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Thirty Years of Research on Infant Speech Perception: The Legacy of Peter W. Jusczyk

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The field of infant speech perception emerged in the early 1970s as new techniques became available to assess young infants' sophisticated discriminative capacities. Peter W. Jusczyk, who died in 2001, was involved in the first studies of infant speech perception and became over the next 30 years the most prolific and influential contributor to research on language acquisition. We review his many contributions and comment on their impact in addressing four key aspects of early language development: discrimination of speech segments; prosody and its role in language development; effects on perception of frequent segments and sequences; and early word-form perception, segmentation, and learning.

Peter W. Jusczyk was one of the most prolific and influential forces in the study of infants' perception of spoken language. When he died in 2001, he had published over 80 articles, chapters, and books; new publications bearing his name continue to appear.[1] He had enormous enthusiasm not only for his own work but for that of the infant language community. He provided reviews and comments on dozens of manuscripts each year, and he opened his laboratory and his home to old friends as well as to new investigators who were breaking into the world of infant perception.

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[1]A summary of work in progress when Peter died can be found at http://hincapie.psych.purdue.edu/Jusczyk

Peter was an extremely enthusiastic collaborator, with a network of colleagues spreading across North America, Europe, and Asia. Peter and his collaborators contributed to our understanding of at least four aspects of language development in infants: discrimination of speech segments; prosody and its role in language development; effects on perception of frequent segments and sequences; and early word learning, especially early word segmentation. In this article, we review these four areas and highlight how Peter's work changed the field of infant speech perception and language development. For a broader look at his work, written in his own words, see Peter's book *The Discovery of Spoken Language* (1997) as well as a chapter entitled "Learning Language: What Infants Know About It, and What We Don't Know About That" (2001a).

In addition to being an active collaborator, Peter Jusczyk was also a researcher characterized by two themes: an intense interest in the richness of human language and a desire to consider language from an infant's perspective. In reviewing the main foci of Peter's research, we attempt to elucidate these two themes, which we believe underlie many of Peter's unique contributions to our field.

DISCRIMINATION OF SPEECH SEGMENTS

Peter Jusczyk's publications spanned three decades, beginning with the seminal *Science* article by Eimas, Siqueland, Jusczyk, and Vigorito (1971), which was based on research conducted while Peter was an undergraduate at Brown University. The first phase of his research program on infant speech perception consisted of basic descriptive studies of the infants' ability, using mostly the high-amplitude sucking (HAS) technique, to discriminate phonetic contrasts instantiated in simple consonant–vowel (C–V) syllables or vowel–consonant (V–C) syllables (Jusczyk, 1977; Jusczyk, Copan, & Thompson, 1978) as well as in multisyllabic tokens (Jusczyk & Thompson, 1978). However, after these initial successes in demonstrating infants' sophisticated phonetic discrimination abilities, it became apparent to the field that the auditory correlates of phonetic contrasts may mediate this performance. That is, unlike adults, infants may perceive phonetic contrasts at the level of auditory tokens rather than as linguistic units.

The second phase of Peter's research program therefore consisted of trying to understand the level at which infants represent speech sounds. Initially, this included studies of nonspeech perception. In three studies (Jusczyk, Pisoni, Reed, Fernald, & Myers, 1983; Jusczyk, Pisoni, Walley, & Murray, 1980; Jusczyk, Rosner, Cutting, Foard, & Smith, 1977), the second of which was definitive and revolutionary, Peter and his colleagues showed that infants' discrimination performance for nonspeech tokens, whose critical acoustic attributes mimic those of the voice–onset–time distinction, was categorical. Thus, the mere demonstration of categorical discrimination should not be taken as definitive evidence that infants perceive phonetic tokens

at a linguistic level. This hypothesis—that, in early infancy, speech may not be perceived at a phonemic level—was supported by studies demonstrating losses in sensitivity to phonetic contrasts, as infants had accumulated more language-specific information by the second half of the first year (e.g., Werker & Tees, 1984).

