ANALOGS ANYWHERE: THE FLOW OF HIGHWAY TRAFFIC AND LANGUAGE EVOLUTION[*]

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1. Introduction

The purpose of this paper is primarily heuristic. It is an attempt to articulate details

of some aspects of the dynamics of language evolution through comparisons with

something non-linguistic,[1] vehicle traffic in this particular case. I could have made the

comparison with a stream or a river (Mufwene (1998), but I would not be able to

highlight the role of individual speakers as unwitting agents of change, which is central to

the position I present in Mufwene (2001). The river metaphor has its own merits, such as

regarding substrate influence and blending inheritance, but it does not lend itself easily to

the identification of counterparts of idiolects.

I wish to highlight similarities between, on the one hand, how individual speakers

influence the evolution of their communal language and, on the other, how the actions of

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[1] I use *language evolution* here in the same way as in Mufwene (2001), in reference to
changes undergone by a language from the point of view of both its structures and the
pragmatic constraints associated with its use. I utilize it also in reference to aspects of what
may be considered its life, such as its diversification into offspring varieties, its
birth/beginnings, its vitality, and its potential death. I continue to treat languages at the
communal level as species and it is from this particular perspective that the reader is invited
to think about language evolution below.

individual drivers on a highway influence the overall traffic flow.[2] In other words, the way in which a language changes is a function of how individual idiolects change under each other's influence. Likewise, the way traffic flows on a highway is a function of how individual vehicles proceed. It is also true that what individual vehicles can do depends on the overall traffic itself, such as its volume. Likewise, the changes that idiolects can undergo are largely constrained by the communal language they are part of. It is on the dynamics of this mutual dependence between idiolects and language, just like between vehicles and highway traffic, that I focus below. I say nothing about the restructuring process itself qua system reorganization (Mufwene 2001), neither at the level of idiolect nor at that of language. This requires a separate essay in its own right, to flesh out much of what has been proposed in the literature on, for instance, the development of creoles.

I owe this paper to Keller's (1994) thought-provoking comparisons of aspects of

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[2] Some linguists use 'language' also synonymously with 'idiolect' or 'I-language'. In this paper I often use 'language' as short for 'communal language', the construct that I analogize with 'biological species' in Mufwene (2001) and consider to be an extrapolation from idiolects or a population thereof. This notion should not be confused with Chomsky's (1986) 'E-language', which refers to the set of utterances produced by speakers of a communal language, identified as English, Swahili, or Turkish, for instance. An E-language provides the corpus or "primary linguistic data" from which one can infer the structure of an I-language or idiolect, or that of a communal language. I focus on communal language because it is what has concerned historical and genetic linguists, who are concerned with aspects of language evolution. 'I-language' has been the focus of scholarship about "language appropriation" as an I-language-recreation process by a learner. This distinction is critical because 'evolution' can apply to either an idiolect or a communal language, though the evolution undergone by the former need not entail evolution in the latter. In addition, an E-language constantly grows in size, as long as speakers continue to produce utterances, whereas a communal language, as a counterpart of a biological species, can grow only to the extent that it comprises more idiolects, just like a species grows by acquiring new organisms at greater rate than it loses older ones. The complexification of a language is not growth, at least not in the same sense.

language change with aspects of city traffic and to Heidi Elston's term paper (Winter 2001, included in this volume) on the subject matter. Both of them led me to realize that Keller may have scraped only the tip of an interesting heuristic iceberg.

2. Highway traffic and language evolution

2.1. Keller's original examples

Keller (1994) provides several interesting analogies between vehicle traffic and language change. One of these is discussed by Heidi Elston in the present volume. It regards the paths that emerge across campus lawns not by design but as a consequence of pedestrians taking shortcuts from one building to another and avoiding the longer, paved, and geometrical paths provided by the landscaper. The emergence of the paths illustrates the fact that repeated similar acts of individuals in a population wind up producing communal patterns, unless some action is taken against such an evolution. Keller intended the example to illustrate the agency of what he identifies as the "invisible hand."[3] In the case of language, it amounts to the cumulative, though typically uncoordinated, actions of individual speakers which bring about change (which is unplanned). The focus in this case should be largely on the role of imitation in group behavior, as some speakers adopt innovative deviations of other speakers and new structural and/or pragmatic patterns emerge from the way they speak their language in various contexts.[4] As more and more

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[3] This phenomenon is also known as "hidden hand" in other ecology-based studies of evolution. See, e.g., Holland (1995).

[4] To be sure, repetition is an important factor in the emergence of new patterns,

and more new linguistic behaviors similar to the initial innovation occur, new norms emerge at the communal level and are identified as changes relative to an earlier stage of the relevant language.

To be sure, speakers do not necessarily behave in identical ways nor in a concerted fashion (Mufwene 2001), not any more than pedestrians' footprints can be expected to hit the same spots on the ground. However, similarities in the ways they communicate and exapt aspects of their linguistic knowledge to cope with new communicative challenges wind up producing communal patterns through the power of the "invisible hand" discussed by Keller.[5] For instance, phenomena known as *grammaticization* evolve this way, as innovations spread through copying or independent inventions within a population of speakers.

