The Spectral Development of Spelling in School-Age Children

by

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Abstract

This paper compares the varied portrayals of school-age spelling development as consisting of sequential or simultaneous stages, phases, or waves, including the arguments addressing the homogeneity of any given stage, the strength of its boundaries, and finally the speed and direction of a typical child's navigation through that terrain on their way to becoming an accomplished speller. The *spectrum* metaphor is promoted to harmonize these perspectives.

The Development of Spelling in School-Age Children

Before 1960, spelling was universally characterized as a monolithic skill best absorbed through the rote memorization of lists of standard forms. During the 1960s a small group of researchers began to question this assumption in parallel with the promotion of reading as a *language* skill, investigating children's spelling under increasingly rigorous conditions. Finally, in 1970, the results of formal experiments began to reveal behavioral consistencies in children's invented spelling (CIS), where those regularities reflected a series of developmental patterns. This paper examines the subsequent controversy surrounding the variable characterization of that developmental process in terms of sequential or simultaneous stages, phases, or waves, as well as arguments addressing the homogeneity of any given stage, the strength of its boundaries, and finally the speed and direction of a typical child's navigation through that terrain on their way to becoming an accomplished speller.

Such terminological issues often arise in a new field of inquiry as its growing body of test results is interpreted through paradigms borrowed from established domains; consequently, serious issues appear to be nothing more than a mere quibbling over vocabulary, when in fact that particular rhetoric is a healthy symptom of claim-staking. Territoriality represents vigor in a new field as its fundamental definitions crystallize. In the spirit of active participation in the growth of the field which it examines, this paper proposes the *spectrum* as a unifying metaphor for the process of spelling development.

Since early research revealed patterns of CIS behavior that could be broadly associated with grade level, that body of work will be examined before moving on to research which organized those patterns along a navigable series of stages. Attacks on this stage theory will then be analyzed, followed finally by a defense of the spectrum metaphor.

Research Revealing Isolated Spelling Patterns

Before 1960, a word was only spelled in one of two ways: *right* or *wrong*. Memorizing

lists of standard spellings was the order of the century, because no more sophisticated mental

process was proposed than brute-force retrieval. As the 1960s wore on, linguists described

language in terms of a great deal of underlying complexity, and this perspective was transferred

to studies of reading, and then spelling, with the result that both skills started to be examined

specifically as *language*. In this light, CIS samples were sifted with increasing rigor for evidence

of this very linguistic processing. Most of this early research was dominated by Charles Read.

Read (1970) was the cornerstone in which CIS regularities (such as the dropping of

nasals in consonant clusters) were discovered, and subsequently attributed to children having

different phonological awareness judgments than those found in adult spellers. Read may not be

examined here in detail, however, as no copy was available for circulation at the time this paper

was being written, but later research relies on it so fundamentally that to pass it over entirely

without comment would have left an unconscionable historical gap.

Read (1971) contended that children's spelling development progressed regularly, rather

than randomly or by rote memorization; in specific, increasing familiarity with the "names" of

letters (e.g. /e/ for "A," /bi/ for "B," and so on) is said to support an appeal to a "system of

phonetic relationships that [children] have not been taught by their parents and teachers" (p. 30).

Read then suggested that "lady" had been spelled simply as "LADE" on the basis of tense

vowels having straightforward letter-name avatars (p. 6), and "left" is suggested to have been

spelled as "LAFFT" (p. 6; cited as "LAFT" in Read, 1973) because the speller ostensibly

associated /e/ with / / in terms of place (while ignoring apparently less salient features such as

tenseness, length, and off-gliding). Sensitivity to the affrication in word-initial /tr/ and /dr/

explained the likes of "CHRIE" for "try," and "JRAGIN" for "dragon" (p. 13). Read indicated that similar processes of phonetic categorization were responsible for: (a) the typical use of "D" for an alveolar flap; (b) the absence of the letter "N" in spelled-out VnC sound sequences, since the nasal was dismissed as a nasalization *feature*; and (c) the use of liquid and nasal letters to represent whole syllables. Spelling, therefore, was presented as a complex system, the depths of which were plumbed over time as a child acquired two distinct types of knowledge: (a) alphabetic; and (b) phonological. This all seems plausible, but begs for rigorous testing.

Read's (1973) sound-similarity tests provided some initial support for these speculations, insofar as the participating children tended to judge the nonce word "/pek/," for example, to be more like "peck" than "peek" (p. 23), preferring height as a categorizing feature; similarly, they showed a sensitivity to the affrication in word-initial /tr/ when they judged "/troz/" to be more like "chose" than "toes" (p. 27). This behavior was significantly more pronounced in the children (32 six-year-olds and 24 seven-year-olds) than it was in the adults (19 university students). Read concluded that "children may recognize specific inter-phonemic relationships, making certain abstractions in spelling relatively natural, and in other cases they may group phones according to features that are not especially prominent to adults" (p. 37). These findings back up some of Read's (1971) contentions, but not all of them.

Read (1975) contained further tests of sound-spelling judgments. When nasals in test items fell between a vowel and a following consonant (homorganic in Read), a population of first-grade children did in fact treat them as a nasalization *feature*, which Read (1971) suggested was the reason that such nasals were not associated with explicit, individual letters in spelling (e.g. "*dent* without an *n*", p. 78); more generally, a syllabic sonorant or liquid was evidently taken to be a holistic vowel-like unit rather than a VC sequence, and was accordingly spelled

with a single letter (e.g. the 'r' in "*brother* without an *e*", p. 78). A further study of front vowels showed that tenseness was treated as a more salient categorization feature than height. As a consequence of posing this connection between phonological relationships and CIS, Read ended up being cited repeatedly in the literature in support of various definitions of a "phonetic" spelling level.

In contrast, little notice was ever given to Read's further, equally important, observation that these effects were significantly more pronounced in unfamiliar words, which suggested that once learned, conventional spellings were preferred over invented ones, despite the fact that the lexical spellings did not reflect the child's phonetic sensibilities. CIS was portrayed, in this sense, as a stop-gap measure applied on the way to correct spelling. Though not intended as a work defining developmental levels, Read concluded that:

> [Child spellers] will have acquired the basis for this adult [standard spelling] system only when they have tacitly learned not to represent the effects of regular phonological processes such as affrication and vowel shift, so that their spellings are phonologically abstract. (p. 78)

They may be noted to *start* this movement "when they begin to abstract away from phonetic variation" (p. 78). In terms of development, Read's portrayal of unidirectional adaptation infused most of the subsequent literature, and suggested that the transition from invented to conventional spelling was an inexorable but ultimately incomplete process.

