REVIEW

From Phonetics to Phonology: theoretical and methodological accomplishments

Lucas Santos SILVA ⓘ
Federal University of Sergipe (UFS)

Victor Renê Andrade SOUZA ⓘ
Federal University of Sergipe (UFS)

ABSTRACT

In this text, we present a review of the lecture *Phonology: accomplishments and challenges* delivered by Professor and Doctor Thaís Cristófaro Silva (FALE-UFMG) and mediated by the Professor and Doctor. José Sueli Magalhães (UFMG) on July 16th, 2020, as part of the program of the Abralin Ao Vivo – Linguists Online event. Cristófaro-Silva explains the accomplishments, advances, and challenges of the past years in Phonology. The lecturer i) presents an overview of the methodological and theoretical contributions from Phonetics to Phonology studies, considering the peculiarities referent to their respective fields of study; ii) considers the emerging phonological phenomena in Brazilian Portuguese, such as the nasalization and palatalization; and iii) describes the main accomplishments of Phonology in Brazil, drawing attention to the plurilinguistic diversity existent in the country and citizens' social commitment to know this reality.

RESUMO

Neste texto, apresentamos uma resenha da conferência *Fonologia: conquistas e desafios* proferida pela Professora Doutora Thaïs Cristófaro Silva (FALE-UFMG) e moderada pelo Professor Doutor José Sueli Magalhães (UFMG) no dia 16 de julho de 2020, integrando a programação do evento Abralin Ao Vivo – *Linguists Online*. Cristófaro-Silva explana acerca das

conquistas, dos avanços e dos desafios dos últimos anos na Fonologia. A conferencista i) apresenta um panorama das contribuições metodológicas e teóricas da Fonética aos estudos de Fonologia, considerando as peculiaridades referentes aos respectivos campos de estudo; ii) considera fenômenos fonológicos emergentes no Português Brasileiro, a exemplo da nasalização e da palatalização; e iii) descreve as principais conquistas da Fonologia no Brasil, chamando atenção para a diversidade plurilinguística existente no país e o compromisso social dos cidadãos em conhecer esta realidade.

One of the human innate capacities is the evolutionary capacity. Men are naturally creative and innovative. We always innovate and evolve. These advances bring gains for all humans and for a variety of scientific knowledge fields. As science, Linguistics has also greatly evolved, since the neo-grammarians to the experimental studies of linguistic processing, with the availability of new theories and methodologies.

The accomplishments and advances in the last years in Phonology, explained by the Professor and Doctor Thaís Cristófaro Silva (FALE-UFMG) at the event Abralin ao vivo – Linguists Online, are discussed in this text. The lecture *Phonology: accomplishments and challenges*, which happened on July 16th, 2020, was mediated by Professor and Doctor José Sueli Magalhães (UFMG).

Thaís Cristófaro Silva is a volunteer Professor at the Graduate Program in Linguistic Studies at the Federal University of Minas Gerais. She is an excellent professional and a reference in the studies of Phonetics and Phonology of Brazilian Portuguese (PB). Besides, she has published numerous articles and books, among which we cite: *Phonetics and Phonology of Portuguese ´Study guide and* exercises (Fonética *e Fonologia do Português – Roteiro de Estudos e Guia de Exercícios*) (1999); *Exercícios de Fonética e Fonologia* (Phonetic and Phonology exercises) (2003); and most recently, *Acoustic Phonetics: the sounds of Brazilian Portuguese* (Fonética Acústica: *os sons do português brasileiro*) (2019), which compose the bibliography of many letters courses across Brazil.

In the contextualization of her talk, Cristófaro-Silva stresses the importance of the advances of Phonetics and the incorporation of other aspects that would generally be left aside as the relationship between Language and Brain, under a cognitive perspective. This scientific advance directly contributed to the reflections of Phonology as field of knowledge.

The author exemplifies these gains with Bryan Gick, Ian Wilson and Donald Derrick's book *Articulatory Phonetics* (2013), which brings reflections on the articulation of sounds and speech production under an anatomic bias, starting from the brain, following the peripheral nervous system, and then ends with the muscular movement. Beyond purely articulatory descriptions, this dialogue makes linguistic science progress and offers a wider understanding of language functioning; not only about anatomy, but also about physics and many other things that widen this field of knowledge.

