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Carol A. Fowler's Perspective on Language by Eye

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ABSTRACT

This article considers highlights of Carol Fowler's development as a scientist against the background of major developments in the fields of ecological psychology, speech research, and the psychology of language. Beginning from her graduate student years, the focus is on those aspects of Fowler's research that pertain most directly to the relations between speech and reading.

Graduate studies in the psychology of perception and language

Carol Fowler, who as an undergraduate had begun the study of psychology and language at Brown University, moved to the University of Connecticut for graduate work arriving in 1971. She says she chose the University of Connecticut because while at Brown, at the suggestion of one of her professors, she had read and admired an article, "Perception of the Speech Code" (A. M. Liberman et al., 1967), by University of Connecticut Professor Alvin M. Liberman and three colleagues at the Haskins Laboratories in New Haven—Franklin S. Cooper, Donald Shankweiler, and Michael Studdert-Kennedy—two of whom (A. M. Liberman and Shankweiler) were also members of the Connecticut Psychology faculty when Fowler arrived. Shankweiler became Fowler's faculty advisor. Other faculty members who influenced the formation of her interests were Isabelle Liberman, Ignatius Mattingly, Michael Studdert-Kennedy, and Michael Turvey. Fellow students, from both the Psychology and Linguistics departments, were also important: she mentions Susan Brady, Cam Ellison, Bill Fischer, Garry Kuhn, Len Mark, Claire Michaels, Terry Nearey, Bob Port, Tim Rand, Robert Remez, Philip Rubin, most of whom have subsequently gone on to distinguished careers in science. It is shown in this essay that early in her research career, indeed already as a graduate student, Fowler entertained and explored big ideas that were her own. Of special importance is her clarifying view of the nature of the phonological segment, which is fundamental to understanding speech and its derivative abilities, reading and writing.

Manifestations of Fowler's early interest in reading

When Carol Fowler arrived at the University of Connecticut's Psychology Department, Donald Shankweiler and Isabelle Liberman were beginning to conduct research with the aim

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to discover what children need to know about their language to be ready to learn to read as well as to discover why some children fail to become proficient readers in spite of schooling. Fowler was to become the first graduate student in the department to join in this endeavor. Although she eventually moved on to pursue different interests with other members of the faculty, and those interests came to dominate her research efforts, solving the puzzles of reading and its difficulties remained a challenge that she resonated to. She has continued to do original research and to write about reading throughout her long career, a career that led her to be chosen President and Director of Research at Haskins Laboratories, a position she held from 1992 to 2008.

During the time Fowler was a student, in the late 1960s and 1970s, the study of reading, long neglected by the dominant behaviorist psychology, was coming to the forefront with the rise of the then new cognitive psychology (Neisser, 1967). She was challenged by the problems of reading that were being discussed and researched at the University of Connecticut. From the start, she was attracted to fundamental problems. She was struck, she says (C. A. Fowler & Shankweiler, 2015), by the importance of Alvin Liberman's insistence that reading cannot be an autonomous language skill; instead, reading by its nature is parasitic on speech (A. M. Liberman, 1968). In keeping with that insight, Fowler and her mentors, Isabelle Liberman and Shankweiler, designed studies to clarify what children learn about the phonology of the ambient language that is useful for learning the alphabetic principle and to discover how and when the ability to manipulate phonological structures becomes achievable for young children and useful for learning to recognize printed words.

Fowler's introduction to Gibson and ecological psychology

It is important for understanding the subsequent course of Carol Fowler's research career that during the period of her graduate study and afterward basic assumptions underlying theory in experimental psychology were being refashioned at the University of Connecticut by the infusion of James Gibson's theory of direct perception (J. J. Gibson, 1966), spurred by the developing research program of Michael Turvey and Robert Shaw, who did much to create the discipline of ecological psychology.¹ Fowler was greatly influenced by these developments beginning in 1974 with a course on perception taught by Turvey that contrasted the dominant information-processing approach to an ecological approach deriving from J. J. Gibson.