While there were a few studies after Read (1975) that still focused only on individual CIS aspects,[1] most of the work from the mid-1970s onward also proposed (or supported) systems to conjoin these pieces; therefore, component studies beyond this time will be analyzed in the following section, where they can be viewed in the context of contemporary system studies.

Studies Defining the Spelling Spectrum Itself

As a growing set of CIS patterns was revealed, the complex nature of spelling became clearer, and the natural progression in the research was to organize this behavior into a system. Those proposals just as naturally led to acid-testing, resulting in the terminological migration clarified in Tables 1 and 2. Note that the term "band" (as in a spectral band) is used in this paper when referring generically to developmental nodes such as stages, phases, or waves.

Beers and Associates

<>Beers (1974), a dissertation, was the first work to propose a *system* of developmental stages, analyzing CIS in regards to the awareness of tense and lax vowels. Beers drew upon Read's conclusions to posit four categories for classifying CIS samples, namely: "omission of a vowel," "letter-name," (a word which included a vowel without a marker), "transitional" (a word including a vowel with a marker), and "correct" (p. 32). Using this system, Beers found a rise in the level of awareness across the spelling of 81 first graders and 75 second graders, as gauged by a greater number of second-grade spellings that landed closer to (or in) the "correct" category.

Beers and Henderson ([B&H] 1977) explored regular changes in the types of spelling errors made by 25 first graders as they learned the finite set of highly regular English spelling rules proposed by Chomsky & Halle (1968). To classify this progress, B&H defined categories of errors as sequences of patterns; for example, in the category of errors with "Short vowels," B&H listed a three-part sequence for errors involving "Short *e* as in *met*," where each of the following three parts was a pattern: (a) "*a* substituted for *e*," (b) "*i* substituted for *e*," and then (c) "correct form" (p. 137). This "pattern sequence" was exemplified by "went" being spelled first as "WAT," next as "WINT," and then presumably as WENT (p. 137). Such pattern sequences were described for the following error categories: short and long vowels, "m" and "n," vocalic

"r," flapped "t" and "tt," and morphological "-ed" and "-ing." B&H concluded that children learned these patterns at variable rates, but in invariant sequence, with the proviso that there might be some temporary waffling in the middle of the otherwise monotonic transition from one pattern to another.

Having defined these *pattern* sequence levels, B&H then proposed *spelling* sequence levels, where each such level was effectively a metapattern defined by a root strategy; for example, the first spelling level was not just a collection of all of the first-level patterns, but rather it was associated with "the letter-name strategy," which was characterized in turn as a matter of "relying on articulatory features to determine the most appropriate letter for a particular sound" (p. 146). In the case of consonants, this name could be holistic (e.g. 'D' in 'DL' for the /di/ in /dil/) or analytic (e.g. 'D' as just a flap in 'SWEDER'), but vowels were only holistic (e.g. children did not derive short-e from the first part of the name of 'A'). This difference was important because it made the association between letter names and articulatory features more forgiving than it would otherwise have been for consonants, and this tolerance allowed B&H to gather the first-level pattern for alveolar flaps, for instance, into the same first-level spelling fold as the short vowel patterns. The establishment of this first level of spelling might have been clearer had examples been included in which the liquids and nasals were called upon in terms of their holistic letter names, rather than only analytic at the first level, and then syllabic at the next.

At the second level, children had begun the process characterized earlier by Read (1975; not referenced in B&H) as abstracting away from phonetic detail, which B&H described as the point at which "children have begun to realize that written language is made up of symbols (letters) that represent the sounds of oral language instead of being the sounds themselves" (p. 147). In particular, spellers were becoming increasingly familiar with the syllable as a higher-

order component of a word, and this knowledge influenced their errors. Missing vowels appeared (often with substitutions for short vowels) as spellers ensured that every syllable had a vowel, while "m" and "n" *dis*appeared (as seen earlier in Read) as spellers removed them from syllables in which they unnecessarily marked the phonetic detail of nasalization. For most of the errors classified in B&H, spellers proceeded from the second pattern level to the correct form, but there were a few in which a third pattern level interceded.

In the case of morphological "-ed" and "-ing," the second *pattern* sequence level in B&H reflected an additional level of *spelling* progress identified simply as "the third spelling level" (p. 147). (It should be noted that there are citations in other articles that quote B&H as calling this the "transitional" level, but the term does not appear in B&H, and is implied only inasmuch as the next level would presumably be the correct form.) Errors at this level were interpreted to suggest an appeal to organization of an order higher than that of the syllable, either syntactic or morphophonemic, in the sense that the data suggested that some spellers might have relied on the knowledge that the past-tense marker was always spelled the same way, without regard to how it sounded. In B&H, this suggestion was less than solid for "-ed," and weaker yet for "-ing," but at least none of the data counterexemplified this speculation, which would tend to be supported by later studies.

Beers, Beers, and Grant (1977) is a component study that extended the findings of B&H to show that: (a) phonetic strategies appear even into third and fourth grade, although with declining frequency across grade levels ("the incidence of letter-name spellings was highest in first-graders and lowest in fourth-graders," p. 239); (b) that words used more often were more likely to be spelled correctly; and (c) some children mixed strategies of different levels of sophistication ("[children] revert to a more primitive strategy when confronted with words they

do not know," p. 241). An interesting observation not made in the other studies is that some spelling errors were the result of words being pronounced slowly during a sounding out strategy; for example, when "you pronounce long *a* slowly, it is actually a diphthong with two vowels sounds gliding together" (p. 239). The long *a* sound then showed a tendency to be spelled as AI.

Gentry and Associates

Gentry (1977) was yet another dissertation (which reflected the pioneering nature of the field), and it relied on a system of "five sequential patterns of spelling strategies" adapted from B&H (with influence from Beers, 1974) while B&H was still in press. This system would become a familiar five-band spectrum in later research, namely: "deviant, prephonetic, phonetic, transitional, and correct" (p. 18). While these terms might well have been used in the cited document while it was being prepared to go to press, they did not all appear in the published version (which might help to explain the citation anomalies in Gentry, 1978, discussed below); nonetheless, the debt owed B&H is clear.

