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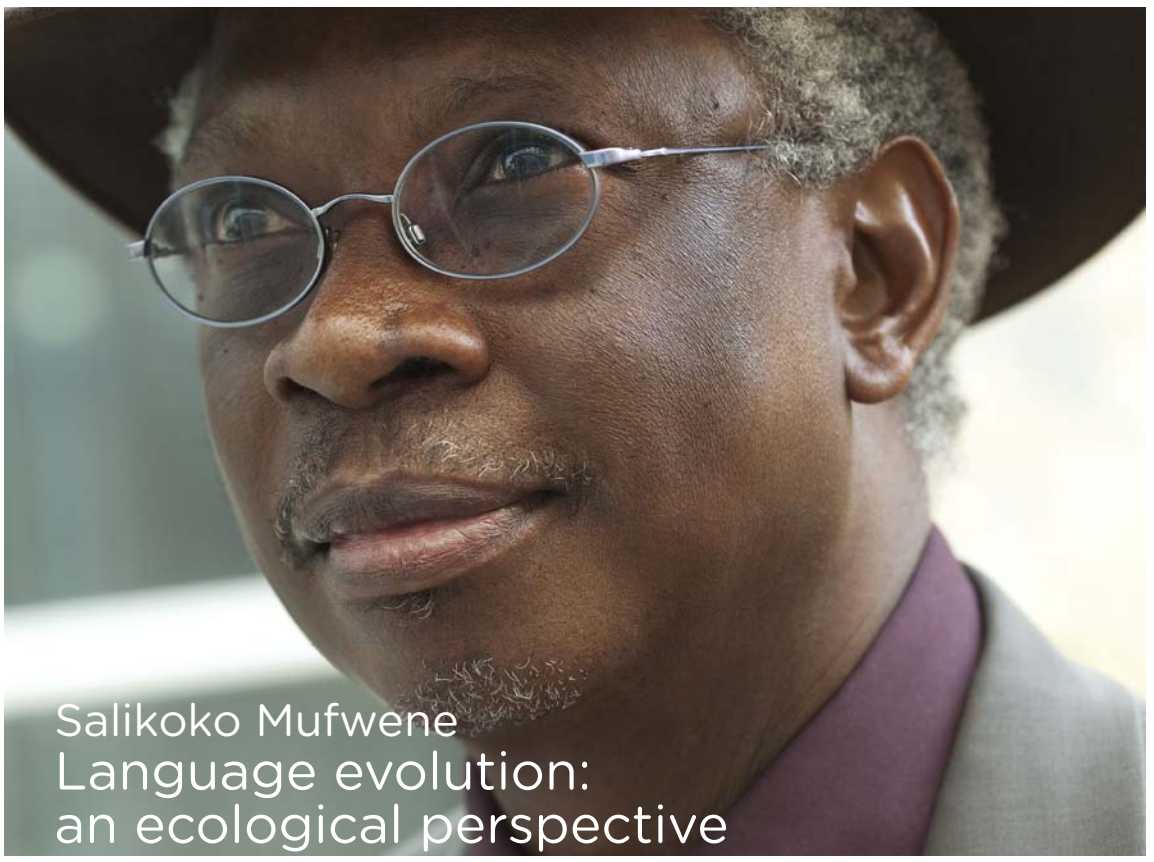