Extending ecological approaches to perception and action to speech

Carol Fowler should be credited with the first explicit extension of the ecological approach to the study of speech. Her dissertation, *Timing Control in Speech Production* (C. A. Fowler, 1977), examines the issue of whether the timing of constituents of an utterance is imposed externally via an a priori plan as generally believed at the time and argued in a famous paper by Lashley (1951) or whether timing falls out of the spontaneous self organization of the vocal tract structures as the utterance is produced, the view that Fowler proposed after a series of ingenious experiments.

¹The science alluded to in this section and the next is discussed by Turvey (this issue).

After taking her doctorate in 1977, Fowler took up a faculty position in the Psychology Department at Dartmouth College and joined the interdisciplinary research staff at Haskins Laboratories, where she had already been engaged as a student. Shortly thereafter she became a major contributor to a collaborative project to rework phonological theory, initiated by linguists Catherine Browman and Louis Goldstein under the influence of Turvey's theory of action. These Haskins researchers proposed a gesture-based approach to phonological and phonetic structure that they called "articulatory phonology" (Browman & Goldstein, 1986). The aim of this approach was to develop an explicit dynamical model based on the observed motions of the human vocal organs during speech. The approach is unique in that time in an inherent part of the definition of phonological entities and also that these are public things.

In this approach to phonology ... there is no separation between the mental (phonological) and the physical (phonetic) aspects of the spoken language as there is in other phonological theories, and hence no need for the supposition of other phonological theorists that a translation must occur between a symbolic and a physical domain of linguistic representation. Rather ... the phonology-phonetic contrast is between a low- and a high-dimensional characterization of the same speech system. (C. A. Fowler, 2011, pp. 12–13)

Fowler joined with Browman and Goldstein and others at Haskins Laboratories to further develop the theory and to create an experimental program that provided empirical underpinnings for this approach (e.g., C. A. Fowler, 1986). For example, experimental work was undertaken studying speakers' remarkable ability to adapt immediately to perturbation of the jaw during speaking (e.g., Kelso, Tuller, Vatikiotis-Bateson, & Fowler, 1984), work that was influenced by the general theory of coordinative structures developed by Michael Turvey (also a Haskins researcher) and Robert Shaw, which had strongly attracted Fowler during her graduate student days (see Turvey, this issue).

Toward an ecological approach to reading

It is telling that Carol Fowler also brought an ecological perspective on language and phonology to bear in shaping her ideas and research on reading. A contribution that is basic to understanding the fundamental nature of reading is the research and theorizing by Fowler and her associates that led to reconceptualizing the phonetic segment. Established traditions of speech research and phonology each have regarded discrete segments as purely mental entities. They are triggered by acoustic manifestations of articulations of a speaker's vocal tract in a perceiver who knows the language. The speech signal itself is quasi-continuous and apparently unsegmented. Fowler's research, in contrast, reveals segments as temporally overlapping physical entities that are present in articulation and specified in the acoustic signal. They are dynamically instantiated, coproduced, and gestural in nature (according to the special concept of phonetic gestures stemming from articulatory phonology, discussed by Turvey in this issue). This unifying perspective brings speech production, perception, and acoustics into alignment, thereby allowing a proper understanding of the nature of speech and clarifying the relations between speech and reading (e.g., C. A. Fowler, 1980, 2006, 2011; C. A. Fowler, Shankweiler, & Studdert-Kennedy, 2016).

A chapter examining research on reading acquisition written early in her career (C. A. Fowler, 1981) finds Fowler already seeking bridges between the ecology of perception and

reading. Reading, she notes, is a special kind of visual perception. The relation between the proximal and distal stimulus is constrained by a kind of grammar, a real-world physical grammar.