Keller makes another comparison, this time between the pace of language evolution and the speed of traffic. He invokes the case when, for reasons unknown to most drivers, the traffic jams and vehicles approaching the location must stop. Every driver applies their brakes a little bit heavier than the preceding driver, in order to avoid stopping in the

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especially at the level of individual speakers. Going back to the path metaphor, a path can well emerge from the foot prints of a single pedestrian who takes the same shortcut over and over again. However, it emerges faster if several other pedestrians take the same shortcut. At the communal level, changes in a language are more manifest, even if they consist only of new (patterns of) variation, when more than one speaker are involved. This is especially important because discourse on language evolution has been less about idiolects than about communal languages (e.g., Vulgar Latin, Ancient Greek, or Gaelic as social constructs).

[5] The verb *exapt* is used here as a backformation from Stephen Jay Gould's term *exaptation*, intended for those adaptations that things undergo that had nothing to do with their original designs, such as the use of vocal cords to produce speech or of hands for sign language.

rear of the latter's vehicle. He wanted to illustrate with this example the fact that changes spread gradually, and faster and faster in a population. This is similar to the amplification of waves in wave theory, with the outer rings becoming bigger and bigger when one drops some mass (say a rock) into a pond of stagnant water.

However, in the case of language change, things do not proceed only in the direction and way that caught Keller's attention. Just the opposite happens when vehicles start again after stopping. The time it takes a vehicle to start off again is partly a function of its distance from the first vehicle in front, and apparently also a function of the degree of patience of drivers in the other vehicles that precede. The farther back a vehicle is in the line, the more it seems that nobody is moving. Some linguistic changes proceed faster among the innovators than among their followers, depending in part on whether the latter can identify with the innovators in social class or in age group, among other factors. For instance, according to Bailey & Maynor (1987), extensions of invariant *be* to denote the PROGRESSIVE rather than the CONSUETUDINAL/HABITUAL aspect in African-American English of Brazos Valley, Texas, is progressing faster in the urban younger generation than in the other social groups. In language evolution, there are both heterostasis and homeostasis (Gilman 1993), and in either case the speed can be faster or slower among the followers. The overall picture is a complex one of changes and resistance to change, with different kinds of speed or strength identifiable among those who do one or the other thing.

2.2. Beyond Keller's comparisons

In this section, I focus on vehicle traffic on a highway, where increase and decrease of volumes and accelerations and decelerations of speed are considered more normal than complete stops, which need explanations, such as a car accident. In language, these initial images correspond, respectively, to increase and decrease of number of speakers — hence of idiolects — and the pace of language evolution. A living language in frozen state is difficult to imagine, unless one thinks of a ritual language that is no longer spoken. Below, I develop more analogies between the flow of vehicle traffic and that of language evolution, highlighting a number of respects in which the two evolutionary complexes of processes are similar.[6] I use the more concrete case of vehicle traffic to hopefully shed light on the dynamics of various factors that bear on how evolution proceeds in a language. While undeniably inspired by Keller (1994), I am also elaborating some of the views developed in Mufwene (2001), in which I start with the argument that one can understand language evolution better if a language is analogized with a biological, parasitic

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[6] I could have chosen to compare language evolution with the flow of pedestrian traffic too, but things are much more complex in this case and the rules regulating it apparently much looser. It seldom proceeds in one direction and there are no rigid lanes in the pedestrian two-way traffic. There are undoubtedly interesting things to be learned from such a comparison, for instance, the fact that in the same traffic some people walk at what may be considered a normal pace (though not at exactly the same speed), some people are almost running, while others are strolling instead and making it difficult for even normal walkers following them to proceed ahead, when traffic is heavy. That kind of comparison will have to wait for another study. Readers will also notice that the comparison undertaken here has its share of limitations. One of these has to do with making mistakes. In vehicle traffic, mistakes are often crippling and sometimes fatal. There is no such corresponding price to pay for linguistic mistakes. Although I highlight some other differences more relevant to this discussion below, I focus on aspects of highway traffic that can help us articulate some aspects of the interactive dynamics of idiolects, which are characterized by Mufwene (2001)

species rather than with an organism.

The justifications adduced in Mufwene (2001) for thinking of a language as a species include the following: 1) a communal language is an extrapolation from the idiolects of its speakers; 2) it is variable, in part because its idiolects are not identical with one another; and 3) it does not evolve in a uniform way. Some idiolects do not participate in some of the changes that a language undergoes, and those that participate in them do not necessarily evolve at the same speed. These peculiarities are more typical of a population than of an organism, with which a language has traditionally been mis-analogized since the 19th century. It is this same perspective on the nature of a communal language that makes possible the comparison with vehicle traffic, assuming individual vehicles to be counterparts of idiolects, as explained below.

While dealing with specific languages, I find thinking about them as 'species' more apt than thinking about them merely as 'populations'. Like organisms as individual members of a species, the idiolects of a language are like each other on the family resemblance model.[7] Likeness in structural features (the counterpart of phenotypes in biology) is not a

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as part of the internal ecology of a communal language considered as a species.

