

January 19–29, 2010

CLASSES 1–4: GETTING STARTED INSIDE OUT

INTRO

biolinguistics (*n.*) A developing branch of linguistics which studies the biological preconditions for language development and use in human beings, from the viewpoints of both the history of language in the race, and the development of language in the individual. It is also known as **biological linguistics**. Topics of common interest to the two subject-areas involved include the genetic transmission of language, neurophysiological models of language production, the anatomical parallels between human and other species, and the development of pathological forms of language behaviour (see clinical linguistics). In recent years, Chomsky has called his entire generative grammar an exercise in biolinguistics, claiming that it is possible to ask a question beyond explanatory adequacy: how did the language faculty evolve in the human species? See Chomskyan. (Crystal 2008: 55)

We will learn more about the “**real**” meaning of the term *biolinguistics* as we go along — at least, that’s the goal for this course (perhaps judged unattainable by some, but we won’t get bogged down by such animosity). On the apparently first (documented) use, see this:

The term ‘biolinguistics’ first appears, to our knowledge, as part of a book title, the *Handbook of Biolinguistics*, published nearly 60 years ago (Meader & Muyskens 1950). The book advocates (as the authors put it) a modern science of biolinguistics, whose practitioners “look upon language study [...] as a natural science, and hence regard language as an integrated group of biological processes [...]. This group seeks an explanation of all language phenomena in the functional integration of tissue and environment” (Meader & Muyskens 1950: 9). (Boeckx & Grohmann 2007: 2)

Some **core concepts** from the first chapter of the textbook (Boeckx 2010):

- E-language vs. *I-language*
- *ambiguity* in language and parallelism
- ambiguity elsewhere in *cognition* (vision; Necker cube)
- *binding* properties (pronouns vs. names and their antecedents)
- *recursivity* in language

Let’s formulate the “**5 Questions**” of the biolinguistic enterprise (with a Capital Q):

1. What is **knowledge of language**?
2. How is that knowledge **acquired**?
3. How is that knowledge **put to use**?
4. How is that knowledge **implemented** in the brain?
5. How did that knowledge **emerge** in the species?

(Boeckx & Grohmann 2007: 1; see Chomsky 1986: 3, 1988: 3)

SOME [WIKI](#) DEFINITIONS

In [epistemology](#) and in its modern sense, **rationalism** is “any view appealing to [reason](#) as a source of knowledge or justification” (Lacey 286). In more technical terms it is a method or a [theory](#) “in which the criterion of the truth is not sensory but intellectual and [deductive](#)” (Bourke 263). Different degrees of emphasis on this method or theory lead to a range of rationalist standpoints, from the moderate position “that reason has precedence over other ways of acquiring knowledge” to the radical position that reason is “the unique path to knowledge” (Audi 771).

In [philosophy](#), **empiricism** is a theory of [knowledge](#) that asserts that knowledge arises from sense [experience](#). Empiricism is one of several competing views about how we know “things”, part of the branch of philosophy called [epistemology](#), or “the Theory of Knowledge”. Empiricism emphasizes the role of [experience](#) and [evidence](#), especially [sensory perception](#), in the formation of ideas, while discounting the notion of [innate ideas](#) (except in so far as these might be inferred from empirical reasoning, as in the case of [genetic predisposition](#)).^[1]

In the [philosophy of science](#), **empiricism** emphasizes those aspects of scientific knowledge that are closely related to evidence, especially as discovered in [experiments](#). It is a fundamental part of the [scientific method](#) that all [hypotheses](#) and [theories](#) must be tested against [observations](#) of the [natural world](#), rather than resting solely on [a priori reasoning](#), [intuition](#), or [revelation](#). Hence, science is considered to be *methodologically* [empirical](#) in nature.

Innatism is a philosophical doctrine that holds that the mind is born with ideas/knowledge, and that therefore the mind is not a ‘[blank slate](#)’ at birth, as early empiricists such as [John Locke](#) claimed. It asserts therefore that not all knowledge is obtained from experience and the [senses](#).