Orthographies and linguistic grammars are at once fundamentally similar and fundamentally different from physical grammars. They are similar in providing an organized set of restrictions (orthographic rules, phonologic rules, syntactic rules) on arrangements of a set of components (letters, phonemes, words). The arrangements of components that do occur thereby take on a message function that they would not have in the absence of the restrictions; they provide information about something other than themselves. (p. 173)²

A fundamental difference between physical grammars and linguistic grammars is that the former are a matter of physical law whereas the latter are matters of social convention. Others have also pointed to differences between general object perception and print perception: the former is 3D, the latter 2D; objects retain their integrity over rotation whereas perceiving letters and words requires the perceiver to adopt a specific orientation to the line of print that must be maintained during successive looks; scenes appear spontaneously whereas reading requires sustained, deliberate attention (e.g., E. J. Gibson & Levin, 1975). In consequence, although words are visual objects, would-be readers must learn a new way to perceive this class of visual objects.

Later in her chapter of 1981, Fowler discusses methods and results of studies that she and her graduate school mentors devised previously for the investigation of children's and adult's errors in reading words and nonwords (C. A. Fowler, Liberman, & Shankweiler, 1977; C. A. Fowler, Shankweiler, & Liberman, 1979). The purpose was to look for clues concerning what children are learning when they learn to recognize unfamiliar words, probing the view of Isabelle Liberman and her colleagues that for reading no less than for speech perception, the phonological structure of language must be perceived. Because of the arbitrary way that phoneme segments are conveyed in alphabetic writing, *phonological awareness* is a special requirement for learning to read in an alphabetic system (I. Y. Liberman, 1973; I. Y. Liberman, Shankweiler, Fischer, & Carter, 1974). In order to discover how alphabetic writing represents the language and to recognize the systematicities of spelling, a learner needs to become aware that words are composed of sequences of meaningless segments, consonant and vowel phonemes. This knowledge and the ability to use it do not arise spontaneously with the development of spoken language, however. Many preliterate children develop a rudimentary appreciation of sublexical segmentation, but literacy itself seems to be a precondition for full phonemic awareness. Hence, there is a bidirectional relationship between awareness and reading (e.g., I. Y. Liberman, Liberman, Mattingly, & Shankweiler, 1980; Morais, Cary, Alegria, & Bertelson, 1979).³

Fowler (1981) discussed possible reasons for children's delay in becoming aware of phonemes. She noted that by the time children are beginning to learn to read, speech-processing tasks are performed automatically in line with the general observation that attentional

²To enable language to be productive, its elementary particles, the phoneme segments, must be meaningless (gaining meaning ordinarily only in combination), as Studdert-Kennedy (2005) argued in his explication of the particulate principle of self-diversifying systems.

³As Fowler (1981) noted, the use of phonological awareness in promoting decoding abilities essential for developing skill in word recognition is not the only way that phonology is important in reading. Another use of phonology is to provide a vehicle for working memory during reading of connected text for meaning (see Baddeley, 1979; Shankweiler & Crain, 1986; Shankweiler, Liberman, Mark, Fowler, & Fischer, 1979).

demands of a task diminish with practice and skill. Preliterate children don't have phonological awareness because they don't need it for acquiring the spoken language. Fowler invoked the distinction between *knowing how* and *knowing that* (Ryle, 1949). Speaking and comprehending speech requires only a practical knowledge in which segments can be implicitly known ("knowing how"), whereas alphabetic writing and its decipherment require explicit recognition of segments and their serial order, that is, "knowing that." For Fowler (1981),

The difference lies in the *necessary relation* between acoustic stimulation and its phonetic significance, on the one hand, and the *conventional relations* between optical stimulation and its phonetic significance on the other. (p. 178)

Another possibility that Fowler considers in a later return to this question (C. A. Fowler, 2011) is that phonological aspects of lexical memory are not fully segmental in preliterate children (suggested by A. E. Fowler, 1991). She considers the possible import of the fact that vocabulary expands to include many similar sounding words that differ in only one phoneme, and this crowding creates pressure for more detailed word specifications in memory. Alternatively, literacy itself may be the principal stimulus to greater specificity. Supporting this possibility, Fowler cites findings that adult illiterates are less accurate than matched literate people in repeating new words or pseudowords that they hear (Castro-Caldes, Petersson, Reiss, Stone-Elander, & Invar, 1998). Fowler speculates that there may be a poorer coupling of phonetic gestures, for example lip and larynx gestures, in preliterate children and illiterate and semiliterate adults that makes it harder to establish links between spoken and written word forms (C. A. Fowler, 2011, p. 14).