Equally clear are the strategies as they were defined by Gentry. The "deviant" strategy was a "catchall" (p. 22) for adult non-standard spelling, used for classifying the letter-shape use of alphanumeric characters by children before they associated letters with sound. As they got to know the letters, children represented some of the sounds of a word with the "prephonetic" strategy, in which "spellings are usually greatly abbreviated and lack all the essential phonetic elements needed to represent the surface structure of a word" (p. 22). The missing element was typically a vowel, and if a letter was missing, so was the sound it represented. The "phonetic" strategy was the letter-name mapping familiar from B&H, where "spellings are rendered phonetically on the basis of the letter names which best represent the surface sound continuum of the word" (p. 20). If a letter was missing in a phonetic spelling, it was because the sound that it

would have represented was being treated as an unnecessary phonetic detail (e.g. nasals as nasalization). A speller who drew upon the "transitional" strategy evinced knowledge of English orthographic conventions with appropriate "marking, use of digraphs, vowels in every syllable, and other constraints" (p. 19). A sample of transitional spelling might have had some of the letters incorrect or out of sequence, but the production still "'looks like' an English word" (p. 19). As always, the use of the "correct" strategy was self-explanatory (p.19). As with all initial domain-specific vocabulary, these terms would come to be refined with use over time.

Gentry drew strict boundaries between these strategies because they were used to classify portions of the behavior found in CIS samples, but crucially, these terms were *not* used as labels to classify *children* as spellers belonging strictly to a *specific* level; in fact, Gentry explicitly said, "children often spell… with intermixtures of two or three sequentially adjacent strategies," and when a given child was identified in Gentry with a particular stage, it was only because that particular child was one who happened to "use almost a pure single strategy" (p. 23). Gentry referred to "the period of mixed strategies" as "extending from kindergarten to second grade" (p. 84), and only those children whose "productions manifested a virtually pure example" of a particular spelling strategy were used in the work as exemplars of a single developmental stage (p. 23). Any extension of this system to wholesale pigeonholing misinterprets its intended purpose.

Gentry and Henderson (1978) was primarily a teacher's guide to the virtues of creative spelling, but it is of interest here because of its ontology. The terms "phonetic" and "transitional" were identified at various points as "strategies," with "deviant" being the trivial case of a lack of strategies, and "correct" being the lack of a need for any (pp. 634-635). A list of sample words from these categories (other than "deviant") suggests that these "strategies" were to be viewed as

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sets of error types clustered around a central paradigm, like the letter-name perspective. Each strategy was clarified with writing samples produced by a child whose spelling fell primarily within that category. The work never identified any of these children as a speller at a particular stage of development, but it is easy to understand how this particular exemplification strategy might have led an otherwise uninitiated reader to think that the system might have been used to classify a child, instead of their writing.

Gentry (1978) is not an experiment, but rather a further proposal of the five-band framework. It drew support from three sources, namely: B&H, Beers (1974), and Gentry (1977). It is the manner of this support, however, that left Gentry (1978) no stronger, albeit no weaker, than Gentry (1977). To begin with, Gentry said that B&H offered an example involving a vowel omission in an early strategy, then a letter-name vowel replacement at the next (presumably pattern) level, followed by orthographic knowledge in what B&H allegedly referred to as a "transitional stage," and finally followed by the correct form (pp. 88-89). The fact of the matter is that B&H listed only *one* sequence in which a short vowel was omitted as the first pattern level,[2] and this pattern was only followed by *one* more pattern level before the correct form emerged; furthermore, there were *no* sequences, including the one just mentioned, in which the second pattern level was equated with the letter-name strategy. In the only four-pattern sequence in the study, both the beginning and ending patterns were the correct form. Finally, B&H did not use the term "transitional stage," and said nothing to suggest that the third spelling level was any more transitional than either of the others. If the stages proposed in Gentry have stood the test of time, they have done so without stretching the parallels to B&H.

Given that Beers (1974) only showed that children's spelling improved across a sketchy set of levels, and for just three short vowels at that, the only substantial support left to Gentry

(1978) for a full-blown system was Gentry (1977), which was the dissertation on which Gentry (1978) was based, in which the same five bands were proposed, which was not evidence in support of the contention, but merely recapitulation. What's important here, however, is that Gentry continued to state that children were not restricted to just one strategy or stage, "Young children typically use a mixture of sequentially adjacent strategies, but it is not uncommon to find a child who uses a single strategy almost exclusively," and children who used a different spelling strategy were said to be "at a different stage of development of word and spelling concepts" (p. 90). Terminologically, the notion was to have the strategies be well defined, and the manner of spanning the stages be fuzzy.

As in Gentry (1977), Gentry (1978) drew strict boundaries between these strategies because they were to be used by teachers to classify children's spelling samples, but crucially, in this work intended for a broader public, they were still not used to classify *children* as spellers belonging to a specific level. The "deviant" strategy remained a "catchall" (p. 22), and in the "prephonetic" strategy, "some sound features of the word are omitted" (p. 92). The "phonetic" strategy continued to mirror B&H, "In phonetic spelling the letters are assigned strictly on the basis of sound, without regard for acceptable English letter sequence or other conventions" (p. 91). If a letter was missing in a phonetic spelling, it was because the sound that it would have represented was being treated as an unnecessary phonetic detail (e.g. nasals as nasalization). In wording very similar to that found in the earlier work, a speller who drew upon the "transitional" strategy was said to use "markers, digraphs, vowels in every syllable, and other orthographic constraints" (p. 91), and was allowed either a two-letter reversal, *or* a correct phonetic spelling if there was a vowel in every syllable. The "correct" strategy remained self-explanatory (p. 89).

The definitions of the strategies were starting to become somewhat more refined as the articles instructed novices in their use for the classification of CIS samples.

Henderson and Beers (with a Dash of Morris)

Henderson and Beers (1980) was cited by the subsequent works of Gentry (1982) and Ehri (1986) to support their general characterization of spelling as consisting of some developmental stages, and while the work certainly contained material to support this contention, it was more valuable than that (cf. Morris, 1981). Henderson and Beers was a collection of articles by a variety of researchers who addressed a multitude of issues, such as summarizing the body of spelling research conducted up until the point of publication, making additional inroads into the cognitive processes underlying spelling, and suggesting pedagogical methods based upon these findings (to name but three). It is clearly beyond the scope of this particular work to analyze that research in full, and its importance was as a milestone validating developmental spelling research as a cohesive body.