[7] For an explicit exposé of my position, see Mufwene (2001:1-3). A similar view is presented by Chomsky (2000). According to him, "speaking the same language is on a par with being-near or looking-like" (31). An important correlate of this is his other observation that "successful communication between Peter and Mary does not entail the existence of shared meanings or shared pronunciations in a public language" (30). Idiolects differ among themselves precisely in regard to such details as pronunciation, meanings of words or phrases, and sets of items affected by a grammatical rule. Chomsky's remark is similar to Mufwene's (1989, 1992) observation that speakers of a language communicate with each other not because they operate according to the same system but because they are capable of assigning to each other's utterances interpretations that are similar most, but not all, the time.

requisite for isolating a group of individuals as a population. It often is when individuals

are grouped into one species. Moreover, speakers of such idiolects also acknowledge that

they speak the same language (variety)[8] and they assume that it descends from an earlier

form to which their idiolects can be genetically related. They also claim association with

the same community, even if they do not fully understand one another.[9]

For the purposes of this analysis, idiolects correspond to individual vehicles. The

latter's individualities are determined by whether they are cars, vans, trucks, buses, or

motorcycles, and by their different makes, ages, and drivers, among a host of factors that

bear on the flow of traffic. Whether or not one can claim that different kinds of vehicles

(cars, vans, trucks, buses, and motorcycles) are one species is debatable—and the

question is similar to that of whether different breeds of dogs belong to the same species,

or whether two or more language varieties (e.g., African American English and

Appalachian English) are the same language. If they are not, the fact that the different

kinds of vehicles share the same roadway is still significant. The presence of different

kinds of vehicles on the same highway is similar to the coexistence of dialects or languages

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[8] This is analogous to members of the same species (especially among animals) recognizing which other individuals they can interbreed with — a criterion that keeps recurring in conventional definitions of 'species' in biology.

[9] See O'Hara (1994) for such a definition of a biological species based on claims of common ancestry rather than on sharing particular phenotypes. See Mayr (2001) about the position that a species is not an essentialist category but involves degrees of membership. Hey (2002) provides a survey of what he terms "the species problem," which need not concern us here, except to remind us that there is no unanimity on either the concept itself nor on the membership of individuals in a species. I return to the latter aspect of categorization below, just to show that the comparison is even more apt, because it raises the same population grouping problems about languages and traffic as about biological species.

in the same population, which is reminiscent of, for instance, different animal species

sharing the same econiche and affecting each other.[10]

Thus the vehicle traffic can also be compared to a genus in biology, a larger population

consisting of several related species. This is also so true of the coexistence of language

varieties in a population, which stands for their econiche, in which they compete for

similar resources, speakers and communication topics, and they influence each other.[10] As

interesting as these observations are, they will not be further explored in this essay. I will

simplify the subject matter here and treat vehicle traffic as if it were one species,

comparable to a language consisting of related idiolects, and I will focus on the coexistence

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[10] Such comparisons are rarely perfect of course. One cannot think of some kinds of vehicles preying on others in the way that carnivorous animals live at the expense of other animals. As a matter of fact, the phrase *killer language*, whose currency has increased in the literature on language endangerment, is quite inadequate. Languages do not kill languages, speakers do (Mufwene 2002a). One should also realize that the highway is no more part of traffic than speakers as hosts of idiolects, or the community in which the speakers evolve can be assumed to be parts of languages. Assuming that speakers are to languages more or less what drivers are to traffic, both the highway and communities are just the physical loci of the relevant species being compared here. If every kind of vehicle is a species in its own right than traffic is a heterogeneous, multi-species population in the same way that the totality of language varieties spoken in a community can be claimed to form a linguistic population of many species, with every variety considered to be a species in its own right.

[10] The relationship between speakers and their language is indeed a complex one, depending on what particular perspective one adopts. There is no doubt that speakers make their languages as they speak, in the sense that although idiolects qua I-languages are already fully-formed by puberty and account for speakers' ability to communicate in a language (say Swahili), they are also adapted, through innovations, to new communicative needs. However, to the extent that we can speak of them as having lives, languages as parasitic species have speakers as their hosts and they are affected by the social activities of these hosts (Mufwene 2001, especially Chapter 6). It is mostly from the perspective of Richard Dawkins' and Susan Blackmore's idea of memes as colonizers of their hosts that I can speak of communal languages as competing for the same resources, speakers who can use them. Perhaps speakers are just the loci where languages compete, through idiolects, for communication topics. In any case, in comparison to vehicle traffic, speakers are still comparable to drivers, as they are the ones who control the motion of the vehicles. As far as the lives of languages are concerned, speakers hold symbiotic relations to them.

and interactive dynamics that can be observed in vehicle traffic, as in language, and bear on the flow of traffic and the evolution of a language.[11]

I focus here on one-way traffic on a highway, so that I can more clearly show analogies with the evolution of a species as a one-way motion from one point in time to another (regardless of regressions in the health or size of a species).[12] Although one can think of traffic in motion as a giant unbounded organism, traffic is a function of individual vehicles that make it. Its overall motion is a function of the motions in which vehicles are individually engaged. It is affected by the actions of individual drivers in the different vehicles and how these are affected by actions or their neighbors. This characteristic is almost like that of the life of a species, which is function of individual lives of member organisms. Likewise, the life of a language is also a function of the lives of individual idiolects. It changes because idiolects undergo changes individually, because their speakers have innovated something or have adopted changes innovated by other speakers.[13] A language dies also when the last of its idiolects dies. Because idiolects and languages are

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[11] The alternative would involve comparing the extent to which car, truck, and motorcycle traffics affect each other (as different kinds of traffic) on the same highways. Unfortunately, there is no such clear separation of traffic on the highway, at least not in the same way that some cities have designed special bike lanes on some of their streets.

