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THE RATIONALISM OF GENERATIVE GRAMMAR

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1 The Object of Inquiry

Aspects of the Theory of Syntax (*Aspects*) is one of the defining texts of Generative Grammar (GG). Along with *Logical Structure of Linguistic Theory* (*LSLT*) (in its massively reduced *Syntactic Structures* [*SS*] avatar), *Lectures on Government and Binding* and the "Black Book," *The Minimalist Program* (*MP*), *Aspects* defines the four major theoretical epochs of the Generative tradition. Looking back on it now, however, there is a sense in which *Aspects* constituted a misstep, albeit an extremely productive one. Its major theoretical innovation was 'Deep Structure' (DS). DS has three major properties: (i) it serves as the recursive engine of the grammar, (ii) it codes for (what we now call) 'thematic information,' and (iii) it is input to the transformational component that maps DS to 'Surface Structure,' the grammatical level that feeds the phonological component in the Standard (i.e. *Aspects*) theory. In the previous *SS* framework, the transformational component is the source of grammatical recursion. *Aspects* relocates this power to the base, context free phrase structure rules replacing embedding transformations as the engine generating bigger and bigger hierarchically structured phrase markers.

Variants of this *Aspects* picture persisted within GG syntactic theory until *MP* returned recursion to its earlier transformational home and argued for the elimination of Deep Structure (and all its Dish variants) to boot. In short, *MP* returned us to a version of the original *LSLT*/*SS* vision of how the grammar is organized. In this sense, the theoretical investigation that *Aspects* initiated, proved to be a wrong turn, given current assumptions.[1] Hence, theoretically speaking, syntax has rejected the *Aspects* conception of UG.

[1] Let me reiterate that this does not mean that it was an unproductive one. Theory in the thirty years between *Aspects* and *MP* was unbelievably fecund. Moreover, I believe that it could be argued (though I will not do so here) that by factoring grammatical operations between phrase structure rules and transformations allowed the latter's properties to be brought more clearly into focus. Despite some very interesting attempts to re-unify structure building and movement operations in the *MP* period (via E/I-Merge), there remain important asymmetries between

Nonetheless, *Aspects*, in particular chapter 1, remains one of the most important documents in GG and is as relevant today as it was in 1965. Why? Because it is (one of) the best articulations to date of the subject matter of linguistics. Nothing better defines the goals of linguistic theory and outlines the kinds of theories we should be looking for. What *Aspects* did, and continues to do, is firmly link the aims of generative grammar with a Rationalist conception of mind and explanation ('Rationalist' here is in opposition to 'Empiricist').[2] Its major achievement was to firmly ground the Generative enterprise in a Rationalist conception of mind and, more broadly, in a Rationalist conception of what constitutes a good scientific explanation. In what follows, I would like to highlight some of the ways that *Aspects* managed this.

2 Some Preliminaries

Aspects defines a primary object of study in linguistics to be the "underlying system of rules that has been mastered by the speaker-hearer and that he puts to use in actual performance." This "generative grammar" is a procedure for assigning interpretations for an infinite range of sentences (i.e. a procedure for relating a phonetic interpretation and a meaning over an infinite range of objects). So described, the first object of study is a generative procedure, a system of rules, a grammar that specifies sound/meaning pairs over an effectively unbounded domain.

Chomsky is similarly very explicit here that this conception is "mentalistic" in that we are aiming to discern an "underlying mental reality" on which behavior supervenes. More pointedly, the object of study is *not* linguistic behavior itself (the "actual performance") but a far more abstract substructure, which though used in the course of linguistic behavior is not identical to it. Thus, on this view, grammars are not summaries of linguistic behavior (i.e. generalizations over our comprehensions and productions or a model for a "speaker or a hearer" (9)), rather it is the abstract characterization of an abstract system of knowledge that gets put to use in various ways.[3] Linguistic behavior is (at best) one possible source of evidence that we can use to probe the structure of the generative procedure, but grammars are in no sense summaries of behavioral patterns or representations of the regularities in the input.