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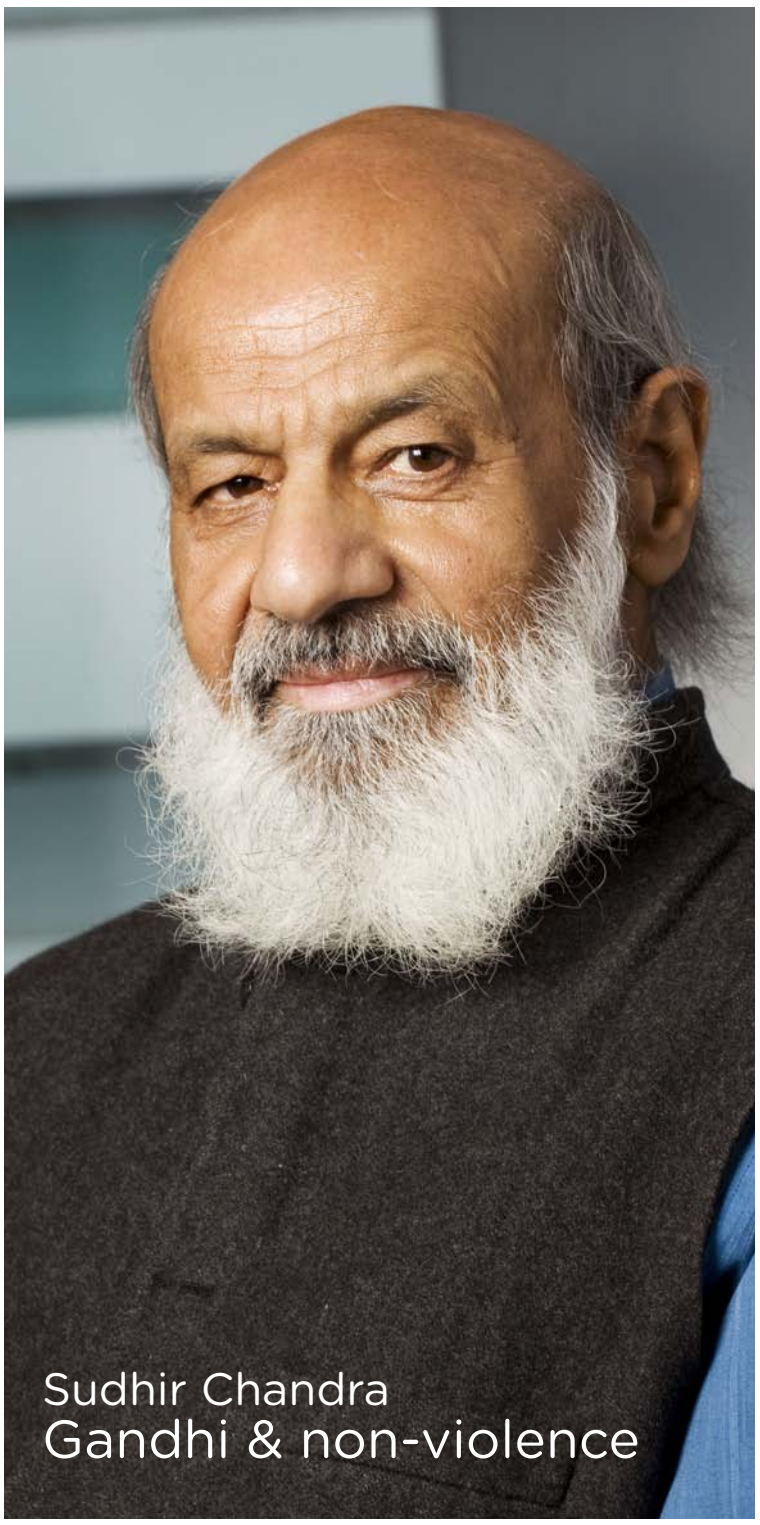

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# LANGUAGE EVOLUTION: AN ECOLOGICAL PERSPECTIVE

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Language is a complex phenomenon and it can be examined from different complementary perspectives, including but certainly not limited to its modular architecture, its functions as means of communication and as identity marker, and its relation to cognition as catalog of knowledge and experience. In the context of my current research on language evolution, I have chosen to conceive of it both as a complex adaptive system and as a piece of technology that was built incrementally and has been modified several times over by its users and makers (speakers and signers alike) to meet their current communicative needs, under the influence of habits developed previously. The succession of these adaptive modifications, which often entail no improvements, is what evolution boils down to. I mean by "language" (without an article!) what is identified in French as *le langage*, an abstraction of convenience for the common characteristics of individual languages, which downplays diversity among them.

Various generations of individuals have successively and collectively contributed to the current states of individual languages as pieces of technology, contributing or modifying a component or a function at a time, subject to various direct and indirect ecological factors, as explained below. At the population level, the process of producing technology involves innovators and copiers. This state of affairs introduces variation and therefore competition and selection, as different innovators often introduce variants (forms or structures) for the same functions. The copiers show preference for one or the other, for various reasons, such as what is more efficient, what is less costly (say, in terms of energy), or what is easier to use. This complex communal process reduces variation to smaller ranges of variants acceptable to the population using the technology. These considerations apply to language too, for instance, regarding words or particular constructions intended to describe particular activities, emotions, or states of minds. In time, self-organization produces communal norms, which typically just reduce variation and define patterns thereof. Thus, in French, one can say *le livre dont Marie m'a parlé* just as another can say *le livre dont m'a parlé Marie*. Linguists think of these (variable) patterns as fitting into "systems," but we could also identify them as "emergent patterns," in the language of complexity theory. The convergent processes that produce them are hardly controlled by the speakers or signers of the relevant languages, because languages do not emerge by design.