When it comes to support for the stage theories, Henderson (1981) was an unusual case. First, there was a recap of terminology from Beers (1974), specifically: "no attempt," "letter-name strategy," "transition (inclusion of a marker vowel)," and "correct" (p. 59). Oddly, Beers actually had "omission of a vowel" instead of "no attempt" (p. 32). This was followed by a mention of the use of "letter-name and transitional strategies" in B&H (p. 70). The problem is that Henderson then claimed to adopt the terms "Preliterate, prephonetic" from Gentry (1977), even though the term "preliterate" appears nowhere in that work (p. 71); similarly, a table in Henderson (p. 116) is supposed to contain examples collected from Gentry, but most of the examples have been changed liberally from those found in the dissertation. (In addition, a column is added after "phonetic," namely "advanced," which is presumably a stage that occurs

before correct spelling.) For example, where Henderson gave "MONSTRE" as a transitional spelling (p. 116), Gentry gave "MONSTOR" (p. 19); likewise, "EGLLE" was swapped out for "EAGEL," "UNINTIDE" for "UNNITED," and on down the column. The same substitutions were made with the examples of the phonetic spelling ("COST" / "CLOSD"; p. 20), and even simple examples of prephonetic spelling got changed to "m" from "MTR," and "c" from "KLS" (p. 22). It is difficult to find examples in the table that Henderson did *not* change,[3] and the purpose behind having done so is unclear, although the tailored examples did fit the explanations in Henderson more closely than the originals.

Morris (1981) attributed the terms "pre-phonetic," "phonetic," "vowel transition," and "correct" to Henderson (in press), again with some mismatch (e.g. the added "vowel" in "vowel transition") against the subsequently published version (1981).[4] Crucially, in Morris these terms were presented as actual developmental stages used to classify *children*, rather than just portions of their spelling. As far as the boundary conditions between stages were concerned, Morris said that, "An individual child could be in one stage (a Phonetic speller) or could be simultaneously in or between two stages (a late Pre-Phonetic or a Phonetic/Transitional speller)" (p. 664). Morris also noted the likelihood of variable rates of progress. The term "strategy" was only used in the broadest sense, as when the phrase, "sequential, sounding-out strategy" was meant to be taken in parallel with the "Phonetic stage" at large (p. 663). "Strategy" finally ended up as no more than a stylistic synonym when Morris mentioned "sounding-out spelling" (p. 664). The term "deviant" was also used, but it was downplayed towards the end of the article, with both examples of this behavior being reclassified into other stages.[5] So when Morris was cited in support of stagewise characterizations of spelling development, as it was in Ehri (1986), it is important to note its

demotion of strategies and promotion of stages, and its terminological reliance on previous

spelling research through the unusual example of Henderson (1981).

Gentry Rides Again

Gentry (1982) analyzed Glenda Bissex' detailed chronology of her son's spelling

behavior (Bissex, 1980) to demonstrate the efficacy of the now-familiar classification system

divided into "five stages of spelling development" (p. 192).[6] The identification of the actual

stages and their classification was credited variously to Read (1975), B&H, Gentry's dissertation

work (1977), and the collection of articles by Henderson and Beers (1980) which, when it comes

to terminological issues, is better characterized as a pointer back towards even earlier research.

All of these previous attempts at classification finally began to gel, and Gentry said outright that

"children… progress through five levels of spelling…: precommunicative spelling, semiphonetic

spelling, phonetic spelling, transitional spelling, and correct spelling (Gentry, 1978)" (p. 193).

(Unfortunately, the door opened by Morris (1981) was pushed wider by this sort of phrasing, and

exacerbated the risk of the system being misinterpreted as a classifier of children.) Gentry took

time to point out that "precommunicative" would be used to avoid the pejorative connotations of

"deviant," but the reason for switching from "prephonetic" to "semiphonetic" was left unstated

(presumably due to transparency of purpose). This was more than a matter of terminological

quibbling, because while this article was presented primarily as an *application* of a new analytic

system, the definition of this framework and its associated terms was a significant development

as it crystallized several years' worth of collective preliminary research.

Naturally, Gentry went beyond simply providing a few labels. For the first time, truly

detailed lists of rules were given for the classification of spelling into each of the categories, as

well as heuristics for differential diagnoses, as it were; for example, one of the rules defining the

phonetic stage was that, "Letters are assigned strictly on the basis of sound, without regard for acceptable English letter sequence or other conventions of English orthography" (p. 195). The clarity of these rules helped to support the use of this system as a diagnostic tool, but the lack of hedging seems to have led later researchers to mistreat Gentry as defining the process of development itself as consisting of strictly bounded stages.

It is of equal importance, however, that Gentry made clear in this article that the nature of spelling development was not defined by severe boundaries, even when it was described in terms of relatively strict stage components, as in, "Change from one spelling stage to the next is more or less gradual; samples of more than one stage may co-exist in a particular sample of writing" (p. 198). In terms of gradual changes occurring from one specific stage to another, Gentry mentioned Bissex' son having "produced messages with *fewer* semiphonetic and *more* phonetic spellings" during the "evolution of complete phonetic spelling from the earlier semiphonetic version" (p. 195; emphasis added). When it came to discrete proportions, Gentry said that, "correct forms may account for from 0 to 50% or more of words in semiphonetic writing" (p. 197), which again reflected a mixture of strategies at a given age. In general, the article relied on the use of vocabulary that appealed to notions of smooth transitions, such as *assimilate*, *finer discrimination*, *move towards*, *extension*, *growing accuracy*, and *continues to master*. The earlier comments about children progressing through levels should be read in that light. There should be no mistaking the fact that Gentry intended for development across stages to be taken as blended.

Gentry was more strict, however, when it came to the directionality of development, indicating that it was monotonically increasing, citing his dissertation work once again, "Children do not fluctuate between stages, passing from phonetic back into semiphonetic spelling or from transitional back to phonetic (Gentry, 1977)" (p. 198). Not surprisingly, this

contention was in partial contrast to the unusual Henderson (1981), which in analyzing the

writing of one child (allegedly based on Gentry's earlier system) suggested that, "He is fixated

at, or has reverted to, a prephonetic or pre-letter-name state" (p. 150). While Henderson thus left

open the *possibility* of reversion, it did so without refuting the generality of the assertion of a

typically forward trend.