This latter point is worth re-emphasizing in the current climate. In *Aspects* Chomsky proposes that we study not what people *do* linguistically but the underlying mental structure that describes a native speaker's linguistic knowledge. To mark this point, *Aspects* distinguishes linguistic *competence* from *performance* and argues that a theory of the former is logically prior to a theory of the latter (viz. performance theories *presuppose* some account of competence). A theory of competence is a theory about a capacity, a theory of performance is a theory of how this capacity is exercised. In modern parlance, it roughly tracks the distinction between data structures and algorithms. Though there is an intimate relation between the two (and we can often learn a lot about each from the other), nonetheless, they are very different and confusion ensues if we don't keep them apart.

Aspects introduces further distinctions to keep us from confusing these different though related domains. For example, it emphasizes (p. 11) the difference between 'grammaticality' and

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those binary operations that build structure and the unary ones that transform it (e.g. the latter, but not the former, is conditioned by *Agree*). I defer a discussion of these issues to another time and place.

[2] As Katz and Bever (1976: 12) observe that "the most significant aspect of the transformational revolution is that it is a decisive defeat of Empiricism in an influential social science."

[3] Of course, how it gets used is an interesting empirical issue.

'acceptability.' The former is a property of phrase markers and their derivations. A given linguistic structure can be well formed (grammatical) or not (ungrammatical).[4] So, the phrase marker of a given sentence might violate the Complex Noun Phrase Constraint. If it does, it is an ungrammatical structure (either cannot be generated or would be weeded out by some kind of filter). Native speakers may judge ungrammatical sentences to be unacceptable. And the fact that unacceptability is often a good indicator of ungrammaticality is what allows linguists to use acceptability judgments as empirical probes into grammatical structure. However, as *Aspects* notes, it is entirely possible that some unacceptable sentences are grammatical (e.g. *Police police police buffalo buffalo buffalo buffalo*) and that some ungrammatical sentences are acceptable (e.g. *More people visited Rome than I did*). Like the competence/performance distinction, the grammaticality/acceptability distinction is meant to guard us from mistaking the principle object of inquiry.

Aspects further identifies two different uses of the notion *grammar*. In the first instance a grammar describes the linguistic competence a native speaker of a given language has concerning that native language. Thus, the grammar of English would differ from that of French because native speakers of the two languages know different things (i.e. are in different mental states) reflecting the fact that they are competent speakers of different languages. However, there is another sense in which these native speakers have similar linguistic capacities for each *could have acquired* the other grammar but for adventitious circumstances. Thus, were Peter raised in Paris he would have acquired a French G and were Pierre raised in London he would have acquired an English G. Thus, despite their particular actual differences, Peter and Pierre's capacity to learn either language (and of course, we should not stop with English and French, any natural language will do) is a common feature of our native speakers. And this higher order capacity is also a proposed object of linguistic study: what is the underlying capacity the native speakers have that allows them to acquire any G when exposed to uttered products of G? *Aspects* dubs this second capacity 'Universal Grammar' (UG) and contrasts it with 'Grammar' (G) tout court. It also outlines the conceptual dependencies between the two studies. A theory is dubbed 'descriptively adequate' if it faithfully describes a native speaker's language particular G. A theory is explanatorily adequate if it shows how any particular G can be derived from the principles of UG given the kind of input native speaker's are exposed to (the 'Primary Linguistic Data' [PLD]).

So to recap: *Aspects* identifies the object of study to be two related mental capacities. The first is the mental capacity that a particular G describes: the capacity to generate sound/meaning pairs for an unbounded number of linguistic structures. The second object of study is a second order capacity that UG describes: the capacity to derive first order grammatical capacities based on PLD. The first order capacity (partly) underlies our further capacity to engage in certain kinds of linguistic behavior (e.g. talking, comprehending, poetizing, explaining etc.). The second order capacity (partly) underlies the human capacity to become a native speaker of a natural language.

[4] Though we tend to describe well formedness in dichotomous terms, there is nothing preventing us from taking sentences to have degrees of grammaticality, as *Aspects* (p. 11) notes.

3 The Rationalism of *Aspects*

There are several different Rationalist features encapsulated in the *Aspects* program. Let's consider some of these in turn.