My research at the Collegium de Lyon is an extension of my ecological approach to language evolution as explained in my books *The Ecology of Language Evolution*[1], *Créoles, écologie sociale, évolution linguistique*[2], and *Language Evolution: Contact, competition and change*[3]. Inspired by population genetics and macroecology, I then focused on how indirect external ecological factors (e.g., population movements, the particular dialect mix of the allopatric population, the kinds of languages spoken by the people they came in contact with in the colony, and population structure, which determines patterns of social interaction) influenced language change. I attempted especially to explain the ecological factors that trigger or favor the speciation of some dominant languages into new varieties and, in some cases, the concurrent, or perhaps consequent, loss of the socially "weaker" languages. I started with the emergence of creole language varieties; then I extended the approach to all colonial varieties of the imperial European languages (especially English and French), and even to the dispersal and diversification of Indo-European and Bantu languages, the families I understand the best.

Impressed by the explanatory power of the ecological approach, particularly regarding the actuation of change, I now attempt to apply it to the protracted phylogenetic evolution of language or languages. I project an evolutionary trajectory that extends from what can be identified as *Homo tacitus* (corresponding to any of our early hominid ancestors up to *Homo habilis*) to *Homo loquens* to meet various pressures to communicate, in increasingly more complex ways, at various stages of the hominid evolution all the way to Late homo sapiens. Following Brian Arthur[4], I interpret technology as whatever an individual or population develops, physical or mental, to serve some purpose. This includes solving communicative problems.

The structure of a particular piece of technology need not be monolithic; it can involve components of different natures, as with computers, which consist of both hardware (which is physical) and software (which includes various complex abstract algorithms). In the case of language, hominids domesticated their own anatomy, viz., the lungs and the bucco-pharyngeal structure to speak and the hands to sign. The vocal and manual signs produced are physical; they carry meanings, mental abstractions packaged into information chunks of different sizes, without which the vocal and manual gestures would have no significance in communication. All this is the essence of the linguistic technology, though I am oversimplifying things in this short exposition of an architecture that is much more complex, as several modules run concurrently when we speak or sign, as well as when we process utterances (spoken or signed).

From a phylogenetic perspective, the concurrently evolving mind and social structures played a critical role in the gradual invention of language, but the architecture of this emergent technology was subject to the direct ecological constraints that the human body imposed. This can be conceived of on the model of the production of music, which is constrained by the particular instruments used, including the singer's vocal organs. Music produced with a string instrument is of necessity different from that produced by a wind instrument, notwithstanding the specific kind of instrument used (say, a guitar or an accordion); and the singer's voice affects the quality of the production, regardless of the specific skills of the relevant agents.

> I attempted to explain the ecological factors that trigger or favor the speciation of some dominant languages into new varieties and, in some cases, the concurrent, or perhaps consequent, loss of the socially "weaker" languages.

From the point of view of architecture of languages, linearity (the stringing of units), which is more significant in speech than in signing, is a consequence of the fact that only one sound can be produced at a time. The phenomenon is less true in signed languages, as two (or perhaps more) signs can be produced concurrently, so that the sign for flying and the sign for upward motion can be produced concurrently to mean "flying up", which I just expressed in English with "flying" expressed first and then the direction up following. In the activity I described, both the motion and the direction actually take place concurrently, and signing captures it more iconically than English. An aside of this phenomenon is the question of how language of thought or conceptualization is correlated with the languages we speak or sign. Although the language of thought is less constrained by time, and it need not be subject to linearity, can populations have been so influenced by their languages that their conceptual patterns correspond the ways the information is packaged into words and phrases, variably from one language to another? Cognitive linguists and linguistic anthropologists should be interested in this kind of question.

Phonology (the particular ways that sounds can be combined into words in a particular language) and syntax (how words can be structured into sentences of different kinds) are derivative consequences of linearity. They illustrate the arbitrariness of cultural conventions, which must be learned. Other kinds of cognitive factors impose constraints on, for instance, how related constituents can be moved in a sentence, such as when we ask questions and move the question word to the beginning of a sentence in European languages, or when we form a relative clause and move the element in focus to the beginning of a clause (as in *the man*$_i$ *<u>whom</u> you talked to* 0$_i$). The constraint in this particular case has to do with keeping track of the moved constituent (*whom*) and tracing it easily to the relevant position in the sentence (marked by "0") — I have coindexed them in the example with the subscripted "i."

Among my research questions are the following: 1) When did particular aspects of language emerge in human phylogeny? 2) What particular evolutionary stages of human anatomy and mind favored these evolutions? 3) How did the changes happen? 4) What particular developments may be considered as consequences of which earlier evolutionary stages? 5) What led to complexity in the emergent languages? 6) What are the consequences of thinking of languages as complex adaptive systems? 7) Does linguistic diversity today provide any hints about whether the origins of language or languages are monogenetic or polygenetic? These are plenty of research questions to keep me busy for the next few years.

1 Cambridge University Press, 2001, 276 p.
2 L'Harmattan, 2005, 230 p.
3 Continuum, 2008, 376 p.
4 *The Nature of Technology: What it is and how it evolves*, Free Press, 2009, 256 p.