The **nature versus nurture** debates concern the relative importance of an individual’s innate qualities (“nature”, i.e. [nativism](#), or [innatism](#)) versus personal experiences (“nurture”, i.e. [empiricism](#) or [behaviorism](#)) in [determining](#) or [causing](#) individual differences in [physical](#) and [behavioral](#) traits.

In the field of [psychology](#), **nativism** is the view that certain skills or abilities are ‘native’ or hard wired into the [brain](#) at [birth](#). This is in contrast to [empiricism](#), the ‘blank slate’ or [tabula rasa](#) view, which states that the brain has inborn capabilities for learning from the environment but does not contain content such as innate beliefs.

Tabula rasa ([Latin](#): *blank slate*) refers to the [epistemological](#) thesis that individuals are born without built-in mental content and that their knowledge comes from experience and perception. Generally proponents of the *tabula rasa* thesis favour the “nurture” side of the [nature versus nurture](#) debate, when it comes to aspects of one’s personality, social and emotional behaviour and intelligence.

The term **Cartesian linguistics** was coined with the publication of *Cartesian Linguistics: A Chapter in the History of Rationalist Thought* (1966), a book on [linguistics](#) by [Noam Chomsky](#), written with the purpose of deepening “our understanding of the nature of [language](#) and the [mental processes](#) and [structures](#) that underlies its use and [acquisition](#)” (ix).

Chomsky wishes to shed light on these underlying structures of the human language, and subsequently whether one can infer the nature of an organism from its language (x).

Cartesian linguistics refers to a form of linguistics developed during the time of [René Descartes](#), a prominent 17th century philosopher whose ideas continue to influence modern philosophy. Chomsky’s book, *Cartesian Linguistics*, manages to trace the development of linguistic theory from Descartes himself to [Wilhelm von Humboldt](#), or in other words, directly from the period of [the Enlightenment](#) up to the [Romanticism](#) (59). The central doctrine of Cartesian linguistics maintains that the general features of grammatical structure are common to all languages and reflect certain fundamental properties of the mind (59).

SKINNER AND ALL THAT (adapted from the [Stanford Encyclopedia of Philosophy](#))

The rationalist philosopher **René Descartes** (Cartesianism, Scientific Revolution) identifies in his *Discourse on the Method* (1637) the ability to use language as one of two features distinguishing people from “machines” or “beasts” and speculates that even the stupidest people can learn a language (when not even the smartest beast can do so) because human beings have a “rational soul” and beasts “have no intelligence at all.”

The generative linguist **Noam Chomsky** suggests that what is special about human brains is that they contain a specialized ‘language organ’, an innate mental ‘module’ or ‘faculty’, that is dedicated to the task of mastering a language (e.g. Chomsky 1965, 1986, 1988).

The behaviorist psychologist **B.F. Skinner** argued that human linguistic behavior (that is, our own utterances and our responses to the utterances of others) is determined by two factors (Skinner 1957):

- (i) the current features of the environment impinging on the speaker, and
- (ii) the speaker’s history of reinforcement (i.e., the giving or withholding of rewards and/or punishments in response to previous linguistic behaviors).

Behaviorism (or **behaviourism**), also called the **learning perspective** (where any physical action is a behavior), is a philosophy of [psychology](#) based on the proposition that all things which organisms do — including acting, thinking and feeling — can and should be regarded as [behaviors](#).^[1] The school of psychology maintains that behaviors as such can be described [scientifically](#) without recourse either to internal physiological events or to [hypothetical constructs](#) such as the [mind](#).^[2] Behaviorism comprises the position that all theories should have observational correlates but that there are no philosophical differences between publicly observable processes (such as actions) and privately observable processes (such as thinking and feeling).^[3]