3.1 Capacities versus Regularities

Let's first consider *Aspects'* emphasis that what needs explaining is an abstract capacity rather than a form of behavior. Nancy Cartwright (1999) discusses the difference between capacities and regularities and makes the following point. The classical empiricist/Humean tradition rejected capacities/powers as occult residues of an earlier search for Aristotelian essences and insisted on founding all scientific knowledge on "the kinds of qualities that appear to us in experience (79)" (recall the dictum: nothing in the intellect that is not first in the senses!). Modern empiricists/Humeans endorse this antipathy to "powers" by treating the laws of nature as summaries of "what things do (82)." Cartwright contrasts this with the view that laws are about powers/capacities, which is not about what things do but "what it is in their nature to do (82)." Here's a quote that provides a good feel for what she has in mind (81-82):

> What we have done in modern science, as I see it, is to break the connection between what the explanatory nature is—what it is in and of itself—and what it does. An atom in an excited state, when agitated, emits photons and produces light. It is, I say, in the nature of an excited atom to produce light. Here the explanatory feature—an atom's being in an excited state—is a structural feature of the atom… For modern science what something really is—how it is defined and identified—and what it is in its nature to do are separate things.

In short, there is an important metaphysical distinction that divides Empiricists and Rationalists. For the former the laws of nature are in effect summaries (perhaps statistical) of "actually exhibited behaviors", for the latter they describe abstract "configurations of properties" or "structures." These latter underlie, but are distinct from, behavior ("what appears on the surface"), these being "the result of the complex interaction of natures (81)."

Cartwright notes the close connection between the Rationalist conception of powers/capacities and the analytic method of inquiry characteristic of the physical sciences, often called "Galilean idealization." She also provides several interesting reasons for insisting on the distinction between what something is versus what it does. Here are two.

First, given that visible behavior is an interaction effect of complex natures it is often impossible to actually see the contribution of the power/capacity one is interested in, even in the very contrived circumstances of controlled experiments. She illustrates this using Coulomb's law and the interfering effects of gravity. As she points out:

> Coulomb's law tells not what force charged particles experience but rather what it is in their nature, *qua* charged, to experience… What particles that are both massive and charged actually experience will depend on what tendency they have *qua* charged and what *qua* massive (82).

Thus, actual measurable forces are the result of the interaction of several powers/capacities and it takes great deal of idealization, experimentation, calculation and inference to (1) simply isolate the effects of *just* one and segregate it from everything else, viz. to find out how two charged bodies "would interact if their masses were zero."[5] And (2) to use the results of (1) to find out what the actual powers involved are:

> The ultimate aim is to find out how the charged bodies interact not when their masses are zero, nor under any other *specific* set of circumstances, but how they interact *qua* charged.

Second, contrary to the accepted wisdom more often than not in the real world the same cause is *not* followed by the same effect. In fact, generating stable relations between cause and effect requires very careful contrivance in manufactured artificial experimental settings. Cartwright refers to these as nomological engines; set-ups that allow for invariant regular connections between what powers/natures/capacities *can* do and what they actually do. Except in such settings the Humean dictum that effects regularly follow causes is hardly apparent.

> Outside the supervision of a laboratory or the closed casement of a factory-made module, what happens in one instance is rarely a guide to what will happen in others. Situations that lend themselves to generalizations are special… (86).

Cartwright's discussion tracks the one we find in *Aspects*. The distinction between competence and performance is a rationalist one. Descriptions of individual grammars and theories of UG are intended to be accounts of human linguistic powers/capacities, not theories of linguistic behavior. Neither G nor UG is a summary of behavioral regularities (nor, for that matter, a summary of regularities found in the input). Indeed, as *Aspects* insists, linguistic behavior is a very complex interaction effect with competence being one of many (very poorly understood) factors behind it. The distinction between what a speaker knows (competence) and what a speaker puts this knowledge to use (performance) clearly echoes Cartwright's rationalist themes. Similarly, the rejection of the idea that linguistic competence is just (a possibly fancy statistical) summary of behavior (or of the input) should be recognized as the linguistic version of the general Rationalist endorsement of the distinction between powers/capacities and their behavioral/phenomenal effects.

3.2 The Rich Structure of UG

Around the time that *Aspects* was written, linguistics was in the vanguard of the cognitive revolution, a major battle-ground on which Rationalism and Empiricism met and disputed. *Aspects*, with its focus on the necessity for a highly structured UG to account for how particular grammars are acquired, argued for a Rationalist understanding of minds against the then dominant Empiricist conceptions. Here's what was taken to be at stake.

Empiricism, a species of environmentalism (natural selection being another), holds that minds are structured by the environments in which they are situated. Grammars, are, at best, "compressed memory representations of the regularities found in the input" (Lidz and Gagliardi

[5] Cartwright observes that though doing (1) is difficult it is "just a stage; in itself this information is uninteresting." (83-4).