Henderson Alone

Henderson (1985) was clearer about defining "stages" as nodes distributed along a

continuum, stating:

> The developmental stages of word knowledge… are somewhat arbitrary divisions.
>
> Language change is continuous, and continuous, too, is the learner's progress as he or she
>
> gradually masters English spelling. Still, there are periods of more rapid change and then
>
> longer periods when a new understanding is tested and refined. Our decision has been to
>
> divide English word knowledge into five such periods, or stages. (p. 40)

Those stages ended up being: "preliterate," "letter name," "within-word patterns" (hyphen added

for clarity), "syllable juncture," and "derivational constancy" (p. 40), which was the first time

that names of individual strategies were explicitly adopted as *stage* labels. There was no

"correct" stage, as spelling development was suggested to be a life-long process. Within-word

patterns were sets of letters that were regularly associated with the same sound. Syllable juncture

referred to the building of words out of these patterns, and so was associated with learning such

rules as the doubling of consonants after short vowels. Derivational constancy was a matter of

learning that spelling consistencies could reflect common derivational sources, such as in "sign"

and "signal," even when those word parts sounded different. There was a shift here away from

the representation of stages in fairly homogeneous letter-sound terms, to the association of increasingly higher-order letter sequences with sound patterns, and then with meanings.

More in specific, Henderson addressed the issue of letter-meaning correspondence in suggesting that exposure to the "-ed" past tense marker taught the child that, "things that mean alike are spelled alike," even when they sounded different; similarly, exposure to homophones would teach the child that, "things that mean differently are spelled differently" (p. 63). Henderson noted that, "At the early grade levels, there are few opportunities to emphasize meaning" (p. 62), in particular because the association of meaning with a spelling pattern was not going to develop until after the child learned that spelling patterns could be associated regularly with certain sounds; therefore, these lessons in meaning would be learned towards the end of the within-word patterns stage. Henderson suggested lessons with homophones at early grade levels to increase exposure to these principles, but seemed to indicate that special attention might not be as necessary later, "From the third grade on… the role of meaning becomes rapidly more conspicuous" (p. 63). Note that this is *not* saying that meaning is not learned until the third grade, but only that it gets short shrift unless measures are taken to profile its importance.[7]

Ehri Circles the Wagons

Ehri (1986) preferred a slimmed-down, three-stage system, namely: "semiphonetic"; "phonetic"; and "morphemic" (p 141). An initial "precommunicative" or "pre-spelling" stage was dismissed as not involving spelling (p. 141), and the "correct" stage was not included because it involved a "separate kind of knowledge," specifically, "memory for word spellings" (p. 154). There is a good argument to be made in favor of that contention, but no room in the scope of the current work to do so.

Ehri equated the single morphemic stage with a combination of Henderson's (1985) within-word pattern, syllable junction, and derivational constancy stages, but this is a mismatch. It is true that the latter two stages are morphemic in nature, but the first one is not, or at the very least it is not morphemic in a rich way. Henderson described a progression of letter associations, first with sounds, then with sound patterns, and then with meaning patterns. The earliest move from patterns to meanings–specifically a demonstration of a single spelling for past tense "-ed" endings based on common meaning despite varying sounds–was a measure of the *readiness* of the child to leave the within-word pattern stage and move on to the syllable juncture stage. This behavior was only analyzed in the section detailing the within-word pattern stage because the original, sound-based behavior occurred there, and because the transition to meaning-based behavior *would* occur there, but that change signaled a leaving of a stage that was not morphemic in nature. Ehri's morphemic stage, therefore, was a good match only for the syllable junction and derivational constancy stages.

At this point in the research, work characterizing stage theories dropped off, in part because there was little left to be said in the mainstream after Ehri's summary. Everyone seemed to agree that a phonetic strategy could reliably be used to identify instances of spelling that sat between the trivial spelling state at the beginning (deviant or pre-spelling) and the one at the end (correct spelling), where the latter did not require a spelling strategy proper (beyond the retrieval of a correct form from memory). Between each of these trivial end points and the phonetic stage at the center, there was intervening ground, with the semiphonetic letter-name behavior occurring in the early transition space and the morphemic behavior occurring in the later one. Stated in this fashion, stage theory seemed to be innocuous enough, but after a decade of percolation, the stage theory started to attract dissenters.

Strong Stages Questioned

The alternatives to stage theory, namely phases and waves, are examined in this section of the paper. The proponents of these alternatives criticized unnaturally strong versions of stage theory, and this exaggeration made their arguments weak, but the fact remains that there is something about stage theory that lent itself to being misinterpreted in precisely that absolutist fashion, and that issue still needs to be addressed.

Strict Stage Ordering Questioned (Treiman and Associates)

Treiman & Cassar ([T&C] 1996) studied morphology and spelling, questioning "strong versions of stage theories of spelling development" (p. 165) by posing the following question specifically as a disjunction, "Do beginning spellers rely largely on a sound-based strategy, as the stage theories maintain, or do these children have some ability to use other sources of information?" (p. 143). T&C conducted three experiments on children in first, second, and fourth grade, the results of which suggested that even at the first grade level, spellers did exhibit what seemed to be *some* early morphological knowledge.

While these results were interesting, there were a number of problems with the embedded line of anti-stage argumentation, beginning with the fact that the strong versions of the stage theories did not actually appear, nor were they implied, in the fundamental sources to which T&C referred (Ehri, 1986; Gentry, 1982; and Henderson, 1985). To begin with, Gentry stated that stages could co-exist within one writing sample, and so presumably one child could be a denizen of multiple stages. To continue, Henderson did not disallow early sound-meaning associations, just so long as they were preceded by appropriate knowledge of the related sound-pattern links. T&C must support Henderson in this contention because the experiment in T&C relied on showing that not all children drew upon sound-based spellings for the past tense, which

meant that at least *some* of them *did*; in addition, T&C did not go so far as to suggest that some

spellers sprang spontaneously into morpheme-based spelling before having relied on sound

strategies, so T&C can hardly have claimed that children relied *less* on sound-based strategies as

they got older, unless it also admitted that those same children did rely *more* heavily on them

initially. Finally, while Ehri did suggest that the notion of "transition" should be viewed as

"morphemic," no claims were made regarding the nature of the boundaries between the stages.

