Verse Form: A Pilot Study in the Epidemiology of Representations

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This paper presents a pilot study in the "epidemiological" program for cultural research put forward by Dan Sperber. Theory is offered to argue that verse form is so disabling that its worldwide distribution must be explained by functions other than the broad communicative, or ideological, power traditionally attributed to it. The theoretical case is confirmed by numerical data showing that in matched texts of English prose and verse the latter contain words of a lower mean length (measured in syllables). Candidate hypotheses for the epidemiology of verse are offered, including design for mnemonic properties, the registration of differences in verbal intelligence, the presentation of gestures of commitment, and the introduction of levels of quasi-randomness that lead to an impression of semantic richness and the illusion of profound and powerful communication.

KEY WORDS: **Epidemiology of representations; Metrical analysis; Poetry; Sperber, Dan; Verse form.**

EVOLUTIONARY THEORY AND CULTURAL STUDIES: THE EPIDEMIOLOGY OF REPRESENTATIONS

Essentialist approaches to culture are still surprisingly common, even amongst those whose work recognizes the importance of evolutionary

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biology. We still speak carelessly of this or that as being the result of culture, as if an abstraction could be an effective causal force. However, in a literal sense, anything, a behavior for example, that is attributed to a cultural cause must be said to be the result of a natural cause, and by this we must mean a concrete physical cause or conglomerate of causes. We do not encounter culture in the general sense; we encounter particular cultural objects, physical objects, which have consequences on our own physical state. A traveler who experiences culture-shock is not prostrate before a homogenous stranger, an organic individual, but is troubled by exposure to clusters of cultural objects and their consequences on other bodies—clusters and consequences that are markedly different in composition from those familiar to the traveler.

Typically, therefore, students of culture must regard themselves as obliged to engage with population thinking, as it is understood in the biological sciences. The case for this approach has been made repeatedly by the anthropologist Dan Sperber (1985, 1990, 1994, 1996a, 1996b). Briefly, the "epidemiological program" (Sperber 1996a:1–2) draws our attention to the description and explanation of the *distributions* of cultural objects. It should be noted that just as epidemiology in general is not confined to the study of contagious disease, so a cultural epidemiology need not presume, as memetics (Dawkins 1989) arguably does, that a cultural object is contagious or that it is a disease, though it might in fact be both. As Sperber puts it "diabetes is not contagious, believing in witches is not a disease, and having white hair is neither," and yet all may be studied epidemiologically (Sperber 1996a:2). Thus the net cast by this approach to culture is more inclusive than alternative cultural transmission theories, is less dependent on the principle of replication, which is as Sperber points out (1996a) not clearly applicable to all cultural objects, and thus, because of its flexibility, allows tailor-made precision in the definition of research goals in particular fields.

Sperber divides the examination of cultural objects into two major areas of investigation: on the one hand, the study and explanation of the mass distributions of public representations, and on the other, of psychological representations. In the first category we find objects such as printed books and spoken words, musical scores, music, paintings, houses, machines, and all the clutter of the Victorian drawing room, or the twentieth-century teenager's bedroom wall. The second category circumscribes the contents of human minds, that is to say brain states resulting from interaction with the outside world, including the world of public representations, and not infrequently creating further public representations. There is a strong temptation for workers in the humanities to leap at the study of brain states, partly because there is a ready database at hand, in their own minds, and partly because it imposes a

lower degree of methodological rigor on the investigator, since no one expects rigor about something so little available to rigorous examination. It also promises, at present, to confine the study within the bounds of human relevance, a fact which unfortunately shuts off the path to clear causal understanding (for further discussion of this latter point see Boyer 1994:295). Moreover, although not logically prior to the study of psychological representations, the study of public representations and their formal properties is pragmatically prior, since formal study may guard against errors, particularly so because it may prevent us from slipping into *criticism*, that is, into partial and evaluative discussions of the properties of cultural objects as they bear on the interests of individuals and sects. Further, the difficulties of collecting information about a large sample of psychological representations will tend to encourage concentration on the mind closest at hand, and hence the investigator and his or her allegiances will usually take pole position, which is a program for therapy or theater, not science. Public representations, by contrast, have the very considerable advantage of being amenable to large-scale empirical study, and of thus being open to public examination and the generation of public agreement.

In addition to population thinking, naturalized cultural study must recognize that public representations are produced and supported by, and psychological representations instantiated in, an information-processing device which has evolved by Darwinian natural selection. The connection is, however, involved and indirect. Cultural objects themselves may, of course, be used as a cultural strategy to serve the genetic interests of the organism that creates, hosts, and distributes them (Cronk 1995:187; Eibl-Ebesfeldt 1988:61; Scalise Sugiyama 1996). However, since this view also implies that human psychology is vulnerable to culture, otherwise one organism could not use cultural output to manipulate another, we are led to a second major possibility—that much of the contemporary cultural pool is, in Sperber's terms, made up of objects to which that evolved information processing system is susceptible (Sperber 1996a:67) but for which it has no need, and which are maintained in the cultural pool by that susceptibility rather than by Machiavellian design. The reasons for this will presumably be explained by reference to evolved functions, and studies which locate such susceptibilities may be able to gesture helpfully in the direction of such functions, though their elucidation will lie in other fields.