2013). The leading metaphor is the mind as soft perfectly receptive wax tablet (or empty cupboard) which the external world shapes (or fills) via sensory input. The leading slogan, borrowed from the medievals, is "nothing in the intellect that is not first in the senses." The mind, at its best, faithfully records the external world's patterns through the windows of sensation. Good minds are good pattern matchers, able to track the generalizations in the data.[6]

Rationalists have a different animating picture. Leibniz, for example, opposed the wax tablet metaphor with another: ideas are in the mind in the way that a figure is implicit in the veins of a piece of marble (p. 52). The sculptor cuts along the marble's grain to reveal the figures that are inchoately there. In this picture, the environment is the sculptor, the veined marble the mind. The image highlights two main differences with the empiricist picture. First, minds come to environments structured ("veined"). They have a natural grain, allowing some figures (ideas) to easily emerge while preventing or slowing the realization of others. Second, whereas a hot wax imprint of an object mirrors the contours of the imprinting object, there is no resemblance between the whacks of the chisel and the forms that such whackings bring to life. What's in the senses may provoke the emergence of one or another mental structure, but not by summarizing the inputs into various generalizations, but in a more oblique way. Data is used to select among pre-specified options. Thus, linguistic input is to emerging mental structure as experimental data is to theory. It is used to test *given* hypotheses. *Aspects'* elaborate (almost Bayesian) version of the acquisition problem (p. 31) presents a picture in which language acquisition requires the *pre-specification* of a set of (weighted/ordered) alternatives among which the data selects. Thus, Rationalists allow minds to represent external reality but deny that they do so in virtue of some sort of similarity obtaining between the sensory perceptions and the ideas they prompt. The mind is a selection device choosing among *given* alternatives, not a device for generalizing inputs into patterns. The metaphors are important here: whereas Rationalists postulated causal connections between mental content and environmental input they denied that environments *shape* those contents. The distinction between triggering and shaping is an important one.

Associationism is the modern avatar of empiricism. The technology is more sophisticated, neural nets and stimulus-response schedules replacing wax tablets and empty cupboards, but the guiding intuition is the same. Minds are pattern matchers able with sufficient exposure to the patterns around them to tune themselves to the patterns impinging on them. What made *Aspects'* ideas about Generative Grammar so exciting was that they showed that this empiricist picture could not be right. To account for a native speaker's linguistic competence requires that humans come equipped with highly structured special purpose mental procedures and this is inconsistent with empiricisms associationist psychology. Two features of linguistic competence were of particular importance: first that the competence emerges relatively rapidly, without the learning being guided and despite data that is far from perfect. Second, much of what speakers know about their language is not attested at all in the data they have access to and use. No data, no possible associationist route to the mind. Ergo: the mind *must* be structured.

3.3 Patterns and Generative Procedures

Aspects characterizes the acquisition problem as going from *primary linguistic data* (PLD) to grammars. PLD are "examples of linguistic performance" (25) while grammars "are systems of

[6] See (i) above. Note that the relation between minds as pattern matchers lives comfortably with the rejection of the competence/performance distinction: regularities in
behavior are what minds track and pattern detection is what minds do.

rules" that constitute "the native speaker's internally represented "theory of his language."" (25). The problem then is going from instances of used outputs of grammars to the rules that characterize (aka, generate) the linguistic objects used. Note the problem is *not* one of finding patterns in the data, but rules that generate it. Indeed, one of the interesting things about the project is that contrary to say Greenberg's conception of Universals, the *Aspects* notion does not assume that there are patterns in the PLD to discern. The relation between data and theory is more remote than simple pattern detection. An analogy might help illustrate what this means.

Consider two kinds of patterns.[7] The first kind is illustrated in sequences like (1):

1. (a) .222222…
   (b) .333333…
   (c) .454545…
   (d) .123412341234…

If asked to continue into the … range, a normal person (i.e. a college undergrad, the canonical psych subject and the only person buyable with a few "extra" credits, i.e. cheap) would continue (1a) with more 2s, (1c) with more 3s (1c) with 45s and (1d) with 1234s. Why, because the average person would detect the indicated pattern and generalize as indicated. People are good at detecting patterns of this sort. Hume discussed this kind of pattern recognition behavior, as have empiricists ever since. What the examples in (1) illustrate is constant conjunction, and this leads to a simple pattern that humans have little trouble extracting, (at least in the simple cases[8]).