Why does literacy in an alphabetic writing system foster phonemic awareness? Fowler suggests (2011, p. 15) that explicit experience with phonetic units, promoted by repeatedly writing and decoding words, is needed to relate them by conventional rule to symbols of the orthography. Advanced learners who read and write a lot gain phonological maturity (Mattingly, 1984), which

leads readers to see the sound system of their language (and probably to hear it as well) in a way that they did not hear it before they learned to read. (C. A. Fowler, 1981, p. 181)

This discussion suggests not only why awareness of segments need not develop during speech acquisition but also why it does develop with experience in reading.

Can phonology be bypassed in reading?

A big question for reading research from the 1980s up to the present time is whether skilled readers can bypass phonology. It has often been supposed that in order to read efficiently, a reader would need to read in a holistic manner. Carol Fowler observes that when people make this claim they may mean quite different things. Sometimes the claim is made that skilled readers read by "going direct to meaning." Although the meaning of this is unclear, it could mean that a skilled reader can ignore the specific words and directly apprehend from print the content of the message. But considering that words and their grammatical relations are the essential conveyers of a linguistic message, and considering that a word is ineluctably a phonological structure, Fowler (1981) promptly dismisses this possibility:

Inasmuch as words must be accessed [in spoken or written communications] rather than unlabeled meanings, it may make no sense to ask whether a reader goes directly to meaning. (p. 184)

A different claim, and one that Fowler does take seriously, is that in order to achieve rapid rates a skilled reader should identify the words as whole, unanalyzed visual configurations, bypassing sublexical phonological structure (which would be needed only to decode unfamiliar words). This hypothesis, she notes, has been the target of much experimental work, and there is evidence on both sides. But after weighing the evidence, she concludes that the phonology cannot ordinarily be bypassed in recognizing words and that purely visual reading is not possible. That this should be so, she remarks that

it is not surprising given that the written language is the spoken language translated into a visible medium. (C. A. Fowler, 1981, p. 193)⁴

In a recent article Fowler (2011) considers how diverse theories of phonology have contributed to the search for causes of the difficulties of attaining phonological awareness and related problems of reading acquisition. Phonology, the study of the systematic properties of the sounds of language, is the gateway to word formation and hence to conveying meaning by language. Phonology is central to reading because all writing systems have found some way, direct or indirect, to represent words as phonological entities (De Francis, 1989). Fowler evaluates the contributions of each of the main traditions of phonological studies: descriptive, generative, and articulatory for accuracy in representing speech and for understanding the challenges of reading in an alphabetic system.

In the descriptive approach to phonology, sometimes called the structuralist approach, the phoneme plays a central role in capturing linguistic contrast. Phoneme segments were established by intersubjective agreement; they are not physically apparent in the speech signal. This approach projected an analysis of phoneme segments as columns of distinctive features. The left-to-right arrangement of the columns corresponded to the order of the segments within a word, but this is a static conception; temporal properties are not represented. The omission of time, Fowler notes, creates a potential mismatch between the feature-column representation and observations of speech itself. One result is ambiguity as to the number of segments in some words. For example, it is an open question whether the first and last affricate consonants in “church” and “judge” should count as one segment or two. The same problem arises with diphthongs; they have some properties of one vowel segment and some of two. Fowler proposes that such ambiguities can contribute to the difficulties in achieving phonological awareness that often plague beginning readers.