Cristófaro-Silva argues that the evolution of Phonetics made phoneticians re-think their practices with a new proposal of incorporating acoustic analysis and experimental methodologies. For the author, one of these advances was the invention of PRAAT, a free software that enables the acoustic analysis of speech data (BOERSMA; WEENINK, 2017), and also synthesizes and manipulates from segments to the melody of speech sounds, creating figures of high quality as spectrograms, oscillograms, pitch contour, and intensity (FONSECA, 2009).

Based on the researcher's own experience, if it were only possible to view a spectrogram of speech overnight, today we have new technologies and even new methodologies that automated the process. There have been advances other than PRAAT in the analysis with the use of video to capture the speech (FREITAG *et al.*, 2020); ultrasound analysis used to assess images of internal organs during speech production (GICK, 2002; VASSOLER; BERTI, 2015); analysis with the use of electromagnetic articulography (EMA), which uses alternative magnetic field devices for acquiring articulatory data (BAKEN; ORLIKOFF, 2000; MEIRELES, 2017); use of Electropalatography which offers information on the contact of the language with the palate in real time (JESUS, 2010); study with Electroglottography, used in the investigation of the vibrant functions of the vocal fold (MOURÃO; BASSI; GAMA, 2011) among other methodological perspectives.

The evolution in Phonetics towards an Experimental Phonetics is, then, observed. For Cristófaro-Silva, this direction, as a consequence, impacted the understanding of Phonology. As new methodologies are applied, new questions are also made.

Another advance mentioned by the author concerns the elaboration of a symbolic apparatus able to represent and transcribe the features of sound production of natural languages, as the International Phonetic Alphabet (IPA), elaborated by the International Phonetic Association and based on the Latin Alphabet. Despite its importance, according to Cristófaro-Silva, the representations of IPA are violable for being generally confused with representations of the written system and with phonological representations. This confusion is understandable, since the evidences show that people store linguistic material with a detailed and rich auditory and motor-sensory code which tends to be unique for each speaker (PAUL, 2011).

In order to present the differences of the representations in each one of the systems, Cristófaro-Silva systematized the table below:

PHONETICS	PHONOLOGY	WRITING
Level of the phones	Level of the phonemes	Level of the letters
Level concrete/physical	Abstract level	Orthographic level
Motor processing	Cognitive Processing	Writing process
Pronounceable	Unpronounceable	Reading

Performance	Competence	Writing
Gradient	Discrete	Conventional
[....] brackets	/.../ transversal bars	Letters

TABLE 1 - Representation of the systems
Source: FONOLOGIA (2020)

However, in spite of this consolidation and the symbolic advances of IPA, the transcription norms have not effectively reached classrooms through didactic books. Cirstófaro-Silva discusses a research made with 8 didactic books in which she found distinct patterns for the phonetic and phonological representations: 1) data presented WITHOUT [brackets] or /transversal bars/; 2) data only with /transversal bars/ indicated; 3) phonetic representations presented between /transversal bars/, in the case of dictionaries; 4) the orthographic forms are listed and the corresponding symbol(s) are phonologically indicated; 5) combines orthography and phonetic representation.

The description levels and representations already consolidated are important but are not used in didactic books. According to the author, this happens because there is a symbiosis between Phonetic and Phonology, an unsolved problem that requires much attention due to the confusion that might be caused. For that, Cristófaro-Silva suggests the reading of April Mcmahon's *Sounds, brain, and evolution: or, why phonology is plural* (2007) according to which the problem in the distinction of two similar domains is part of our representational confusion. While Phonetics work with the empiric and the symbolic, Phonology works with the abstract (MCMAHON, 2007).

The author continues her talk explaining the theoretical evolution and terminologies applied to Phonology. We have, as examples: Phonological Representation; Phonemic Representation; Underlying Representation, of the Generativism; Lexical Representation; Mental Representation, of Usage Models (BYBEE, 2001) and of Optimality Theory (PRINCE; SMOLENSKY, 1993); Gesture Representation; Input; and Exemplars, of the Exemplar Model (JOHNSON, 1997; PIERREHUMBERT, 2001).