[12] Despite some imperfections that have already been pointed out, and some others still to be explained below, this comparison is justified by another important reason: like life itself, species evolution does not backtrack. It is illegal to reverse, or drive backward, in one-way vehicle traffic, and the norm has been to avoid it even at the cost of missing one's exit.

[13] As observed above, it is when such changes spread in a population of speakers, even if they do not affect all of them, that we can speak of the kind of changes that have interested historical linguists, i.e., those associated with communal languages. Changes can introduce variation or eliminate it, provided they spread from an innovator to other speakers.

parasitic entities, whether or not they die is a function of the activities and lives of their speakers. In this respect, vehicle traffic and languages are very similar phenomena. Provided they are in good condition, whichever way vehicles move in traffic depends very much on the drivers who operate them.

The comparison of language with vehicle traffic makes it difficult to continue ignoring the agency of speakers in language change, as has often been done in the traditional practice of historical linguistics. Just as vehicles on the highway cannot move without the agency of drivers, languages do not evolve without the agency of speakers, on whom their lives depend. Traffic moves faster or slower depending on how fast individual vehicles are driven on the highway. How it moves also depends very much on whether individual drivers decide to follow a pace-setter. This depends of course on many ecological factors, for instance, whether or not road conditions make it possible to drive faster, or whether there are police patrolling the traffic, or whether staying alone in a seemingly isolated portion of the highway makes a particular driver feel unsafe. There are similar reasons why speakers change their idiolects, including keeping up with one's peers, not feeling comfortable in speaking differently, and an opportune time for a change. Linguistic changes also meet the resistance of academies or self-proclaimed patrollers of their communal language.

Both vehicle traffic and languages are unbounded phenomena, not because they have no beginnings nor ends but because they are typically experienced in the present.

Individual drivers or speakers focus on interactions with their neighbors and on reaching their destinations or being successful communicators. In some ways, they participate in mass behavior, in which individuals are driven by the patterns that emerge from the group that they are part of. Changes in both how traffic flows and a language evolves are ideally observed by outsiders, although, thanks to the benefit of time, drivers and speakers realize how and to what extent their positions in the flow of things have changed relative to fellow drivers or speakers, respectively. The changes are largely due to the fact that drivers and speakers often realign themselves, as they are also affected, for instance, by those that join the traffic or community of speakers (children or immigrants) and by those who leave them. In both cases, the entries and exits may be temporary or indefinite. For instance, a vehicle may get on the highway only for a short drive and exit a few miles away, just like those speakers who join a community but for reasons of relocation of death do not stay long enough with other speakers. They may have an impact on how a traffic will flow or a language evolve, if they had behaved in ways that affected other drivers or speakers and thus deprived them of whatever pressure they had exerted.[14]

Mass behavior is especially significant in regard to drivers who share the highway for a long time with other motorists, not knowing when these other travelers joined the traffic or will leave it, if they themselves do not leave it sooner. Speakers coexist for years with

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[14] There is also an analog for drivers and vehicles that leave the highway traffic to refuel and/or have take a break and then come back. These actions are reminiscent of speakers who leave their communities for others and return some time later. They may have lost some of their previous features or bring with them new ones that other speakers may adopt or ignore.

each other not worrying about when the other speakers started using their communal language or will stop (due to death or some form of impairment), if they themselves do not stop speaking before the others. Of all those who participate in traffic or speak a communal language, very few are those who see it start or die. The vast majority see it in process and could not care less when it started, or if and when it will die, as long as they enjoy the company of other drivers or speakers and influence each other.

Traffic as a species really flows in ways similar to a language as a species. Traffic stays alive even while some vehicles are leaving and new ones join in. To say that a traffic continues, or stays alive, does not mean that exactly the same vehicles make it at the beginning as at the end, wherever the beginning or the end happens to be. Typically no vehicle stays in the traffic from the initial time or location to the finish time or line. The vehicles that proceed at the same speed during a particular period of traffic flow do not maintain the same speed nor positions throughout the flow of the traffic. Some drivers become tired and slow down, some become impatient and speed up, or they join other vehicles that are moving at a faster speed, and the fear of being all alone between vehicle clusters may cause a driver to drive slower so that they can join the following vehicle cluster, or to drive faster until they catch up with the preceding cluster. And there are those drivers who must exit the highway to refuel or just rest, notwithstanding the unfortunate ones that are crippled by breakdowns or die in accidents. One must also recognize those drivers that break the momentum one way or another because they want

to avoid particular company.

More or less the same thing is true of how a communal language evolves. It stays alive independent of the fact that several idiolects leave or die out and new ones emerge, and there is no idiolect that proceeds all the way from the beginning to the end point. Speakers move around and associate with different speakers at different times. Participation in different clusters or networks (often in overlapping relations), which are not identically defined among members of the same language community, affect the evolution of individual idiolects differentially, so that speakers find themselves in different evolutionary positions relative to each other.