From early psychology in the 19th century, the behaviorist school of thought ran concurrently and shared commonalities with the [psychoanalytic](#) and [Gestalt](#) movements in psychology into the 20th century; but also differed from the [mental philosophy](#) of the Gestalt psychologists in critical ways.^[citation needed] Its main influences were [Ivan Pavlov](#), who investigated [classical conditioning](#), [Edward Lee Thorndike](#), [John B. Watson](#) who rejected [introspective methods](#) and sought to restrict psychology to [experimental methods](#), and [B.F. Skinner](#) who conducted research on [operant conditioning](#).^[3] In the second half of the twentieth century, behaviorism was largely eclipsed as a result of the [cognitive revolution](#).^[citation needed]

Eschewing **talk of the mental as unscientific**, Skinner argued that ‘knowing’ a language is really just a matter of having a certain set of behavioral dispositions: dispositions to say (and do) appropriate things in response to the world and the utterances of others. Thus, knowing English is, in small part, a matter of being disposed to utter *Please close the door!* when one is cold as a result of a draught from an open door, and of being disposed (other things being equal) to utter *OK* and go shut a door in response to someone else’s utterance of that formula.

Skinner believed that, since knowing a language is just a matter of having a certain set of behavioral dispositions, **learning a language just amounts to acquiring that set of dispositions**. He argued that this occurs through a process he called *operant conditioning*. (‘Operants’ are behaviors that have no discernible law-like relation to particular environmental conditions or ‘eliciting stimuli.’ They are to be contrasted with ‘respondents,’ which are reliable or reflex responses to particular stimuli. Thus, blinking when someone pokes at your eye is a respondent; episodes of infant babbling are operants.)

Skinner held that most human **verbal behaviors are operants**: they start off unconnected with any particular stimuli. However, they can acquire connections to stimuli (or other behaviors) as a result of conditioning. In conditioning, the behavior in question is made more (or in some paradigms less) likely to occur in response to a given environmental cue by the imposition of an appropriate ‘schedule of reinforcement’: rewards or punishments are given or withheld as the subject’s response to the cue varies over time.

According to Skinner, language is learned when children’s verbal operants are brought under the ‘control’ of environmental conditions as a result of training by their caregivers. They are rewarded (by, e.g., parental approval) or punished (by, say, a failure of comprehension) for their various linguistic productions and as a result, their **dispositions to verbal behavior gradually converge** on those of the wider language community. Likewise, Skinner held, ‘understanding’ the utterances of others is a matter of being trained to perform appropriate behaviors in response to them: one understands *Shut the door!* to the extent that one responds appropriately to that utterance.

In his famous review of Skinner’s book, Chomsky (1959) effectively demolishes Skinner’s theories of both language mastery and language learning. First, Chomsky argued, **mastery of a language is not merely a matter of having one’s verbal behaviors ‘controlled’** by various elements of the environment, including others’ utterances — language use is (i) stimulus independent and (ii) historically unbound. Language use is *stimulus independent*: virtually any words can be spoken in response to any environmental stimulus, depending on one’s state of mind. Language use is also *historically unbound*: what we say is not determined by our history of reinforcement, as is clear from the fact that we can and do say things that we have not been trained to say.

The **same points apply to comprehension**. We can understand sentences we have never heard before, even when they are spoken in odd or unexpected situations. And how we react to the utterances of others is again dependent largely on our state of mind at the time, rather than any past history of training. There are linguistic conventions in abundance, to be sure, but as Chomsky rightly pointed out, human ‘verbal behavior’ is quite disanalogous to a pigeon’s disk-pecking or a rat’s maze-running. Mastery of language is not a matter of having a bunch of mere behavioral dispositions. Instead, it involves a wealth of pragmatic, semantic and syntactic knowledge. What we say in a given circumstance, and how we respond to what others say, is the result of a complex interaction between our history, our beliefs about our current situation, our desires, *and our knowledge of how our language works*.

Skinner’s first big mistake, then, was in failing to recognize that **language mastery involves knowledge** of linguistic rules and conventions.