A subsequent approach to the question of whether infants' early discrimination involved phonetic segments or some other unit of analysis consisted of studies that asked whether infants could recognize the similarity of phonemes despite variability in their surrounding context. Jusczyk and Derrah (1987) used the HAS technique to determine whether 2-month-olds could recognize the similarity of C–V syllables that share an initial consonant (e.g., /b/). If infants could treat acoustically variable phonetic segments as members of the same category, then a phonemic level of analysis would be supported. The results suggested that infants at this age could not in fact extract the common initial consonant from multiple exemplars that had variable vowels. Further studies (Bertoncini, Bijeljac-Babic, Jusczyk, Kennedy, & Mehler, 1988) of newborns and 2-month-olds showed that neither vowels nor consonants are extracted as phonetic segments from multiple exemplars. These results added support to the hypothesis that the syllable, rather than the phonetic segment, is the basic unit of speech perception in early infancy.

The final phase of Peter's work on speech discrimination showed that young infants, who seemingly do not analyze speech at a subsyllabic level, are nevertheless sensitive to coarticulation and context effects. Levitt, Jusczyk, Murray, and Carden (1988) showed that 2-month-olds' discrimination of a /ba/–/da/ contrast, like that of adults, is influenced by the surrounding phonetic context—in this case the presence or absence of frication noise. These results are consistent with other evidence, reviewed below, that infants are keeping track of the distributional properties of their native-language input, although at the level of diphones rather than individual phonetic segments.

In summary, this early phase of Peter's research program established that infants bring a sophisticated perceptual apparatus to bear on the discrimination of speech signals but that these early capacities have limits. Not only did infants appear to analyze and represent speech at the diphone or syllabic level, but the initial conclusion that categorical discrimination implied a linguistic level of representation was challenged by Peter's work using nonspeech signals as well as studies by Kuhl and her colleagues showing similar performance in nonhumans (see Kuhl & Miller, 1975, 1978; Kuhl & Padden, 1982, 1883).

THE MELODY OF LANGUAGE

Although Peter's early reputation was established by the studies of speech sound discrimination, he was also fascinated with the richness of human language, including its use in poetry and its relation to music. As a graduate student at the Uni-

versity of Pennsylvania, he pursued some of these interests with his advisor, Deborah Kemler Nelson. For instance, his 1975 dissertation examined first- and third-graders' appreciation of poetic form. Although he put poetry on hold for the first decade of his career after graduate school, he maintained an interest in language as an undivided experience for infants. For example, one of his early articles addressed the question of whether rhythm affected infants' ability to discriminate two speech sounds (Jusczyk, Copan, & Thompson, 1978). Already Peter was striving to combine his interest in the complex form of human language with the rigor afforded by newly developed infant-testing methods.

However, it wasn't until later that Peter began the second major research thrust of his career: language prosody. During the 1980s, Peter and his family spent a great deal of time in Europe—France and Poland in particular. Perhaps the experiences of being immersed in French and Polish cultures caused Peter to think seriously about how infants learning a variety of languages might accomplish that task. Whatever the reason for his interest, it is not surprising that when Peter began to study the properties of language most closely associated with poetry, he renewed his collaboration with Deborah Kemler Nelson. With Kathy Hirsh-Pasek, they published several papers on infants' sensitivity to linguistic phrases and clauses. The basic technique they employed was the headturn preference procedure (Fernald, 1985; Fernald & Kuhl, 1987; Kemler Nelson et al., 1995).

The team of Jusczyk, Hirsh-Pasek, and Kemler Nelson and their colleagues used this technique to present infants with passages, either from a child's book or as spontaneous speech from a parent to a young child (Hirsh-Pasek et al., 1987; Jusczyk, Hirsch-Pasek, et al., 1992; Kemler Nelson, Hirsh-Pasek, Jusczyk, & Wright Cassidy, 1989). Pauses at clause boundaries (Jusczyk, Hirsch-Pasek et al., 1992) were spliced out, and new pauses of a uniform duration were inserted at the correct boundaries or at nonboundary positions. Infants as young as 6 months were able to distinguish correctly "paused" passages from those incorrectly paused when the correct pauses were at clause boundaries. Infants as young as 9 months showed significant discrimination of the phrase boundary stimuli but only if the stimuli were produced with the high pitch and wide pitch-range characteristic of speech to infants and young children (Jusczyk, Hirsch-Pasek, et al., 1992). Because it is unlikely that infants comprehended the passages, the most likely factor underlying their ability to discriminate and therefore prefer the concordant pauses over the mispaused passages is that they had noted through experience the typical correlation in English of syllable lengthening, pitch resetting, and pausing that occurs at the boundaries of major linguistic units. This explanation was bolstered by the fact that Jusczyk and Krumhansl found similar effects when examining infants' ability to discriminate correctly paused musical passages versus those incorrectly paused (Jusczyk & Krumhansl, 1993; Krumhansl & Jusczyk, 1990).