She writes that

the assumption of descriptive phonology that words are composed of discrete countable consonants and vowels appears to be almost true. (C. A. Fowler, 2011, p. 16)

True enough, she notes, to ensure the viability of alphabetic writing systems, but at the potential cost of some degree of lack of fit between speech and writing, as she shows for complex segments, such as the affricates and diphthongs, mentioned earlier (see also Mattingly, 1992). It also fails to account for segments that undergo dynamic change over time; for example, the claimed poorer coupling of phonetic gestures in preliterate children that may

⁴This has remained Fowler's position, as is apparent in her discussion 30 years later (C. A. Fowler, 2011). For similar reasons, Fowler rejects the related hypothesis that learners in the course of becoming skilled acquire a separate visual lexicon. She prefers the alternative that there is one lexicon containing both graphic and linguistic information, not least because it is more economical.

also persist in illiterate adults. Articulatory phonology, being more ecologically valid, arguably provides a better grounded basis for describing these phenomena and conducting research. Fowler explains how the shortcomings of other approaches can be overcome by the gesture-based representational system of articulatory phonology. Only this approach to phonological theory, she notes, offers a principled way to solve the twin problems of the absence of time in phonological representations and their seeming inherent subjectivity.

A contemporary article pulls together the evidence from a variety of sources that converge on the claim that speech itself is essentially alphabetic. Phonetic segments have an objective existence. They can be traced in speakers' productions and in the acoustic signal, and they are perceived by listeners during oral communication by language and perceived by readers via their optical surrogates (C. A. Fowler et al., 2016).

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References

- Baddeley, A. D. (1979). Working memory and reading. In P. A. Kolers, M. E. Wrolstad, & H. Bouma (Eds.), *The proceedings of the conference on the processing of visible language* (Vol. 1, pp. 355–370). New York, NY: Plenum.
- Browman, C. P., & Goldstein, L. M. (1986). Towards an articulatory phonology. *Phonology Yearbook*, 3, 219–252.
- Castro-Caldas, A., Petersson, K. M., Reiss, A., Stone-Elander, S., & Invar, M. (1998). The illiterate brain: Learning to read and write during childhood influences the functional organization of the adult brain. *Brain*, 121, 1053–1063.
- De Francis, J. (1989). *Visible speech: The diverse oneness of writing systems*. Honolulu: University of Hawaii Press.
- Fowler, A. E. (1991). How early phonological development might set the stage for phoneme awareness. In S. A. Brady, & D. P. Shankweiler (Eds.), *Phonological processes in literacy: A tribute to Isabelle Y. Liberman* (pp. 97–117). Hillsdale, NJ: Erlbaum.
- Fowler, C. A. (1977). *Timing control in speech production*. Bloomington: Indiana University Linguistics Club.
- Fowler, C. A. (1980). Coarticulation and theories of extrinsic timing. *Journal of Phonetics*, 8, 113–133.
- Fowler, C. A. (1981). Some aspects of language perception by eye: The beginning reader. In O. J. L. Tzeng, & H. Singer (Eds.), *Perception of print: Reading research in experimental psychology* (pp. 171–196). Hillsdale, NJ: Erlbaum.
- Fowler, C. A. (1986). An event approach to the study of speech perception from a direct-realist perspective. *Journal of Phonetics*, 14, 3–28.
- Fowler, C. A. (2006). Compensation for coarticulation reflects gesture perception, not spectral contrast. *Perception & Psychophysics*, 36, 359–368.
- Fowler, C. A. (2011). How theories of phonology may enhance understanding of the role of phonology in reading development and reading disability. In S. A. Brady, D. Braze, & C. A. Fowler (Eds.), *Explaining individual differences in reading* (pp. 3–19). New York, NY: Psychology Press.
- Fowler, C. A., Liberman, I. Y., & Shankweiler, D. (1977). On interpreting the error pattern in beginning reading. *Language and Speech*, 20, 162–173.
- Fowler, C. A., & Shankweiler, D. (2015). *An oral history of Haskins Laboratories, part 2*. New Haven, CT: Haskins Laboratories.
- Fowler, C. A., Shankweiler, D., & Liberman, I. Y. (1979). Apprehending spelling patterns for vowels: A developmental study. *Language and Speech*, 22, 243–252.