In particular support of the suggestion that Gentry (1982) presented a strong stage

framework, T&C cited a phonetic rule in Gentry which stated, "Letters are assigned strictly on

the basis of sound, without regard for acceptable English letter sequence or other conventions of

English orthography" (p. 195). As shown earlier in this paper, however, this rule was presented

in Gentry as a non-hedged diagnostic heuristic for the classification of specific spelling samples,

and contrary to the implication in T&C, it was not intended to be used to pigeonhole children as

"semiphonetic and phonetic *spellers*" (p. 142, emphasis added).

There was every allowance in the work of the promoters of the stage theories for an early

appeal to some morphemic knowledge by some spellers, the only stricture being that no such

strategy would appear before the very first of the phonetic strategies, and that such reliance

would tend to be relatively rare among earlier spellers. The appearance of morphemic behavior

simply identified a child as having started to venture into the morphemic spelling stage, and not

as having abandoned all of their phonemic strategies.

To top this all off, there is another viable explanation for T&C's experimental results.

T&C's claim that some children drew upon morphemic knowledge was largely based on the

statistical significance of the observation that children tended to drop the final consonant (the

inflectional suffix) off of a two-morpheme word more often that they did for a one-morpheme

word; however, all that this really suggests is that if a child were being asked to write *real* words by a tester, then they would not be likely to notice if they failed to clearly hear a dictated two-morpheme word like "tuned," because they would simply think that it was the familiar, real word "tune." This would not be likely to happen if they were dictated the one-morpheme word "blond," because if they thought that they heard the *nonsense* word "blon," then they would be more likely to assume that the word must have been "blond" in the first place, and would therefore avoid writing "blon" in error. It would be interesting to see what the results of this test would be were this flaw to be corrected.

Cassar and Treiman ([C&T] 1997) unintentionally highlighted the difference between *orthotactic* and *orthographic* knowledge, which turns out to be very helpful when it comes to straightening out the issue of strong stages. Three types of knowledge of English consonant doubling were tested. The first was an understanding that in a string of letters, allowable doublets (such as "ll" and "ss," but not "hh") were only allowed in certain positions, and so "luss" was more likely to be a word than "llus" (p. 644). Second, regardless of position, not all doublets were allowed, and so "soll" was more likely to be a word than "sohh" (p. 644). Finally, the "o" in a nonsense word like "bonug" was more likely to be pronounced with an /o/ than an / /, just as "bonnug" would have an / / more likely than an /o/ (p. 644). The test results broadly associated the beginnings of these three types of awareness with kindergarten, first grade, and sixth grade, respectively.

By referring to them *all* as "orthographic knowledge," C&T challenged the stage theory claim that orthographic knowledge was not available during the letter-name stage. On the one hand, it would be easy to point out that the stage theorists allowed stages to overlap (when such knowledge was available), but such a simple response would not get to the heart of the matter,

which was the suggestion that orthographic knowledge was available much earlier in a *general* sense than the stage theories might normally have portrayed as being typical. The problem is that this claim ignored the fact that very young spellers were exposed to *many* words containing doublets of the first type (e.g. "doll," "ball," "mommy"), which provided children with the opportunity to develop simple orthotactic familiarity long before they faced the complexities of such truly orthographic (and morphophonemic) knowledge as that the "l" in "traveling" was not doubled (in American English) because the antepenultimate syllable was stressed, or an understanding that "attend" had an assimilated prefix. It was this latter type of experience that the stage theorists suggested was not available to young spellers, and this conclusion seems to be *supported* by the results shown in C&T.

Treiman and Bourassa ([T&B] 2000) provided no new research, but rather rehashed the strong stage issues in T&C, further caricaturing the stage theories of Gentry (1982), Henderson (1985), and Ehri (1986) in absolute terms. The claim here was against the "stage theory's core assumption of consistent spelling patterns within a stage of development" (p. 11). This view was weak from the outset because it misinterpreted stage theories as suggesting that a speller inhabited only one stage of development at a time, but T&B went on to claim a *kind* of stage homogeneity which simply did not exist in the original works cited. As shown earlier, even a cursory examination of the research on which these stage theories were based reveals stages to be spelling *patterns* that were *clustered* according to similarity in the various *types* of errors made across those patterns; likewise, the language used in the stage theory documents showed that the spelling samples written by a given child were not to be taken as falling into a single stage, but rather as possibly displaying behavior found in more than one stage.

In addition, it became clear in T&B that the issue was not with the fact that stages were being interpreted as non-overlapping, but rather that the stages were simply seen as too coarse. T&B drew upon the results of the likes of C&T and Treiman (1994), where the latter found that children's spelling reflected the extraction of the consonant component from a letter's name sooner for the more obstruent consonants (e.g. /b/ from /bi/) than it did for those that were more sonorant (e.g. the /r/ from / r/). This conclusion was used to posit the existence of three non-overlapping, sequential, monotonically increasing "phases" within the use of the letter-name strategy (p. 10). At that point, any real advantage of phases over stages was left as a palimpsest, and an educated guess at the implication intended by T&B can be most clearly explained in terms of the following extended metaphor.

Suppose that you had a stack of red playing cards in your right hand, such as the suit of hearts ordered from ace to king (with the ace on the bottom), as well as the suit of clubs ordered likewise in your left. If the cards in a given stack were all glued together, you could only shuffle the red and black piles in one of two ways: red on top; or black on top. If the cards were left separate, however, then the two stacks could be riffled together in a wider variety of alternating red-and-black patterns. Treiman (at various times, with various confederates) has contended that the stage theorists have glued the cards together, when all they have really done is to suggest that no matter how you riffle the cards: (a) the cards of any given color will tend to remain in order, and (b) the bottom card will always be the ace of hearts. While providing interesting insight into the spelling of children (even when the test results are open to alternative interpretation), Treiman's body of work actually *supports* the stage theorist's first claim, and fails to counter the second; however, it is true that the *tendency* to misinterpret "stage" as a monolith remains a problem, as that same interpretation is evident in the work of other researchers just numerous

enough to defy a full review here. This vulnerability promotes the contention that a spectrum with bands might be less likely to cause confusion.