However, note that, unlike vehicles in traffic, evolving idiolects accommodate each other in giving up their own features or adding features observed in other speakers, so that even a long time afterwards, an idiolect may share features with another with which it is no longer in contact. Speakers of nonstandard varieties who, after a certain amount of schooling and learning a standard variety, move up the socioeconomic ladder and operate in different classes do not only acquire a second vernacular but often also modify their native idiolects. On the other hand, they speak the second vernacular or lingua franca under the influence of their first vernacular, and if they have not completely given up that first one, they are still similar in some respects to fellow speakers from the same background.[15]

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[15] Interesting example come to mind here. For instance, in the USA, the average white southerner and white New Englander or Midwesterner do not speak standard English the same

This particular aspect of the evolution of idiolects is a function of Mufwene's (2001) observation that linguistic species are Lamarckian, because their features change several times over during their life times. Because variation is possible even within the same idiolect (a respect in which the linguistic species may be different from any biological species), the principle of family resemblance in the coexistence of idiolects in a communal language becomes even more critical. Idiolects of a language or dialects resemble each other for reasons that are not identical from one pair to another.

Like a biological species, both traffic and a communal languages stay alive while they continue to have members, although these members need not be the same. The size of he population of vehicles or idiolects may decrease or increase — in fact it fluctuates — but the traffic and language remain healthy as long they maintain a critical mass of vehicles and idiolects, respectively. As a matter of fact, saying that traffic or a species (biological or linguistic) grows has to do with the size of the membership rather than with age in its life. In the case of a communal language one can think of growth when it spreads in a population of potential speakers, which is different from conceiving of it as developing a more complex morphosyntax, for instance, in the way claimed by Schleicher (1863).[16] In

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way. The late Professor Raven McDavid, a dialectologist, reported that while living in Chicago his colleagues sometimes noted his southernisms when he was relaxed, thus made no effort to repress them. The southernisms showed up again when he returned to the South Carolina Piedmont to visit.

[16] DeGraff (2001a, 2001b) provides a compelling refutation of Schleicher's view that languages evolve from a simple and primitive morphosyntactic type, allegedly the isolating type, to more complex and sophisticated ones. There is much more evidence of communal languages developing a simpler morphosyntax than of the complexifying kind of evolution.

any case, part of the changes undergone by a language and by vehicle traffic are a function of all the exits from, and entries into, their collective bodies as they evolve. Focusing on individual members of traffic can actually shed light on some of the changes that affect a language.

Much of this idiolect-and-language or vehicle-and-traffic interdependence falls in the category of the dichotomy between individual and group selection in biology, with pressure on individuals to make selections that are beneficial or adverse to the interests of their groups as speakers or drivers aim at maximizing individual benefits B la Bourdieu (1991). For instance, the traffic is often affected by hurried drivers who want to pass every other vehicle. Other drivers often join the speedy trail. When there are no troopers to patrol the highway and there are no particular obstacles in their path, a significant proportion of the traffic may accelerate. However, as pointed out above, there are also cases when individual drivers singly drive at a speed that is too fast or too slow and constitute a danger for the rest of the traffic. Their impact on the rest of the traffic may amount to nothing more than transitory nuisance.

There are several speakers whose peculiarities are not copied by others. One of the

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At best, there have been evolutions in both directions, if one accepts Givón's (1971) argument that agglutinating temporal markers in the Bantu verb complex evolved from erstwhile verbs. What has been assumed about the development of creoles from putatively pidgin ancestors has turned out to be a misinterpretation of history, at least to those of us who argue that these vernaculars have evolved directly from their nonstandard European lexifiers by gradual divergence in the direction of their present basilects, without an intermediate pidgin stage (Alleyne 1971, Chaudenson 1992, 2001; Mufwene 2001). Interlanguages are transitional idiolectal stages when a second or umpteenth language is targeted. They do not contradict my observation.

interesting aspects of language evolutions is that there are a lot of innovations or deviations that do not spread within the speech community. As a matter or fact, successful innovations or deviations, which are copied by other speakers, are quite few in number compared to numerous others that are produced daily and die immediately or are short-lived within a network of speakers. This state of affairs accounts for why communal languages are assumed to be generally stable, changing very little during (parts of) the lives of some speakers, especially with regard to grammar and phonology (consistent with Dixon's 1997 claim of punctuated equilibrium). For instance, the divergent chain shifts in the vowel systems of Northern and Southern White vernaculars as well as in African-American vernacular English, discussed respectively in Labov (1994) and Bailey & Thomas (1998), are unusual stochastic punctuations in the history of American English, just like the few cases of further grammaticization of invariant *be* (as in *we be minding our own business*) to express the PROGRESSIVE meaning, reported by Bailey & Maynor (1987).

In language, changes are usually initiated by individuals. They take place at the communal level only after a significant proportion of speakers, say a particular social group (defined by age, gender, or socio-economic class) have adopted the change. Some of the changes spread rapidly and some take a longer time, depending on what advantages speakers find in adopting them, consistent with Bourdieu's (1991) notion of linguistic capital. As far as traffic is concerned, it is in some cases simply the wisdom of not being

too slow or too fast in the company of, conversely, fast or slow drivers that prompts the driver to adjust their speed. In the case of language, where the pressure of sounding like one's cohorts is often hard to resist, changes wind up largely being contained in a particular social group. Thus rare are adult Americans who use *thingy* for *thing* or quotative *like* to report speech with some pretense of quoting a particular speaker. In both cases of traffic and language, the personality of the driver or the speaker matters. There are always individuals who are not afraid of being unique, regardless of whether or not they recruit followers. Some particular professors or politicians are marked by their idiosyncratic vocabularies or syntactic constructions. The late Jim McCawley was remarkable for complexity and imaginative examples in his writings.