Now as we all know, this will not get us great results for examples like (2).

2. (a) .141592653589793…
   (b) .718281828459045…

The cognoscenti will have recognized (2a) as the decimal part of the decimal expansion of π (15 first digits) and (2b) as the decimal part of the decimal expansion of *e* (15 first digits). If our all purpose undergrad were asked to continue the series s/he would have a lot of trouble doing so (Don't take my word for it. Try the next three digits[9]). Why? Because these decimal expansions don't display a regular pattern as they have none. That's what makes these numbers irrational in contrast with the rational numbers in (1). However, *and this is important*, the fact that they don't display a pattern does not mean that it is impossible to *generate* the decimal expansions in (2). It is possible and there are well known algorithms for doing so (as we display anon). However, though there are generative procedures for calculating the decimal expansions of π and *e*, these procedures differ from the ones underlying (1) in that *the products* of the procedures don't exhibit a perceptible surface pattern. The patterns, we might say, contrast in that the patterns in (1) carry the procedures for generating them *in their patterning* (Add 2,3, 45, 1234, to the end), while this is not so for the examples in (2). Put crudely, constant conjunction and association exercised on the patterning of 2s in (1a) lead to the rule 'keep adding 2' as the rule for generating (1a), while inspecting the patterning of digits in (2a) suggests nothing whatsoever about the rule that generates it (e.g. (3a)). And this, I believe, is an important conceptual fault line separating

[7] This is based on a discussion in Berlinksy (1988).

[8] There is surely a bound to this. Consider a decimal expansion whose period are sequences of 2,500 digits. This would likely be hard to spot and the wonders of "constant" conjunction would likely be much less apparent.

[9] Answer: for π: 2,3,8 and for *e*: 2,3,5.

empiricists from rationalists. For empiricists, the paradigm case of a generative procedure is intimately related to the observable patternings generated while Rationalists have generally eschewed any "resemblance" between the generative procedure and the objects generated. Let me explain.

It's uncontroversial that learners come to the task of language acquisition with biases. This just means that everyone agrees that what is acquired/learned is not a list, but a procedure that allows for unbounded extension of the given (finite) examples in determinate ways. Thus, *everyone* (viz. both Empiricists and Rationalists) agrees that the aim is to specify what biases a learner brings to the acquisition task. The difference lies in the nature of the biases each is willing to consider. Empiricists restrict the biases they are willing to entertain. The admissible biases are those that allow for the filtering of patterns from data.[10] The leading Empiricist idea is that data reveal patterns and that learning amounts to finding these patterns *in* the patternings of the data. In other words, they picture the problem of learning as roughly illustrated by the examples in (1).

Rationalists are more catholic. Though they allow that Empiricist acquisition exists,[11] they don't restrict themselves to these. They allow that there are learning problems akin to that illustrated (2). And that this kind of learning demands departure from algorithms that look for "simple" patternings of data. In fact, it requires something like a pre-specification of the *possible* generative procedures. Here's what I mean.

Consider learning the digital expansion of π. It's possible to "learn" that some digital sequence is that of π by sampling the data (i.e. the digits) if, for example, one is biased to consider only a finite number of *pre-specified* procedures. Concretely, say I am *given* the generative procedures in (3a) and (3b) and am shown the digits in (2a). Could I discover how to continue the sequence so armed? Of course. I could quickly come to "know" that (2a) is the right generative procedure and so I could continue adding to the … as desired.

3 (a) $$\pi = 2 \sum_{k=0}^{\infty} k!/(2k+1)!! = 2 \sum_{k=0}^{\infty} 2^k k!^2/(2k+1)! = 2\,[\,1+ 1/3\,(1 + 2/5\,(1 + 3/7\,(\,1 +\ldots)))]$$

(b) $$e = \lim_{n \to \infty} (1+1/n)^n = 1 + {}^1/_{1!} + {}^1/_{2!} + {}^1/_{3!} + \ldots$$

How would I come to know this? By plugging several values for *K*, *n* into (3a,b) and seeing what pops out. (3a) will spit out the sequence in (2a) and (3b) that of (2b). These generative procedures will diverge very quickly. Indeed the first computed digit renders us confident that asked to choose (3a) or (3b) given the data in (2a), (3a) is an easy choice. The moral: even if there are no patterns *in* the patternings of the data acquisition via data sampling is possible if the range of relevant choices is sufficiently articulated and bounded.

