused generic copies of a nonlinguistic symbol-replacement operation to pop up within the neural system underlying communication, such protorules could be put to use as parts of encoding and decoding schemes, whereupon they could be subject to selective forces tailoring them to specific demands of language.

Tiny selective advantages are sufficient for evolutionary change. According to Haldane’s (1924) classic calculations, for example, a variant that produces on average 1 per cent more offspring than its alternative allele would increase in frequency from 0.1 per cent to 99.9 per cent of the population in just over 4,000 generations. Even in long-lived humans this fits comfortably into the evolutionary timetable.

Recursion. Given such a capacity one can now specify reference to an object to an arbitrarily fine level of precision. It makes a big difference whether a far-off region is reached by taking the trail that is in front of the large tree or the trail that the large tree is in front of.