With respect to infants' sensitivity to linguistic prosody in particular, several researchers (including Peter and his colleagues) suggested that infants might use their sensitivity to the correlated acoustic cues marking linguistic boundaries to discover something about the syntactic structure of their language (Jusczyk & Kemler Nelson, 1996; Kemler Nelson et al., 1989). The logic of this argument is that infants who can divide the speech stream into linguistically appropriate units, such as phrases, and can engage in further lexical and syntactic analysis over these units are at an advantage over infants who attempt to analyze entire utterances (Morgan, 1986; Morgan & Newport, 1981). This "prosodic bootstrapping" account of early language development was profoundly influential, and it dovetailed nicely with new work in prosodic phonology, which focused on the interface between syntax and phonology (Beckman & Pierrehumbert, 1986; Nespor & Vogel, 1986; Selkirk, 1984). Other research using the pause insertion technique tested specific predictions of prosodic phonology. These studies demonstrated important gaps in the usefulness of prosodic cues for marking syntactic boundaries (Gerken, Jusczyk, & Mandel, 1994). The later research did not necessarily undermine the prosodic bootstrapping account but suggested that specific linguistic units—namely, short sentential subjects—might be difficult for young listeners to locate in fluent speech.

In addition to establishing that infants are sensitive to the correlation of cues typical of the prosody of their language, Jusczyk and a number of colleagues further demonstrated that prosodically marked units are stored in memory by infants 2–6 months old (Mandel, Jusczyk, & Kemler Nelson, 1994; Mandel, Kemler Nelson, & Jusczyk, 1996; Nazzi, Kemler Nelson, Jusczyk, & Jusczyk, 2000) and that newborns are able to discriminate their mother's native language from another language based on prosodic information (Mehler et al., 1988; Nazzi, Jusczyk, & Johnson, 2000). Work by Peter's graduate student Melanie Soderstrom continues to examine the role of prosody in early linguistic analysis (Soderstrom, 2003; Soderstrom, Seidl, Kemler Nelson, & Jusczyk, 2003).

During the period that Peter began to work on issues of prosodic cues to phrases and clauses, he also became interested in the lexical segmentation problem. That is, words are not separated by pauses in fluent speech, but they are prosodically marked in other ways, such as stress placement. Therefore, Peter and colleague Anne Cutler began a foray into questions about lexical segmentation by asking whether infants are sensitive to lexical prosody. Cutler and Carter (1987) had noted that the majority of multisyllabic English words begin with a stressed syllable. Bisyllabic words form the most frequent subset of multisyllabic words; and within this subset, the stressed–unstressed, or trochaic pattern (as in *mother*), is extremely common. Jusczyk, Cutler, and Redanz (1993) demonstrated that 9-month-olds, when presented with lists of stressed–unstressed vs. unstressed–stressed bisyllabic words, showed a signifi-

cant preference for the former trochaic over the latter iambic patterns. They suggested that this preference was due to infants' greater familiarity with the dominant trochaic stress pattern of English.

Turk, Jusczyk, and Gerken (1995) explored infants' sensitivity to the intersection of prosody and the segmental content of words by examining infants' preference for strong–weak words over weak–strong words when the strong syllable was either heavy (a C–V with a long vowel followed by an ambisyllabic consonant) or light (a C–V with a short vowel followed by an ambisyllabic consonant). Turk et al. found that syllable weight was not a necessary component of the strong–weak preference observed by Jusczyk et al. (1993). However, the third experiment in the series, plus additional unpublished experiments, made it clear that infants were sensitive to syllable weight and to the typical patterns of heavy and light syllables that occur in English words. The notion that infants' behavior in the headturn preference procedure is governed by what is typical of their language, which appears to have crystallized during the word-stress studies, played an important role in the set of studies described in the next section.