This is just a thought experiment, but I think that it highlights several features of importance. First, that everyone is knee deep in given biases, aka: innate, given modes of generalizations. The question is not whether these exist but what they are. Empiricists, from the Rationalist point

[10] Hence the ton of work done on categorization, categorization of prior categorizations, categorization of prior categorizations of prior categorizations…

[11] Or *may* exist. Whether it does is likely more complicated than usually assumed as Randy Gallistel's work has shown. If Randy is right, then even the parade cases for associationism are considerably less empiricist than often assumed.

of view, unduly restrict the admissible biases to those constructed to find patterns *in* the patternings of the data. Second, that even in the absence of patterned data, learning is possible if we consider it as a choice among *given* hypotheses. Structured hypothesis spaces allow one to find generative procedures whose products display no obvious surface patterns.

A historical aside: Here, Cartwright provides the ingredients for a nice reconstructed history. Putting more than a few words in her mouth, it would go something like this:

> In the beginning there was Aristotle. For him minds could form concepts/identify substances from observation of the elements that instanced them (you learn 'tiger' by inspecting tigers, tiger-patterns lead to 'tiger' concepts/extracted tiger-substances). The 17th century dumped Aristotle's epistemology and metaphysics. One strain rejected the substances and substituted the patterns visible to the naked eye (there is no concept/substance 'tiger' just some perceptible tiger patternings). This grew up to become Empiricism. The second, retained the idea of concepts/substances but gave up the idea that these were necessarily manifest in visible surface properties of experience (so 'tiger' may be triggered by tigers but the concept contains a whole lot more than what was provided in experience, even what was provided in the patternings). This view grew up to be Rationalism. Empiricists rejected the idea that conceptual contents contain more than meets the eye. Rationalists gave up the idea the content of concepts are exhausted by what meets the eye.

The Empiricist/Rationalist distinction noted here is reflected in different ways of understanding 'universals.' In *Aspects*, 'universal' means a feature of UG, the function that takes you from PLD to a particular G. There is every reason to think that these universals are very abstract and describe the class of generative procedures that humans can attain. There is *no* reason to think that a principle of UG will generate any particular patterns within the phrasal products of a particular G. 'Universals' of UG are *not* shared properties displayed in the products of every G. They are restrictions on the class of admissible operations and, if "visible" at all, will only leave a mark on what is *ex*cluded from the language. Surveying the well formed products of any particular G will tell you very little about the generative procedure that gives you these products.

A useful contrast to the *Aspects* notion of 'universal' is Greenberg's. Here a linguistic pattern is universal if it is visible in the surface patterns of every relevant language, e.g. all languages contain nouns and verbs or, if a language is SVO then it is prepositional. Greenberg universals are claims about the patterning of linguistic observables and will be apparent from well-formed instances of the language (e.g. the acceptable strings). *Aspects* universals are claims about generative procedures, not products. These are two very different things.[12]

We can go further: not only need universals not be "visible" in the products of Gs they need not be visible across all Gs. UG in the *Aspects* sense does not require that every G have common rules or categories or operations. UG delimits the class of possible generative procedures not the specific rules they contain nor the linguistic products generated. So, 'universals' in *Aspects* don't

[12] The "debate" over the relevance of Piraha for the theory of universal grammar revolves around confusing these two sense of 'universal.' Everett takes it to be an implication of the claim that grammars are recursive that *every* language display unbounded embedding. He claims that Piraha limits embedding to degree 1 and concludes that recursion is *not* a property of UG. Everett's point makes sense if one understands 'universal' in the Greenberg sense of the term, not the sense of the term in *Aspects*.

denote the class of admissible visible linguistic patterns, and so we do not expect to be able to find these universals by inductive examination of the (used) outputs of these procedures any more than we would expect to be able to induce (3a) by examining integer patterns in (2a).