If a speaker has had a history of appropriate reinforcement (e.g. if a certain response was followed by “cessation of a threat of such injury — of events which have previously been followed by such injury and are therefore conditioned aversive stimuli”) then he will tend to give the proper response when the threat which had previously been followed by the injury is presented. **It would appear to follow from this description that a speaker will not respond properly to the mand *Your money of your life* (38) unless he has a past history of being killed.** (Chomsky 1959: 34)

His second big mistake was related to this one: he failed to recognize that **acquiring mastery of a language is not a matter of being trained what to say**.

It's simply false, says Chomsky, that "a careful arrangement of contingencies of reinforcement by the verbal community is a necessary condition of language learning." (1959: 39) **First, children learning language do not appear to be being 'conditioned' at all!** Explicit training (such as a dog receives when learning to bark on command) is simply not a feature of language acquisition. It's only comparatively rarely that parents correct (or explicitly reward) their children's linguistic sorties; children learn much of what they know about language from watching TV or passively listening to adults; immigrant children learn a second language to native speaker fluency in the school playground; and even very young children are capable of linguistic innovation, saying things undreamt of by their parents. As Chomsky concludes: "It is simply not true that children can learn language only through 'meticulous care' on the part of adults who shape their verbal repertoire through careful differential reinforcement." (1959: 42)

Secondly, Chomsky argued (see the 'poverty of the stimulus' argument next class), **it is unclear that conditioning could even in principle give rise to a set of dispositions rich enough to generate the full range of a person's linguistic behavior.** In order, for example, to acquire the appropriate set of dispositions concerning the word *car*, one would have to be trained on vast numbers of sentences containing that word: one would have to hear *car* in object position and *car* in subject position; *car* modified by adjectives and *car* unmodified; *car* embedded in opaque contexts (e.g. in propositional attitude ascriptions) and *car* used transparently; and so on.

But the *primary linguistic data (PLD)*, comprising the set of sentences to which a child is exposed during language learning (plus any analysis performed by the child on those sentences), simply cannot be assumed to contain enough of these 'minimally differing sentences' to fully determine a person's dispositions with respect to that word. Instead, Chomsky argued, what determines one's dispositions to use *car* is one's knowledge of that word's syntactic and semantic properties (e.g., *car* is a noun referring to cars), together with one's knowledge of how elements with those properties function in the language as a whole. So even if language mastery were (in part) a matter of having dispositions concerning *car*, the mechanism of conditioning would be unable to give rise to them. The training set to which children have access is simply too limited: it doesn't contain enough of the right sorts of exemplars.

In sum: Skinner was mistaken on all counts. Language mastery is not merely a matter of having a set of bare behavioral dispositions. Instead, it involves **intricate and detailed knowledge of the properties of one's language.** And language learning is not a matter of being trained what to say. Instead, children learn language just from hearing it spoken around them, and they learn it effortlessly, rapidly, and without much in the way of overt instruction. These insights were to drive linguistic theorizing for the next fifty years, and it's worth emphasizing just how radical and exciting they were at the time.

First, **the idea that explaining language use involves attributing knowledge to speakers flouted the prevailing behaviorist view that talking about mental states was unscientific because mental states are unobservable.** It also raised several pressing empirical question that linguists are still debating. For example, what is the *content* of speakers' knowledge of language? What sorts of facts about language are represented in speakers' heads? And how does this knowledge actually function in the psychological processes of language production and comprehension: what are the *mechanisms* of language use? (See also the "5 Questions" on these issues: Chomsky 1986, 1988.)

Secondly, the idea that children learn language essentially on their own was a radical challenge to the prevailing behaviorist idea that all learning involves reinforcement. In addition, it made clear our need for a more **'cognitive' or 'mentalistic' conception of how language learning occurs**, and vividly raised the question — our focus in this article — of what might be the *preconditions* for that process.