By the same token, there are also slow drivers in any traffic, and they in turn may cause the overall traffic to slow down. These are the counterparts of those who resist changes in a language. They are not necessarily academy members, who have claimed the prerogative of legislating on language, but the influential cautious guys who are often last to catch up with changes or who, in their newspaper columns or some other fora, remind other speakers of what good usage is supposed to be. And there are always the older generations who stay different, just like old vehicles that either cannot pick up enough speed or can do so only at the risk of breaking down.

2.3. No cross-species analogs are perfect

No study of evolution in a language or in any species is complete without a discussion

of speciation and contact-induced change. Both phenomena are also common in vehicle traffic but do not seem to be cross-species homologs. They seem to illustrate where the comparison of language evolution and traffic flow are imperfect, consistent indeed with Mufwene's (2001:17, 193) observation that how a species evolves is in part a function of its ontogenetic properties and its species-specific modes of transmission.[17]

When two highways merge into one, their traffics merge in a way that illustrates some form of blending inheritance at the population level. Their respective vehicles combine, preserving their individual properties, although they renegotiate their patterns of coexistence relative to speed and position. The moment and point of encounter create a stochastic event that causes these adjustments. This change is more obvious when the merged traffic is to fork again into new streams that do not reproduce the pre-merger traffic bodies.

This particular process is similar to two populations speaking different languages that meet in the same territory. However, the traffic merger invoked here suggests only a

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[17] It is not by accident that this discussion has been limited to a comparison of traffic flow and language evolution without mention of processes of "transmission" and "acquisition," as relevant as they are to evolution. To begin with, the terms are used between quotation marks consistent with the observation in Mufwene (2001, 2002b, see also DeGraff 1999a, 199b, 2001a) that they are misnomers for active processes of idiolect-formation, viz., piecemeal system-development processes in which language-learners are engaged. This is a re-creation activity that usually also involves minor or major restructuring, which leads to what Lass (1997) characterizes as "imperfect replication." As explained in Mufwene (2001), regardless of whether such speaker-based restructuring is contact-induced, it can contribute to change in a communal language if more and more speakers produce it. Independent of this aspect of language evolution, it is not clear to me that there is a traffic counterpart to language "transmission" or "acquisition," although the whole process of traffic flow involves constant restructuring of its composition, as should be evident from section 2.2.

rather unusual, if not unknown, situation where none of the members of the relevant populations is interested in learning the other language, although they interact with each other. That would be a situation where there is societal bilingualism without individual bilingualism, much discussed in the literature on bilingualism but hardly illustrated with supportive examples. The situation would be possible if, unlike what the is suggested by the traffic merger, the populations remain isolated in their own respective neighborhoods and did not interact with each other at all.[18]

When populations mix in the way that traffics from two separate highways gradually do, speakers interact with their neighbors and at least members of one group will eventually try to speak the other group's language. No such thing really happens in traffic, because drivers remain in their vehicles (the counterparts of idiolects). Although they accommodate each other during the merger, often repositioning their vehicles and adjusting their respective speeds to avoid collisions, none gives us their pre-merger vehicle to drive another from the other pre-merger traffic.

Vehicles in traffic are like Darwinian organisms, with their mechanical makeups (analogous to genotypes) remaining the same from the time their drivers started moving

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[18] Appel & Muysken (1987:2) in invoking "former colonial countries, where the colonizer spoke English, for instance, and the native people a local language." No such situation really obtained, because the colonizers endeavored to learn some form of the local language, which was necessary for their survival, and/or trained colonial auxiliaries in a variety of their language so that they could function as interpreters. Colonization could not have been effected without any form of communication between the colonizers and the colonized, although, more often than not, command of the others' language left much to be desired.

them and/or got them into the traffic. On the other hand, idiolects are more like Lamarckian organisms whose structural features change several times during the lives of their speakers (Mufwene 2001, Chapters 1 and 6). Their systems can change several times during their lifetimes not only by substitution of features but also additively (by copying features from other idiolects) or substractively (by getting rid of some features) as their speakers accommodate each other.

Moreover, speakers can use more than one language. Under various pragmatic constraints that need not be discussed here, they can alternate from one to another while the communal languages continue to be spoken in the settings in which they evolve. Drivers can only be in one vehicle at a time and can therefore not alternate from one to another in the same traffic, not without abandoning the vehicle they step out of and causing problems to the traffic flow. Bilingual speakers do not have to give up one language while speaking the other. In addition, the languages spoken by one speaker can influence each other, because a speaker can borrow materials from one language while speaking another. Such influence is of a different nature from speed adjustments that drivers make under the influence of others in traffic. I know of no counterpart of linguistic osmosis and mutual influences of idiolectal (sub)systems on each other in vehicle traffic.

Such dissimilarities are consequences of an important ontogenetic difference between a language as population of idiolects and traffic as a population of moving vehicles. Languages are like viral species that can copy features (analogs of genes) from each other,

except for the fact that languages can accumulate features additively in the same idiolect, sometimes using more than one feature for the same communicative function. For instance, speakers who have been exposed to different dialects may have alternative pronunciations for the same word (e.g., [i:xcr] ~ [aixcr] for *either*, or [ru:t] ~ [rawt] for *route*), alternative terms for the same denotation (e.g., *pail ~ bucket*, *coke ~ soft drink*, or *rippled ~ grooved pavement*), or alternative syntactic constructions (e.g., *ask him not to come ~ ask him to not come* or *there are ~ there's ~ it's a lot of people there*).Vehicles in traffic cannot alternate between competing mechanical properties.