Strict Stage Boundaries Questioned

Rittle-Johnson and Siegler ([R&S] 1999) suggested using the "overlapping waves metaphor" (Siegler, 1996, p. 84) to describe spelling development, wherein children were portrayed as relying on the fastest combination of strategies that guaranteed a successful solution to a problem. Easy problems tended to be attacked with a single, quick, sure-fire strategy, and more sophisticated efforts were reserved for more difficult problems. (No mention was made of the influence of impulsive personality traits.) So much seems like it should have been obvious, but crucial to the waves framework were the *ways* in which performance could be made faster while maintaining or improving accuracy. A child could learn new strategies, practice old ones, simply perform old ones better, or make better choices among existing strategies. Tests showed that improvement in regards to these skills was gradual, and that it was heavily based on the latter three components, and *generally* not on the learning of new strategies.

This premise was presented in contrast to a typically absolutist misinterpretation of stage theory in R&S, namely that:

> The stage models depict development of spelling as progressing through distinct stages in which introduction of a more advanced strategy results in the child moving to the next stage. These models imply that change occurs over a relatively short period of time, during which children discover a new strategy and use it whenever it is applicable. (p. 33)

As shown earlier, however, stage theories *did* allow for the overlap of adjacent strategies, as well as hybrid periods in which the balance of strategies could fluctuate. What they tended to disallow was a wholesale reversion of strategies, that is to say, the abandonment of new strategies once

learned. Still, the perspective in R&S did highlight a stage theory lacuna: while stage theorists sometimes addressed the issue of heterogeneity within a spelling stage in terms of clusters of different spelling error patterns, development through a stage was not discussed. *This* was precisely the topic that part of R&S investigated well.

This parallax became clear when R&S referred to spelling strategies not in terms of phonetics or morphemics (for example), but rather as general skills that should be more broadly applicable across such stages, namely: retrieval; sounding out; analogy; rule; visual checking; and their combinations. (In fact, to avoid a conflation of terms, these latter strategies will be referred to in this paper as "skills.") The notion of "overlapping waves," then, entered the picture when R&S suggested that a child would overlap the timing of their improvement with these skills, and so the *balance* of skills to which they appealed would change from time to time as one or another of them currently proved to be the most likely predictor of success.

The interesting twist in R&S was that these observations had been well tested when it came to children pursuing algorithmic solutions to the likes of math problems, where slower backup skills should guarantee success even when no fast attack is available. No tests had previously been conducted on the less regular domain of spelling, where backup skills were a matter of educated guesswork; that is to say, a flawless appeal to a spelling rule (for example) still might not produce a correct spelling for a particular word. It becomes more difficult for the child to choose among a set of skills when the prediction of success is fuzzier. R&S found that children appealed to backup skills just as they would for an algorithmic task, but the children did so *not* because they thought that the backup skill would guarantee *success*, but because they knew that the fastest skill, retrieval, had already *failed*.

The problem became one of apples (or perhaps tangerines) and oranges. In an algorithmic problem, the answer (or specific set of answers) would always remain the same. In children's spelling, the target moved as the speller developed. Sounding-out skills were not necessarily used by a beginning speller to find the conventional spelling of a word, but to provide the child with the actual object of their spelling; in other words, a speller using a semiphonetic strategy was not trying to spell the actual string of letters "elephant," but rather a string of letters that would match up with a target something along the lines of the sound /   /. Stage theory suggested that in such a case the child might resort to a letter-name strategy and come up with "LFT." The child had appealed to no analogy, no spelling rule, no visual checking skill, but had chosen a strategy to pick a new target that resulted in their ability to use a skill with complete success. The overlapping waves theory did not take into account the fact that the backup skill outside of an algorithmic domain could rely on the creation of a different target answer to begin with, nor did it consider that this avenue was not available to a child solving a problem in an algorithmic domain unless the correct answer was known beforehand.

In this sense, R&S did not upset stage theory, but rather complemented it dimensionally. Stage cores could remain effectively portrayed as clusters or reefs of spelling error patterns, and the process of transition between stages could be described with equal clarity as a monotonically incoming tide (as long as that tide had an unnatural, evaporating trailing edge[8]).

Monotonicity Questioned

Stage theories were flexible enough to withstand an examination of their characterization of the boundaries and internal consistency of the stages themselves, but they could be accurately interpreted, albeit with *some* fluctuation, as making stronger claims about the monotonically increasing nature of spelling development. Beers, Beers, and Grant (1977) did say that children

might use a less sophisticated strategy when faced with a less familiar word. Henderson (1981) did make a *brief* allowance for some possibility of fixation, and even reversion, but did not go into details. Morris (1981) explicitly allowed for stage overlap. Gentry (1982) said that stages might co-exist, but disallowed reversion waffling. Ehri (1986) remained silent on the issue of reversion. The consensus was clearly that actual reversion, if it happened at all, would be an anomaly.

Curiously, despite the clarity of this opening in the stage theory defense, there was only one attack on this front, and it was a peripheral, cursory one at that. In the course of describing a planned program of spelling assessment, Masterson and Apel ([M&A] 2000) made brief mention of the possibility that, "it is possible that a skill that is mastered at a lower stage will become problematic again when word complexity or linguistic knowledge increases," continuing, "as structural complexity increases and the student attempts to spell three- and four-syllable words, he or she may 'revert' to a failure to represent every sound with a letter" (p. 54). This comment followed a direct reference to T&B, but did not actually refer to that work, neither were there references to any other research, nor is this theme expanded upon elsewhere in M&A, so the statement, while intriguing, must be taken as mere speculation.

The stage theory's claim of monotonicity, then, has yet to be *seriously* questioned.

<div align="center">Discussion</div>

Metaphors to Think by

The stage theory has one great underlying advantage: spelling development is associated with *increasingly higher ordering*. Children first spell individual sounds, and then overlap that with syllables, and then strings of syllables, and along the way they extract nearest matched patterns for form-meaning links (i.e. symbols) that they can rely on when spelling words with

which they are less familiar. It is unfortunate that the common, stepwise connotation of the word "stage" should catalyze with the stage theorists' overly enthusiastic cries of "onward and upward" to miscast their intent as the banging together of yet another Piagetian dependency staircase. The division of stages into phases turned out to be of trivial consequence. And while the waves metaphor is clearer inasmuch as its nodes are explicitly said to be overlapping, in fact significantly so, it actually goes too far in the other direction in that it has *no* internal portrayal of ordering, and *no* sense of interference between waves, either constructive or destructive.