3.4 The Possible and the Actual

Rationalists explain the actual in terms of the possible. This is true both ontologically and epistemologically. The actual, what occurs, is the combination of contingent initial conditions and non-contingent "laws." Furthermore, the operative laws causally at play in any particular case display complex interaction effects depending on the specific initial conditions at hand. Thus, what one sees or measures is the result of at least two kinds of contingencies. The aim of experiment and theoretical inquiry is to disentangle the principled laws from the contingent initial conditions and their resultant interaction effects. As Cartwright put it discussing the interaction of charged particles:

> The ultimate aim is to find out how the charged bodies interact not … under any other *specific* set of circumstances, but how they interact *qua* charged.

The aim of explanation focuses on what's possible ("*qua* charged") not what one sees in any given experiment, the latter being the product of "specific" circumstances and thus obscuring the workings of the general laws. As the aim is to understand these laws, a good experiment allows one to see *through* the specific details to the mechanisms that define the class of *possible* effects, the particular one at hand being merely contingent.

We can put this another way: what's real is the class of *possible* effects. What we actually see is derivative on these laws and some historical accidents.

This fits very well with the conception in *Aspects*. Competence is principled. Performance is not. Gs are theories of competence. They characterize a set of expressions far greater than the particular set of linguistic objects that any (indeed, all) native speakers can ever possibly actually encounter. Further, any given performance (e.g. produced or perceived utterance) is a massive interaction effect of various mental modules, only one of which is the grammar. Plus there are entirely adventitious initial conditions. What is uttered is contingent on the specific circumstances in which the utterance is produced. They are caused by a variety of extremely poorly understood factors (e.g. the "free" decision to utter the utterance). In sum, Gs, which characterize the class of *possible* sentences of a given language, are considerably less contingent on initial conditions or the effects of other mental modules than the utterances actually produced. It is in this sense that Gs are more real than the utterances they (partially) characterize.

The G any given native speaker has is also contingent, this time on the linguistic environment the speaker grew up in. That I happen to speak "English" is an accident. That I have acquired a G with the characteristic properties that UG demands is not.

In sum, the rationalist perspective in *Aspects* enjoins us to abstract away from these contingencies in describing particular Gs (the theory of the *possible* linguistic objects in a given language) and UG (the theory of the possible Gs available to humans as such). UG and the Gs that it permits are *ontologically* more real (i.e. less contingent on accidents) than the actual Gs that arise and the products that one actually encounters and produces.

Aspects also makes these Gs and UG epistemologically more basic as well. This is particularly clear in the case of UG. The *Aspects* project assumes that the class of acquirable Gs

is severely circumscribed. The hypothesis space is circumscribed and the weighting of alternative grammars is highly specified. The role that PLD plays in the acquisition process, therefore, is pictured as being relatively trivial: it selects among a relatively small set of alternatives. Understanding language acquisition is *largely* understanding how the space of possibilities is configured and how the options are weighted. Thus, epistemologically, UG is more basic than the Gs speakers happen to have acquired in being a pre-condition for their acquisition.

Similarly for Gs. As noted they define an (effectively) infinite class of linguistic structures only a finite number of which are actually performed. What you "know" is a precondition of what you "do." The possible circumscribes the actual.

4 Conclusion

Aspects is not only a seminal document within modern linguistics, it is one of the intellectual struts of the cognitive revolution. Chapter 1 makes clear the connection. So, despite the fact that the central theoretical features advanced in *Aspects* have since been rejected (or considerably modified), chapter 1 remains a founding document of the Generative enterprise. Why? Because it is the first (and still best) concise and articulate outline of the Rationalist program in linguistics. We have learned a lot about Gs and UG since *Aspects*. However, the general program outlined there remains as exciting as ever.

References

Berlinsky, David. *Black mischief*. Boston: Mariner Books.

Cartwright, Nancy. 1999. *The dappled world: A study of the boundaries of science*. Cambridge: Cambridge University Press.

Chomsky, Noam. 1965. *Aspects of the theory of syntax.* Cambridge. MA: MIT Press.

Jerrold. J. Katz, Jerrold J. and Thomas G. Bever. 1976. The fall and rise of empiricism. In Thomas G. Bever, Jerrold J. Katz and D. Terrence Langendoen (eds.), *An integrated theory of linguistic ability*. New York: Crowell. 11-65.

Lidz, Jeffrey and Annie Gagliardi. 2013. How nature meets nurture: Universal Grammar and statistical learning. Ms., University of Maryland and Harvard University (to appear in *Annual Review of Linguistics*).