One of Peter's theoretical contributions, which began with the studies of segmental perception and was reinforced by the studies of prosody, is the idea that an infant's language perception proceeds from sensitivity to general acoustic properties shared by many languages (as well as by music) and is shaped by the infant's linguistic experiences. In the word recognition and phonetic structure acquisition model, Peter outlined a developmental progression in which infants are sensitive to general acoustic properties such as pausing very early in development and become attuned to the specific features of the prosody of their own language by about 9 months (Jusczyk, 1993). This hypothesized developmental progression continued to influence Peter's work into the 1990s (a topic we discuss in the next two sections).

To summarize the current section, it is clear that many researchers, including Peter Jusczyk, were interested in the usefulness of prosody in language development from the late 1980s to the mid-1990s. Peter's role, in addition to helping to design and perform a large number of studies, was to serve as a hub for colleagues in Europe and the United States.

EFFECTS ON PERCEPTION OF FREQUENT SEGMENTS AND SEQUENCES

Much of the work in adult cognition during the 1980s and 1990s reflects an interest in the notion that humans store in memory much more detailed information about their input than previously believed. Abstract information, including the sort critically assumed in linguistic theory, was hypothesized to emerge from simple input–output associations (Elman & Zipser, 1988; Rumelhart &

McClelland, 1987) or processes over stored exemplars (Estes, Campbell, Hatsopoulos, & Hurwitz, 1989; Hintzman, 1986, 1988; Nosofsky, Clark, & Shin, 1989). Peter became particularly interested in exemplar-based models of language while he was a colleague of Doug Hintzman at the University of Oregon. He brought this interest with him when he moved to the State University of New York at Buffalo in 1990. His interest was reinforced by Buffalo colleagues Jim Sawusch and Paul Luce, both of whom were thinking along similar lines with respect to adult speech perception. The work on exemplar-frequency effects that Peter began at Buffalo focused on three areas: allophonic variation, phonotactics, and talker voice.

With regard to allophonic variation, the goal of speech perception research before the 1980s was to describe how listeners identify abstract phonemes in the highly variable speech signal. This task proved to be quite difficult, and by the time that Peter had arrived at Buffalo, a number of adult speech perception researchers had begun to take seriously the possibility that the objects of perception were, at the very least, position-specific allophones of phonemes—that is, entities such as syllable-initial /p/ or syllable-final /d/ (see Perkell & Klatt, 1986, and references therein). Peter wondered whether such allophones of abstract phonemes might be the objects of infant perception as well.

In 1994, he and graduate student Elizabeth Hohne published an article demonstrating that 2-month-olds were able to discriminate allophones of a phone (Hohne & Jusczyk, 1994). Using the HAS procedure, they habituated half of the infants in the study to each member of an allophonically distinct pair, such as *nitrate / night rate.* After habituation, infants heard either the same member of the pair to which they had been habituated or to the opposite member of the pair. Only infants who were tested on the opposite member of the pair showed significant dishabituation, and this finding was true even when Hohne and Jusczyk cross-spliced the stimuli. For example, the /tr/ from *night rate* was inserted into *nitrate* to eliminate prosodic differences between the members of a pair. The data are consistent with the view that the objects of early perception are not abstract phonemes but information tied closely to the acoustic signal (Jusczyk, 1993). However, Peter's most enduring theoretical interest in this work was in the possibility that allophonic differences might be used by infants in word segmentation (Johnson & Jusczyk, 2001; Johnson, Jusczyk, Cutler, & Norris, 2003; Jusczyk, Hohne, & Bauman, 1999; see the following section, on word form perception and segmentation).