At the same time as the behaviorist program in psychology was waning under pressure from Chomsky and others, linguists were abandoning what is known as 'American Structuralism' in the theory of syntax. Like the behaviorists, the structuralists (e.g., Harris, 1951) refused to postulate irreducibly theoretical entities; they insisted that syntactic categories (such as 'noun phrase' ('NP') or 'verb phrase' ('VP'), etc.) be reducible to properties of actual utterances (collected in 'corpora' — lists of things people have said). In his landmark book, *Syntactic Structures* (1957), however, Chomsky argued that because corpora can contain only finitely many sentences, no attempt at reduction can succeed. **Linguists need theoretical constructs that capture regularities going beyond the set of actual utterances**, and that allow them to predict the properties of novel utterances. But if the category NP, for instance, is to include noun phrases that haven't been uttered yet, the meaning of *noun phrase* can't be exhausted by what's in the corpus: the structuralists' positivistic strictures on theoretical kinds are misguided.

- *phrase structure rules* (X-bar theory, structure-building & iterative Merge)
- *phrase-marker* and *transformations* (movement, copy theory, derivations)

Only a grammar containing both phrase structure and transformation rules, Chomsky argued, could generate a natural language — **'generate'** in the sense that by stepwise application of the rules, one could in principle build up from scratch all and only the sentences that the language contains (see e.g. HNG: Hornstein, Nunes & Grohmann 2005).

In [theoretical linguistics](#), **generative grammar** refers to a particular approach to the study of [syntax](#). A generative grammar of a language attempts to give a set of rules that will correctly predict which combinations of words will form grammatical sentences. In most approaches to generative grammar, the rules will also predict the [morphology](#) of a sentence.

Generative grammar originates in the work of [Noam Chomsky](#), beginning in the late 1950s. (Early versions of Chomsky's theory were called [transformational grammar](#), and this term is still used as a collective term that includes his subsequent theories.) There are a number of competing versions of generative grammar currently practiced within [linguistics](#). Chomsky's current theory is known as the [Minimalist Program](#). Other prominent theories include or have included [head-driven phrase structure grammar](#), [lexical functional grammar](#), [categorial grammar](#), [relational grammar](#), and [tree-adjoining grammar](#).

[Noam Chomsky](#) has argued that many of the properties of a generative grammar arise from an "innate" [universal grammar](#). Proponents of generative grammar have argued that most grammar is not the result of communicative function and is not simply learned from the environment (see [poverty of stimulus](#) argument). In this respect, generative grammar takes a point of view different from [cognitive grammar](#), [functional](#) and [behaviorist](#) theories.

Most versions of generative grammar characterize sentences as either [grammatically correct](#) (also known as *well formed*) or not. The rules of a generative grammar typically function as an [algorithm](#) to predict grammaticality as a discrete (yes-or-no) result. In this respect, it differs from [stochastic grammar](#) which considers grammaticality as a probabilistic variable. However, some work in generative grammar (e.g. recent work by [Joan Bresnan](#)) uses stochastic versions of [optimality theory](#).

Language acquisition can not occur unless much of the knowledge eventually attained were innate or inborn. The gap between what speaker-hearers know about language (its grammar, among other things) and the data they have access to during learning (the PLD) is just too broad to be bridged by any process of learning alone. It follows that since children patently do learn language, they are not linguistic ‘blank slates.’ Instead, **human children are born knowing the ‘Universal Grammar’ (UG)**, a theory describing the most fundamental properties of all natural languages (e.g., the facts that elements leave traces behind when they move, and that their movements are constrained in various ways). Learning a particular language thus becomes the comparatively simple matter of elaborating upon this antecedently possessed knowledge, and hence appears a much more tractable task for young children to attempt.

Over the years, two conceptions of the innate contribution to language learning and its elaboration during the learning process have been proposed. In earlier writings (e.g., Chomsky 1965), Chomsky saw **learning a language as basically a matter of formulating and testing hypotheses about its grammar** — unconsciously, of course. He argued that in order to acquire the correct grammar, the child must innately know a “a linguistic theory that specifies the form of the grammar of a possible human language” (1965: 25) — she must know UG in other words. He saw this knowledge as being embodied in a suite of innate linguistic abilities, concepts, and constraints on the kinds of grammatical rules learners can propose for testing.