A spectrum, in contrast, is an array ordered in accord with the magnitude of a common property, and in fact there is no necessary reason that it could not be a multidimensional array based on multiple such properties. Imagine the letter-name band as red, the within-word band as yellow, and the morphemic band as blue, in which case every individual (child or adult) would have their own developmental gradient as defined by the pattern of their spelling samples on that spectrum. Now throw luminance (i.e. light and dark) on top of this chrominance, and you can account for variance according to word familiarity. Or think in terms of a sound spectrograph, with the formants changing over time. The property does not matter as much as the degrees of freedom of movement within what remains an ordered dimensional space.

The point, of course, is that metaphors can be captivating, and that is not always a good thing for the captive. Metaphors must be chosen carefully so that researchers will be prompted to think in the most illuminating ways about the nature of spelling when charting the course of their future research. A researcher grounded in stages might never examine the possibility of "illusory recovery" (Scarborough & Dobrich, 1990<>). One who is transfixed by the overlapping waves metaphor will not investigate the liminal areas between bands, where spelling behavior is likely

to be the most interesting, neither will they focus much attention on *new* strategies. When viewed as a spectrum, however, the possibilities are open ended…

Future Research

In fact, no serious attention has been paid to the issue of the spelling development vector. Is it always forward? Do impetuous children have greater forward velocity than breadth across strategies? Will a good speller revert when they are immersed in examples of poor spelling? And what happens to spelling at the *other* end of the age continuum? These sorts of questions beg to foster stress tests. The categorization of errors made by champion spelling bee participants might be particularly interesting in this regard.

And then there is the issue of the degree of overlap between spectral bands, which T&C addressed in part, albeit with an unfortunately flawed experiment. Most of the existing studies examine *invented* spelling, and not correct spelling, which can make up a significant portion of the words spelled even early on, and so constitutes a band that gets ignored. Are early-correct words likely to be simple, or familiar, or both? Do they display morphophonemic or orthographic (as opposed to simple orthotactic) regularity? Is the switch as binary as Ehri suggests, or are there words that are *almost* retrieved? Are there words that will bring an adult speller to their knees, causing them to resort to a strategy as "primitive" as sounding-out? And if an adult *does* sound out a word slowly, will their long vowels also be spelled as diphthongs? An analysis of the characteristics common to words that are *easily* spelled would start to sort out some of these issues.

Finally the boundaries between bands need to be examined for fuzziness and interference. Which strategies can exist in parallel, much less in harmony? Are there hybrid strategies, and if so, are they vigorous? In other words, what *do* you get when you cross a letter-name strategy

with a morphemic one? And what words give "correct" spellers the greatest grief? Although Rittle-Johnson and Siegler (1999) instituted some important methodological changes, much of the categorization work to date has been highly subjective in nature, with researchers trying to make educated guesses about the intent of the speller. An objective method of spelling sample classification is the bare minimum progress required before future research can proceed with confidence.

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Footnotes

1. Read's (1975) syllabic experiments were replicated with methodological variation in Treiman, Berch, Tincoff, and Weatherstone (1993); in addition, Treiman (1985) used a suite of tests (spelling, phoneme recognition, phoneme deletion, and The Wide Range Achievement Test; Jastak, Bijou, and Jastak, 1978) to reproduce the finding that sound-spelling judgments differ in children and adults.

2. Beers (1980) lists a second four-pattern sequence in a table of spelling sequence examples (p. 38), suggesting that it appears in Beers and Henderson ([B&H] 1977), but it is not in the original. An examination of Gentry (1977) suggests that it *might* have been in B&H while it was being prepared for press, but was changed before the published version analyzed here.

3. As Gentry's dissertation chair, Henderson might be citing a pre-final draft.

4. In transferring a table from Henderson (1981, p. 93), Morris did not include the "CHILD" table header, and so fails to make it clear that the three numbered subcolumns under the "Pre-Phonetic" table heading represent examples of spelling from three particular children, and not three substages of pre-phonetic spelling (p. 663).

5. Where Morris (1981) really finds its value is in its comparison of early reading and writing development, an evaluation of which is beyond the scope of this work.

6. Bissex (1980) does not rely on a *specific* analytic framework, and the author simply refers to the "universals" revealed by contemporary spelling research as a "backdrop" (p. 35).

7. This perspective was promoted in the pedagogy of Henderson and Templeton (1986).

8. This analogy actually likens the motion of spelling improvement to that of the creature in *The Blob* (Harris, 1958), or rather to a small, ruly herd of such blobs. (There is otherwise a distinct lack of *cohesive* semiliquid-state juggernauts in English figurative language.)

Tables

Table 1

Synonyms for Names of Specific Bands in the Spelling Development Spectrum

Band	Term
1	Deviant: Gentry (1977, 1978); Gentry & Henderson (1978); Morris (1981)
	Precommunicative: Gentry (1982)
	Preliterate: Henderson (1985); Henderson and Templeton (1986)
2	First level: Beers & Henderson (1977)
	Preliterate, Prephonetic: Henderson (1981)
	Prephonetic: Gentry (1977, 1978); Morris (1981)
	Semiphonetic: Gentry (1982)
	Letter Name: Henderson (1985); Henderson and Templeton (1986)
3	Second level: Beers & Henderson (1977)
	Phonetic: Gentry (1977, 1978, 1982); Gentry & Henderson (1978); Morris (1981)
	Within Word Pattern: Henderson (1985); Henderson and Templeton (1986)
4	Third level: Beers & Henderson (1977)
	Transitional: Gentry (1977, 1978, 1982); Gentry & Henderson (1978)
	Vowel Transitional: Morris (1981)
	Syllable Junction: Henderson (1985); Henderson and Templeton (1986)
	Morphemic: Ehri (1986) [and on into Band 5]
5	Correct: Gentry (1977, 1978, 1982); Gentry & Henderson (1978); Morris (1981)
	Derivational Constancy: Henderson (1985); Henderson and Templeton (1986)

Table 2

Terms Analogous to "Band"

Reference	Term
(Beers & Henderson, 1977)	pattern level; level of spelling
(Gentry, 1977, 1978), (Gentry & Henderson, 1978)	strategy; stage
(Henderson and Beers, 1980)	strategy, spelling, stage, step
(Morris, 1981)	strategy/spelling (informally); stage
Gentry (1982)	stage
Henderson (1985)	period (briefly); stage
Treiman and Bourassa (2000)	phases within stage (and redefine "stage")