Peter's interest in phonotactics, or segment sequences allowed in a language (e.g., *blick* vs. **bnick*), showed a similar theoretical trajectory. Using the headturn preference procedure, Peter and Ann Marie Jusczyk, with several European colleagues, demonstrated that American and Dutch 9-month-olds could discriminate English from Dutch words based on differences in the sound sequences that are legal versus illegal in the two languages (Jusczyk, Friederici, Wessels, Svenkerud, & Jusczyk, 1993). An important question that arose from that study was whether in-

fants responded to what was legal or grammatical in their language or merely to what was most frequent. In collaboration with Buffalo colleagues Paul Luce and Jan Charles-Luce, Peter addressed this question by presenting American 9-month-olds with nonsense words containing legal phoneme sequences that were either frequent or infrequent in English (Jusczyk, Luce, & Charles-Luce, 1994). Infants showed a preference for the words with more frequent phonotactics, suggesting that they were highly sensitive to the statistical properties of their language. This finding—coupled with the study just described, in which infants preferred the stress pattern that was more frequent in their native language—helped direct language development researchers to take seriously the possibility that infants keep track of the statistical properties of their language. Peter, however, was more interested in the possibility that phonotactic information might aid infants in segmenting words from fluent speech. He and postdoc Sven Mattys, with Paul Luce and Jim Morgan, demonstrated the feasibility of this idea in several studies (Mattys & Jusczyk, 2001b; Mattys, Jusczyk, Luce, & Morgan, 1999).

Finally, a particular context effect that maintained Peter's interest from the early 1990s until his death was the role of talker voice. In one of the first studies, Jusczyk, Pisoni, and Mullennix (1992) used the HAS procedure to habituate 2-month-olds with a consonant–vowel–consonant (C–V–C) syllable (e.g., *bug*) produced either by a single talker or by six male talkers and six female talkers. Infants dishabituated to a different C–V–C (e.g., *dug*) regardless of whether they were in the single-talker or multiple-talker condition. However, when a brief delay was introduced between the habituation and dishabituation phases, only infants in the single-talker condition showed discrimination, suggesting that talker information affects infants' encoding of speech sounds into long-term memory. This set of studies may have launched Peter's interest in the intersection of language development with memory and attention (Jusczyk & Hohne, 1997; Newman & Jusczyk, 1996).

Peter continued to pursue the role of input variability (in the form of talker voice) with graduate student Derek Houston, whose dissertation showed convincingly that young infants do not store words as strings of abstract phonemes. Rather, these representations include detailed acoustic–phonetic information, including voice characteristics of the talker who produced the words (Houston, 2000; Houston & Jusczyk, 2000, 2003). The work on talker voice melded Peter's thinking about how infants represent speech segments and his great interest in early word learning, the topic of our next section.

WORD FORM PERCEPTION, SEGMENTATION AND LEARNING

The 1990s were a period of great expansion for Peter's research program. Perhaps due to Buffalo colleagues Paul Luce and Jim Sawusch, who were working on com-

ponents of lexical access in adults, Peter began to wonder how to study lexical perception in infants. As noted, Peter had an enduring interest in lexical segmentation, and he pursued this interest with greater and greater theoretical and methodological sophistication in the 1990s.

He also became interested in the way in which infants stored segmented word candidates. Perhaps the first foray into this new territory was the study Peter carried out with graduate student Denise Mandel and his long-standing colleague from Indiana University, David Pisoni (Mandel, Jusczyk, & Pisoni, 1995). Using the headturn preference procedure, they presented 4.5-month-olds with two types of word lists: one containing the infant's own name with other names and one containing only names other than the infant's. Infants showed a significant preference for the list containing their own name.

Although infants' ability to recognize a word form that they have heard many times outside the laboratory was important, Peter's real interest, and the growing interest of many in the field, was to study behavioral effects (preference) that emerged from brief experiences in the laboratory. Peter's longtime friend and collaborator Richard Aslin, the second author of this article, was an hour east on the New York State thruway at the University of Rochester. Together, at a conference in southern France in 1992, they formulated an important modification of the headturn preference procedure in which infants are briefly exposed to a stimulus and then tested to determine what they might have learned during this exposure. In other words, rather than measure infants' preferences developed by prelaboratory exposure to their native language—that is, before visiting the lab for testing—they wondered whether they could induce preferences by a brief pretest familiarization phase. Jusczyk and Aslin (1995) published the first study demonstrating that 7.5-month-olds could detect words in fluent speech. In this study, half of the infants in the study were exposed for about 2 min to passages containing two repeated words, such as *cup* and *dog,* whereas the other half was exposed to passages containing two other words, such as *bike* and *feet*. During the test, infants heard the words *bike, cup, feet,* or *dog* via randomly ordered test trials, presented repeatedly to obtain listening-time preferences for each word. Infants preexposed to *cup* and *dog* listened significantly longer to these two words during the test than to the two novel words *bike* and *feet*, whereas infants exposed to *bike* and *feet* listened significantly longer to them than to the novel words *cup* and *dog*.