Moreover, drivers on the highway have no experience comparable to that of language shift. This peculiarity accounts for an important difference between some consequences of language contact and those of traffic merger. As noted above, when two traffics merge into one, they literally blend into a new traffic in which vehicles from both gradually reposition themselves into the new one. However, when two languages or dialects come in contact with each other, they do not necessarily merge. One of them can gradually disappear from the scene, through the process of language shift, whereby one of the coexistent populations of speakers gives up their language for the language of the other population.[19] Many immigrant populations to settlement colonies have lost their

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[19] Note that when two or more populations come in contact, they do not behave like organized sport teams with common goals and well-orchestrated rules of conduct in relation to each other. Members of the populations behave as individuals, with similarities in their behaviors following mostly from the common cultural backgrounds, which have not suppressed their individualities, not any more than sharing a language has eliminated idiolectal differences. Responses to communicative pressures from the contact setting are individual, though speakers are influenced by each other. Some feel it sooner and/or more strongly than

languages to that of the economically and politically dominant group. For instance, English has prevailed in the United States, in most of Canada, and in Australia at the expense of several European languages that either have been given up or are moribund now. The loss and endangerment of numerous indigenous languages in the same territories illustrate the same contact phenomenon.

The closest thing to such an evolution in vehicle traffic would be a situation never attested, though possible, in which drivers from one of the highways would gradually dispose of their vehicles and drive others coming from the other highway. One would have to explain how they dispose of their older vehicles (without inhibiting the traffic flow), in ways that are not required to account for language shift. A language that one gives up simply vanishes from one's repertoire of language varieties, by virtue of no longer being spoken. If it is given up by all its pre-contact speakers and their offspring, it vanishes from the setting in which it used to compete with the language that has prevailed. Abandoned vehicles do not likewise vanish, though they are usually removed from the roadway. Also, languages that disappear often, if not usually, affect the prevailing one, with what has been identified as substrate influence if they are indigenous to the territory.[20]

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others and therefore shift earlier than others to the prevailing language or dialect. At the population level, the shift from one language to another is a gradual and often protracted process.

[20] In creole linguistics, the term has also been extended to languages that had been spoken by the subordinate group and had to be given up for that of the dominant group, also identified as the lexifier of the creole or pidgin that emerged from the contact. (See Goodman

Several cases of language diversification, including those that have traditionally concerned both genetic linguistics and the development of creoles, are due to language contact (Mufwene 2001). In genetic linguistics, the development of Romance languages seems to illustrate this evolutionary pattern most incontrovertibly. More generally, the history of mankind, marked as it is by population movements and contacts, suggests that the actuation of the speciation of Indo-European and Bantu languages (among other language families), or of the development of Old English lies in language contact. An ecology-based interpretation of the development of creole vernaculars and pidgins suggests that contact has played the same actuation role in the emergence of new dialects of European languages in former European settlement colonies, of varieties that have been disfranchised as indigenized Englishes or African French in former European exploitation colonies, and basically in all cases of language or dialect diversification.

Linguists can also take advantage of the comparison with the flow of highway traffic to show that languages do not evolve in either unilinear or rectilinear fashions. Materials that affect the evolution of a language, or what used to be the same one, enter its evolution at different junctures, early or later in its evolution, before or after it has bifurcated into offspring varieties. This latter alternative makes it possible for a daughter variety to be influenced by a particular language or dialect while others do not undergo those particular influences. Thus, for instance, American English varieties have been subjected to

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1993 for an interesting discussion.)

influences from continental European and African languages in ways not experienced by British varieties. Even in the United States, these non-English influences have not been experienced in uniform ways from one colonial setting to another.

It is quite true that, as noted by Kurath (1928), dialectal differences are largely traceable to original patterns of migrations from England. However, one must remember that the English did not live in (total) isolation from nationals of other countries. Their interactions with those other populations influenced the ways in which English was being restructured as it was being appropriated by locally born children and other immigrants who would "pass it on" to their offspring (bearing note 16, about "language transmission," in mind). Thus, the evolutionary path of a language is like that of a highway traffic that is joined by other traffic and eventually bifurcates into more than one traffic stream with the only difference (noted above) that languages do not really merge.[21]

If unlike streams or rivers, traffic did not have to flow from the start on a prebuilt highway in the context of this reflection, the comparison between language evolution and traffic flow would be more informative. Bifurcation is one of those respects that make the comparison difficult. Other than drivers wanting to go to different destinations (following pre-established paths), it is difficult to explain why highway traffic bifurcates. The apparent similarity to language speciation in this case applies well especially to the

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[21] It is not really clear to me that Sprachbund, or language convergence, can be analogized with traffic merger. Although languages in such contact settings become more and more similar to each other, they still maintain their individualities, at least in the minds of their speakers. Recent history of the Balkans since the collapse of the former Soviet Union has led

envelope of the two evolutionary phenomena, viz., the bifurcation or forking, and to the differential patterns that can emerge after the separation.