On this view (1965: 30–31), the **inborn UG includes**:

- (i) a way of analyzing and representing the incoming linguistic data;
- (ii) a set of linguistic concepts with which to state grammatical hypotheses;
- (iii) a way of telling how the data bear on those hypotheses (an ‘evaluation metric’);
- (iv) a very restrictive set of constraints on the hypotheses available for consideration.

(i) through (iv) constitute the **‘initial state’ of the language faculty**, and the child arrives at the final state (knowledge of her language) by performing what is basically a kind of scientific inquiry into its nature.

Here HNG’s **meat-grinder metaphor** of the acquisition process comes in handy (where G_L refers to the final state of the grammar G of some language L , i.e. one’s I-language):



This conception of UG is sometimes referred to as the **Language Acquisition Device (LAD)**.

By the 1980s, a less intellectualized conception of how language is acquired began to supplant the hypothesis-testing model. Whereas the early model saw the child as a ‘little scientist,’ actively (if unconsciously) figuring out the rules of grammar, the new **‘parameter-setting’ model** conceived language acquisition as a kind of growth or maturation; language acquisition is something that happens to you, not something you do. The innate UG was no longer viewed as a set of tools for inference; rather, it was conceived as a highly articulated set of representations of actual grammatical principles. Of course, since not everyone ends up speaking the same language, these innate representations must allow for some variation. This is achieved in this model *via* the notion of a ‘parameter’. Chomsky (1988: 61–62) compared the learner to a switchbox (also discussed in HNG; for more elaboration, see in particular Baker 2001).

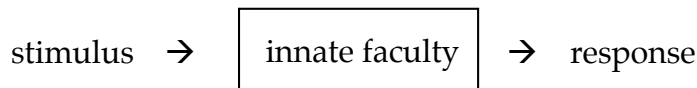
ETHOLOGY

Ethology (from Greek: *ἦθος*, *ethos*, "character"; and *-λογία*, *-logia*) is the scientific study of animal behavior, and a sub-topic of [zoology](#).

Although many naturalists have studied aspects of animal behavior throughout history, the modern discipline of ethology is generally considered to have begun with the work during the 1930s of Dutch biologist [Nikolaas Tinbergen](#) and Austrian biologist [Konrad Lorenz](#), joint winners of the 1973 [Nobel Prize](#) in medicine.^[1] Ethology is a combination of laboratory and field science, with a strong relation to certain other disciplines — e.g., [neuroanatomy](#), [ecology](#), [evolution](#). Ethologists are interested typically in a behavioral process rather than in a particular animal group and often study one type of behavior (e.g. aggression) in a number of unrelated animals.

The desire to understand animals has made ethology a rapidly growing topic, and since the turn of the 21st century, many prior understandings related to diverse fields such as [animal communication](#), personal symbolic name use, [animal emotions](#), animal culture, [learning](#), and even [sexual conduct](#) long thought to be well understood, have been modified, as have new fields such as [neuroethology](#).

We can characterize the correction of the behaviorist **stimuli–response relation** coming from ethology as follows — very much like the meat-grinder view of UG/LAD:



Take now our “5 Questions” and compare them with Tinbergen’s (1963) four questions for ethologists, addressing **function, causation, development, and evolutionary history**:

1. What stimulates the animal to respond with the behavior it displays, and what are the response mechanisms?
2. How does an organism develop as the individual matures?
3. Why is the behavior necessary for the animal's success and how does evolution act on that behavior?
4. How has a particular behavior evolved through time? Can we trace a common behavior of two species back to their common ancestor?

(Boeckx & Grohmann 2007: 2; see Tinbergen 1963)

NB: Work by **Randy Gallistel** is especially relevant for biolinguists (e.g. Gallistel 2007).

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