These results provided compelling evidence that 7.5-month-olds could extract from fluent speech short stretches of auditory information that adults treat as words, even though infants of this age have not yet attached meanings to these auditory word forms. In addition, Jusczyk and Aslin showed that infants did not find slightly modified versions of the target words (e.g., *tog* instead of *dog*) as acceptable matches to what they heard in fluent speech. Thus, not only can infants segment and extract word forms from fluent speech, but they do so using highly specific acoustic–phonetic information. Because the majority of linguistic input to infants is in the form of multiword utterances (Woodward & Aslin, 1990) and not

isolated words (see Brent & Siskind, 2001, for an alternative viewpoint), the ability to segment words from fluent speech is a necessary precursor to the mapping of sounds to meanings.

The field of infant language development quickly capitalized on this modification of the headturn preference procedure, and it has led to a variety of studies on infants' ability to learn structural and statistical properties of language (e.g., Gómez & Gerken, 1999; Marcus, Vijayan, Rao, & Vishton, 1999; Saffran, Aslin, & Newport, 1996). Peter, however, was more interested in using the new technique to study infants' abilities to detect and store recurring word forms in fluent speech. From 1995 to his death in 2001, Peter and his students and colleagues engaged in research that resulted in a dozen or more articles and chapters examining acoustic and contextual factors affecting the ability to extract words from fluent speech. Many of these studies were published with graduate students and postdocs from Peter's labs at Buffalo and the Johns Hopkins University, where he joined the faculty in 1996.

Beginning with studies by Newsome and Jusczyk (1995) and Myers et al. (1996), Peter began a program of research that explored the role of pauses and prosodic cues to word segmentation. Subsequent experiments (Houston, Jusczyk, Kuijpers, Coolen, & Cutler, 2000; Houston, Santelmann, & Jusczyk, 2004; Jusczyk, Houston, & Newsome, 1999) confirmed that infants have a preference to segment words from fluent speech by treating strong syllables as word onsets, even when the segmental information is from Dutch rather than English. This trochaic bias is strong enough at 7 months of age to prevent infants from extracting bisyllabic words with an iambic stress pattern; but by 11 months of age, this bias is sufficiently flexible to handle some weak–strong words.

Johnson and Jusczyk (2001) showed that when strong–weak stress cues are pitted against statistical cues (as used in Saffran et al., 1996), 8-month-olds segment fluent speech using prosodic information. However, subsequent work by Thiessen and Saffran (2003) has shown that statistics can trump prosody at 6 months of age. The role of statistical information was further examined in a series of three experiments aimed at testing the influence of phonotactic information on word segmentation (Mattys & Jusczyk, 2001a, 2001b; Mattys et al., 1999). These studies showed a clear role for probabilistic phonotactics as a constraint on word segmentation from fluent speech in 9-month-olds. Finally, Johnson and colleagues (2003) showed that 12-month-olds are biased to segment fluent speech based on the "possible word constraint"; that is, they have learned from native-language input what a viable auditory word form is and use that information to constrain how they segment unfamiliar words from passages. This last result was foreshadowed by Jusczyk, Goodman, and Bauman (1999), who reported that 9-month-olds listen longer to lists of nonsense words that share an initial consonant or C–V than to nonsense words that have no such common structure. In contrast, infants did not listen longer to nonsense words that shared the medial vowel or the final V–C over unrelated nonsense words. These results suggest that 9-month-olds have learned

that syllable onsets carry more important information for word learning than syllable offsets do, a finding that is consistent with much of the literature on cohort competition in adults' spoken-word recognition.