Vehicle drivers have destinations and the geographical distribution of these destinations physically require bifurcation in the interest of time and practicality. These considerations do not usually apply to language. Speakers contribute to the diversification of their languages unwittingly, despite their commitment to speaking the same language wherever they take it. Regional dialects correspond to language speciation only to the extent that the mechanisms of competition and selection vary from one geographical setting to another, depending in part on what proportions of speakers of other varieties came in contact where they currently live and/or what other languages have come in contact with their own.

Patterns of interaction are a significant component of the dynamics of language coexistence. However, speakers do not engage themselves consciously in the negotiations, accommodations, or innovations that bring about language change and divergence. The advantage of the comparison with vehicle traffic, rather than with a river that splits into a delta (Mufwene 1998), is useful in highlighting the way in which acts of individual drivers, like those of individual speakers, cumulate to produce, on the one hand, bifurcation of traffic and diversification in language evolution, and, on the other, different traffic and linguistic patterns. This is indeed very relevant to understanding Keller's

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to a reassertion of such identities (see, e.g., Friedman 1996.)

(1994) metaphor of "invisible hand."

We are thus also better prepared to address the subject matter of language drift, first discussed by Sapir (1921). Note that he used the word *drift* quite differently from the usage of the term in biology for divergence that is not caused by natural selection. Sapir intended by *drift* no more than regular divergence caused by changes that a language has undergone in a particular community that make its system different from what it used to be. He invoked it to account as much for the speciation of a proto-language into subfamilies and individual languages as for diversification of a language into dialects. He invokes both internal and external factors to account for how it proceeds, although one must be surprised to see him rule out some linguistic evolutions attested in creoles. For instance, he speculated that the development of the construction *me see him* from *I see him* would be a drift toward "horrors" (166), but it is attested in several creoles, a function of the selection of tonic pronouns over their atonic counterparts (according to a normal principle in the assignment of markedness values).

Several linguists have followed Sapir's mistake by stipulating or suggesting that creoles have not developed by the same natural processes that have produced language speciation. Indeed, the study of the development of creoles has rarely been considered part of genetic linguistics. Yet a closer comparison between language evolution and the flow of traffic should at least prompt us to re-examine this position. The development of creoles cannot be excluded from regular cases of language drift, under particular colonial contact conditions. The process it is in fact very similar in kind to the contact-induced

speciation of Vulgar Latin into the Romance languages, the divergence of Old English from Old West Germanic, and later diversification of English, among several similar cases around the world. It is an instantiation of Sapir's own conception of how drift, or divergence, works.

It may not be superfluous to reiterate here (from note 19) that, like traffic, communal languages do not come in contact with each other like well-organized teams. It is some cumulation of changes undergone by individual idiolects that affect their communal patterns. As Sapir observes, "What significant changes take place in [a language] must exist, to begin with, as individual variation" (155). He also states,

> (...) it by no means follows that the general drift of a language can be understood
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> from an exhaustive descriptive study of these variations alone. They themselves
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> are random phenomena, like the waves of the sea, moving backward and forward
>
> in purposeless flux. The linguistic drift has direction. In other words, only those
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> individual variations embody it or carry it which move in a certain direction, just
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> as only certain waive movements in the bay outline the tide. This drift of a
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> language is constituted by the unconscious selection on the part of its speakers of
>
> those individual variations that are cumulative in some special direction (155).

Sapir certainly makes it obvious that a language is as heterogeneous as a species is and its evolution is a function of the acts of its speakers, though they do not all behave the same way. Under Mufwene's (2001) conception of a language as a species (extrapolated

from idiolects), Sapir's use of "direction" must be interpreted in the sense of trend that emerges our of what evolves in individual idiolects, not as some evolutionary direction that has been planned by speakers. The elaborate comparison in this essay underscores the importance of understanding the dynamics of the coexistence of idiolects and how they influence each other, regardless of whether they are native or xenolectal, without any predetermined plan about what patterns of traffic flow are likely to emerge. The actuation of language evolution, including what Sapir identified as "drift" lies nowhere else but in the behaviors of individual speakers, whose primary concern is communication. In this context, his use of the term "unconscious selection" is similar to "natural selection" in biology, meaning prevalence out of a range of competitors. No speaker deliberately plans a particular restructuring process, while the ecology of their language rolls the dice on how its evolution proceeds.

3. Conclusions

The overall picture from the above considerations is that traffic is heterogeneous and does not flow at a uniform speed. The flow itself is subject to the interaction of various factors that largely reflect or affect the motions of individual vehicles. This is also true of language evolution, which does not proceed at the uniform pace and reflects the cumulative actions of individual speakers during their speech acts (Mufwene 2001). Thus the evolution of a language is a function of how the individual evolutions of its idiolects balance out.

Overall, the comparison corroborates my position that a communal language is more like a biological species than like an organism. It exists only to the extent that there are idiolects that co-exist whose speakers interact with each other and sometimes modify their systems either to meet new communicative needs or to accommodate other speakers. The focus on individual speakers, like on individual drivers on a highway makes it possible to account for population contact and the various ways in which they can coexist, depending on whether or not their individual members interact with, and influence, each other's behavior. Interaction and all it entails among the interactors is where the action that brings about change lies. That is where Keller's (1994) "invisible hand" operates. One way or another individual actions of drivers in traffic and speakers in a language community cumulate to produce what is later identified as evolution, i.e., the long-term changes that are observable in the behavior or characteristics of a species or, more generally, a population.

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