These theoretical and terminological changes are important for us to conceive the new and to realize how much the area has evolved. The author resorts to a comparison between the traditional proposal of the Phonology and the Exemplar Model as an example, which is presented in table 2.

TRADITIONAL PHONOLOGY	EXEMPLAR MODEL
Minimalist mental representation	Detailed mental representation
Separation between Phonetics and Phonology	Inter-relation between Phonetics and Phonology
A view of Phonology as a grammatical form, with the use of abstraction	Frequency effects stored in long-term memory
Categorical phonotactic judgment	Gradient effects in phonotactic judgments
Lexicon separated from the phonological grammar	Words as locus of the categorization

TABLE 2 - Comparison between the traditional Phonological proposal and the Exemplar Model
Source: Oliveira-Guimarães (2004, p. 40).

Treating Grammar and Language as a complex system, a single representation, proposed by Traditional Phonology, raises a series of problems to deal with the dynamicity which is inherent to the system itself. Therefore, it is necessary to think about alternative forms, as Experimental Phonology or

Laboratory Phonology, an approach initially proposed by Pierrehumbert, Beckman and Ladd (2000), which "sought to strengthen the scientific bases of Phonology through the use of empiric data, methodological improvement, explicit modeling, and accumulation of results" (CANTONI, 2013, p. 85).

In order to evidence the methodological advances, the author brings an overview of phonological phenomena of Brazilian Portuguese (PB) and cites the process of nasalization, which happens when a vowel is followed by a nasal consonant (CÂMARA JR., 2009[1970]). The author claims that in Brazilian Portuguese the nasalization in the end of syllables and words is an emerging phenomenon, as in *vamos vamos* > *[vʌm]*, *Dona Maria* > *[donmaɾiə]*, and *cano torto* > *[kʌntohtʊ]*. In such a way, Cristófaro-Silva discusses the phenomenon of palatalization of t/ and /d/ before the semivowel /y/ and/or followed by the high vowel /i/, mid vowel /e/ unstressed in high position [i], which may happen in realizations such as ['ti.ɾʊ] and ['tʃi.ɾʊ]. In both phenomena, the acoustic analysis, for example, may demonstrate the spectrographic difference between the speech signal and its variability when the physical characteristics of different speakers are observed.

Finally, the author describes the main accomplishments of Phonology in Brazil and draws attention to the linguistic diversity in Brazil, emphasizing the minority languages and the description of sound systems of indigenous languages. In addition to that, the lecturer highlights the professional qualification that stemmed by the opening of a variety of graduate programs in Linguistics, Laboratories, Research Groups, and events on Phonetics and Phonology in numerous Brazilian states.

Despite all the theoretical and methodological advance in Phonology, we need to keep evolving and go one step ahead. We have scientific and technological maturity to think about new methodological proposals and new questions to our research and linguistic descriptions. One of these advances, according to Cristófaro-Silva, would be formalizing a proposal of integration with cognitive sciences, as in other countries, which may deepen our understanding of human language production. We shall move ahead, then!

REFERENCES

BAKEN, Ronald J.; ORLIKOFF, Robert F. *Clinical measurement of speech and voice*. Cengage Learning, 2000.

BOERSMA, Paul; WEENINK, David. *Praat: Doing phonetics by computer* (Version 6.0.33)**.** 2017. Available at: http://www.praat.org/. Accessed in: May 21st, 2020.

BYBEE, Joan. *Phonology and Language Use*. Cambridge: Cambridge University Press, 2001.

CÂMARA Jr., Joaquim Mattoso. *Estrutura da língua portuguesa*. Petrópolis: Vozes. 42ª ed, 2009 [1970].

CANTONI, Maria Mendes. *O acento no português brasileiro*: uma abordagem experimental. 2013. Tese (Doutorado em Linguística Teórica e Descritiva), Faculdade de Letras, Universidade Federal de Minas Gerais, 2013.

CRISTÓFARO-SILVA, Thais, et al. *Fonética Acústica:* os sons do português brasileiro. São Paulo: Contexto, 2019.

CRISTÓFARO-SILVA, Thais. *Exercícios de Fonética e Fonologia*. São Paulo: Contexto, 2003.

CRISTÓFARO-SILVA, Thais. *Fonética e Fonologia do Português*: roteiro de estudos e guia de exercícios. 10. ed. São Paulo: Contexto, 2015.