Although most of the studies of early lexical development that came out of this period focused on word forms, Peter and graduate student Ruth Tincoff explored the beginnings of word comprehension with a study demonstrating that 6-month-olds reliably associate video footage of their mothers and fathers with the words *Mommy* and *Daddy*, respectively (Tincoff & Jusczyk, 1999). And with postdoc Lynn Santelmann, Peter explored the ability of 15- to 18-month-olds to extract from passages the nonadjacent dependencies that link the auxillary verb *is* with the following main verb ending *-ing* (Santelmann & Jusczyk, 1998). This was Peter's first foray into studying how infants become sensitive to the morphosyntactic structure of English, a program of research that Santelmann has continued with a morphologically complex language (German). Further work on the lexical–syntactic interface continued with Seidl, Hollich, and Jusczyk's (2003) demonstration that 15- to 20-month-olds are sensitive to subject-versus-object *Wh*-questions in a two-choice preferential looking paradigm.

NEW DIRECTIONS

Although Peter was still quite interested in word segmentation and lexical development at the time of his death, he was also engaged in several other projects. At Johns Hopkins, he began to explore new work in linguistics, especially phonology, with colleagues Paul Smolensky and Luigi Rizzi. One posthumously published article emerged from a collaboration with Smolensky (Jusczyk, Smolensky, & Allocco, 2002). Beginning with his 1997 book, Peter had also been asked to write an increasing number of review and tutorial pieces in the last years of his life (e.g., Jusczyk, 1999; Jusczyk, 2001b; Jusczyk, 2002). He enjoyed the scholarship entailed in this type of writing. Finally, Peter and his students and colleagues began to discuss how our growing knowledge of language development in typical infants might be used to help infants with sensory impairments. Indeed, he was at a conference in California on implantable auditory prostheses when he died.

Finally, it is important to note that Peter was the instigator and prime motivator in establishing the present journal. He worked tirelessly for several years to sample the opinions of hundreds of researchers engaged in research on all aspects of child language learning and development. He formed a relationship with the publisher of this journal and organized an executive board that, after his death, worked to bring his idea to life. The present, inaugural issue of the journal, Peter's journal, serves as a true legacy to his love of the field and his dedication to making the work of his colleagues more readily accessible and appreciated.

THEMES OF THE JUSCZYK LEGACY

In this review, we have attempted to provide a sampling of the many contributions that Peter Jusczyk made over a span of 30 years to the field of infant speech perception and language development. Peter's voluminous record of publication represents only a small fraction of his influence on his close collaborators and on those who benefited from his expertise as a reviewer, mentor, and promoter of the field. Not only did Peter contribute to several classic summaries of the field via review chapters (Aslin, Jusczyk & Pisoni, 1998; Aslin, Pisoni, & Jusczyk, 1983; Eimas, Miller, & Jusczyk, 1987; Jusczyk, 1986a, 1986b, 2002, 2003; Jusczyk & Luce, 2002), but he single-handedly convinced the field that a new journal on language learning and development (the present issue) was warranted to further expand the field of empirical and theoretical research.

There was no aspect of language that Peter found uninteresting, and he relished the opportunity to discuss the subtleties and challenges of studying such a rich and varied field. A key characteristic of Peter's dialogue with anyone interested in language development was a sense of balance*:* He was never dogmatic, and he worked strenuously to bring competing viewpoints to the table for discussion (see his article "Viewing the Development of Speech Perception as an Innately Guided Learning Process," Jusczyk & Bertoncini, 1988). Peter also exhibited an intense interest in language that went far beyond his own research program, an interest extending to literature, poetry, and music. Despite his sophisticated approach to these domains, Peter was convinced that a proper appreciation of development required researchers to consider the perspective of the infant, as a learner who is exposed to a complex set of inputs and as a participant in experiments, so that such work is designed to optimally assess the infant's underlying capacities. These characteristics served Peter and the field well, and they will be near impossible to replace. We are fortunate that his work was published so widely and that, as a result, it will continue to have an enduring impact for many years to come.

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