- Fowler, C. A., Shankweiler, D., & Studdert-Kennedy, M. (2016). Perception of the speech code revisited: Speech is alphabetic after all. *Psychological Review*, *132*, 125–150.
- Gibson, E. J., & Levin, H. (1975). *The psychology of reading*. Cambridge, MA: MIT Press.
- Gibson, J. J. (1966). *The senses considered as perceptual systems*. Boston, MA: Houghton Mifflin.
- Kelso, J. A. S., Tuller, B., Vatikiotis-Bateson, E., & Fowler, C. A. (1984). Functionally specific articulatory cooperation following jaw perturbations during speech: evidence for coordinative structures. *Journal of Experimental Psychology: Human Perception and Performance*, *10*, 812–832.
- Lashley, K. (1951). The problem of serial order in behavior. In L. A. Jeffress (Ed.), *Cerebral mechanisms in behavior* (pp. 506–528). New York, NY: Wiley.
- Liberman, A. M. (1968). Comment. In J. J. Kavanagh (Ed.), *Proceedings of the Conference on Communicating by Language: The reading process* (p. 124). National Institute of Child Health and Human Development. Washington, DC: U.S. Government Printing Office.
- Liberman, A. M., Cooper, F. S., Shankweiler, D. P., & Studdert-Kennedy, M. (1967). Perception of the speech code. *Psychological Review*, *74*, 431–461.
- Liberman, I. Y. (1973). Segmentation of the spoken word and reading acquisition. *Bulletin of the Orton Society*, *23*, 65–77.
- Liberman, I. Y., Liberman, A. M., Mattingly, I. G., & Shankweiler, D. (1980). Orthography and the beginning reader. In J. F. Kavanagh, & R. L. Venezky (Eds.), *Orthography, reading, and dyslexia* (pp. 137–153). Baltimore, MD: University Park Press.
- Liberman, I. Y., Shankweiler, D., Fischer, F. W., & Carter, B. (1974). Explicit syllable and phoneme segmentation in the young child. *Journal of Experimental Child Psychology*, *18*, 201–212.
- Mattingly, I. G. (1984). Reading, linguistic awareness, and language acquisition. In J. Downing, & R. Valtin (Eds.), *Language awareness and learning to read* (pp. 9–25). New York, NY: Springer-Verlag.
- Mattingly, I. G. (1992). Linguistic awareness and orthographic form. In R. Frost, & L. Katz (Eds.), *Orthography, phonology, morphology, and meaning* (pp. 11–26). Amsterdam, The Netherlands: North Holland.
- Morais, J., Cary, L., Alegria, J., & Bertelson, P. (1979). Does awareness of speech as a sequence of phones arise spontaneously? *Cognition*, *7*, 323–332.
- Neisser, U. (1967). *Cognitive psychology*. New York, NY: Appleton-Century.
- Ryle, G. (1949). *The concept of mind*. Chicago, IL: University of Chicago Press.
- Shankweiler, D., & Crain, S. (1986). Language mechanisms and reading disorder: A modular approach. *Cognition*, *24*, 139–168.
- Shankweiler, D., Liberman, I. Y., Mark, L. S., Fowler, C. A., & Fischer, F. W. (1979). The speech code and learning to read. *Journal of Experimental Psychology: Human Learning and Memory*, *5*, 531–545.
- Studdert-Kennedy, M. (2005). How did language go discrete? In M. Tallerman (Ed.), *Language origins: Perspectives on evolution* (pp. 48–67). Oxford, UK: Oxford University Press.