FONOLOGIA: conquistas e desafios. Conference presented by Thaïs Cristófaro Silva [s.l., s.n.], 2020. 1 video (1h 47 min 45s). Published by the Associação Brasileira de Linguística's channel. Available at: https://www.youtube.com/watch?reload=9&v=4V6soidU-jOw. Accessed in: May 19th, 2020.

FONSECA, Aline Alves. Análise do Tutorial do programa de análises acústicas Praat. *Revista Texto Livre*: linguagem e tecnologia, Vol. 1, nº 2, 2009. Available at: http://dx.doi.org/10.17851/1983-3652.2.1.13-16 . Accessed in: May 21st, 2020.

FREITAG, Raquel Meister Ko. *et al.* Pilot study of the relationship between the judgment of linguistic features and facial expressions. *Cadernos de Linguística*, v. 1, n. 2, p. 01-19, 14 Aug. 2020.

GICK, Bryan. The use of ultrasound for linguistic phonetic fieldwork. *Journal of the International Phonetic Association*, p. 113-121, 2002.

GICK, Bryan; WILSON, Ian; DERRICK, Donald. *Articulatory phonetics*. Wiley-Blackwell, 2013.

JESUS, Marisa de Souza Viana. *Estudos eletropalatográficos na fala normal e alterada decorrente da fissura labiopalatina*. 2012. Tese (Doutorado em Linguística Teórica e Descritiva), Faculdade de Letras, Universidade Federal de Minas Gerais, 2012.

JONHSON, Keith. Speech perception without speaker normalization. In: JOHNSON, Keith; MULLENNIX, John W. (Ed.). *Talker variability in speech processing*. Morgan Kaufmann Publishers Inc., 1997.

MCMAHON, April. Sounds, brain, and evolution: or, why phonology is plural. In: PENNINGTON, Martha (Ed.). *Phonology in context*. Palgrave Macmillan, London, 2007. p. 159-185.

MEIRELES, Alexsandro Rodrigues. O uso do magnetômetro (EMA) na análise de dados articulatórios da prosódia da fala. In: FREITAG, Raquel Meister Ko; LUCENTE, Luciana (orgs). *Prosódia da fala*: pesquisa e ensino. São Paulo: Blucher, 2017.

MOURÃO, Aline Mansueto; BASSI, Iara Barreto; GAMA, Ana Cristina Côrtes. Avaliação eletroglotográfica de mulheres disfônicas com lesão de massa. *Revista CEFAC*, v. 13, n. 6, p. 1073-1080, 2011.

OLIVEIRA-GUIMARÃES, Daniela Mara Lima. *Variação nas seqüências de (sibilante +africada alveopalatal) no português de Belo Horizonte*. 2004. Dissertação (Mestrado em Linguística) – Faculdade de Letras, UFMG, Belo Horizonte, 2004.

PIERREHUMBERT, Janet. Exemplar dynamics: Word frequency, lenition and contrast. In: BYBEE, J.; HOPPER, P. (Ed.) *Frequency effects and the emergence of linguistic structure*. Amsterdam: John Benjamins, 2001. p. 1-19.

PIERREHUMBERT, Janet; BECKMAN, Mary; LADD, Robert. Conceptual foundations of phonology as a laboratory science. In: BURTON-ROBERTS, Noel; CARR, Philip; DOCHERTY, Gerard (ed.). *Phonological Knowledge*: conceptual and empirical issues.. Oxford: Oxford University Press, 2000. p. 273-303.

PORT, Robert. Phones and phonemes are conceptual blends, not cognitive letters. *Proceedings of the Annual Meeting of the Cognitive Science Society*, 33(33). 2011.

PRINCE, Alan; SMOLENSKY, Paul. *Optimality Theory* - Constraint Interaction in Generative Grammar. RuCCs Technical report 2, 1993.

VASSOLER, Aline Mara de Oliveira; BERTI, Larissa Cristina. Análise ultrassonográfica quantitativa da produção de encontros consonantais realizadas por crianças típicas e atípicas. In: *Anais do XXIII Congresso Brasileiro e IX Congresso Internacional de Fonoaudiologia*. São Paulo: SBFA, 2015.