Certain strains of cultural objects, chairs for example, or many of those known under the umbrella term *science*, have manifest utility or technological power, and their epidemic distribution hardly requires further explanation, though it is entirely reasonable, at least with regard to science, to ask if the obvious functions are the only functions. While

critical ideological analysis does, in its muddled way, attempt to do this, it would be preferable for that approach to itself honor the principles of public scientific exchange which it claims to monitor. The epidemiological program is capable of meeting this requirement.

Many other categories of cultural material are not plainly functional, and these constitute some of the most widely distributed and most discussed cultural forms, such as music, song, dance, literature, and pictorial and sculptural art. Essentialist approaches are extremely common in this area; indeed romantic organicism seems still to permeate cultural anthropology and literary criticism, to name but two fields, and if epidemiological studies prove themselves anywhere, it must be in this arena. With this end in view the present paper takes an abstract property of language output associated with the arts—verse form (meter), an undoubted cultural universal (Brown 1991; Wimsatt 1972)—and outlines an epidemiological approach to objects with this property. Numerical data relating to average word length, calculated in syllables, in matched samples of English verse and prose are used to comment on and move towards answers to problems framed by the epidemiological viewpoint, and a range of hypotheses is presented to explain the global frequency of verse form. It should be stressed that these are no more than hypotheses, and that my purpose here is simply to show that Sperber's program can open up an arcane field such as literary metrics and bring it into a revealing relationship with an anthropology which is itself integrated with the rest of the sciences.

THE EPIDEMIOLOGY OF VERSE FORM

To a cultural epidemiologist four major questions, at least, arise regarding the distribution of verse form:

1. Why is verse so commonly found in the cultural repertoires of the world's peoples?
2. Why is verse used for some purposes but not others? (Scientific papers are not usually written in verse, but see Bunnett and Kearley 1971.)
3. Why are some kinds of verse used for some purposes but not others? (Certain forms, such as the triple rhythms used in English limericks, tend to be regarded as comic, and very unsuitable for a grave poem.)
4. If the answers to these questions vary over time, why is that?

These problems clearly need to be worked on in sequence, and this preparatory paper will address question 1 only, and only parts of that

question as it relates to verse in English, which is a convenient field for such a pilot study in that its principles are now relatively well understood (Attridge 1982, 1995; Youmans 1989), and because its literary critical and scholarly tradition is full and its texts well-edited.

Insofar as traditional English literary critical appreciation has addressed the first question it is assumed that verse is the highest, or fullest form of human communication, and that it possesses features that "enable . . . it to communicate with a richness and precision that prose cannot achieve" (Johnson 1990:469):

> Prosody enables the poet to communicate states of awareness, tensions, emotions, all of humanity's inner life that the helter-skelter of ordinary propositional language cannot express (Gross and McDowell 1996:8).

Those familiar with the current range of discussion in literary criticism will be aware that this position has both Natural Theological and Natural Diabological wings, and that some writers propose that criticism of poetry is important because the materials under discussion are the most vital communication of human feeling and reflection, as opposed to those who believe that it must be assaulted because it is so potent an instrument of political or psychological repression. Inversions, combinations, and impossible compromises between selected elements from these positions are common. A general attitude of this kind, usually in a conservative form, is also found amongst Darwinian literary scholars, who often think that literature is a significant part of an evolutionary approach to human behavior because, being one of the peaks of human expression, it is a very good place to look for anticipations of evolutionary thought. More directly they may hope that evolutionary naturalism will banish poststructuralist relativism and provide a surer foundation for a more or less conventional critical and interpretative literary study in which the value of literature, or, more generally, the arts, is preserved and augmented (Carroll 1995a, 1995b; Dissanayake 1988, 1992; Easterlin 1993, which is more guarded in its claims; Turner 1992; Turner and Pöppel 1988:85). Alternatively, they may assume that literature, and in some cases poetry in particular, will reflect human interests with a high degree of accuracy (Carroll 1995a, 1995b; Cooke 1995; Ellis and Symons 1990:543ff; Fox 1995; Nesse 1995; Price 1995; Whissell 1996) and constitutes a significant meditation on these interests (see especially Carroll 1995a, but Cooke 1995 and Nesse 1995 also appear to share this assumption to some degree). Clearly it would be extremely odd if literature and the arts did not reflect human interests, but I shall later offer reasons for using extreme caution when employing detailed exegesis of literary texts in verse as a data source in human behavioral studies, reasons which also cast considerable doubt on the value of these texts as analysis.

Whether similar doubts should be applied to prose texts is an open question.

The fact that scholars and critics from several disciplines, and with a wide range of positions, share the belief that verse is a remarkably effective communicative and expressive instrument suggests that the belief is well-founded. However, there is a rather obvious difficulty. Namely, there is no way of understanding verse that does not describe it as a set of rules which constrain the composer on several axes. These axes are variable in character from language to language and depend on the surface phenomena available. In English, composers are usually restricted by the number and patterning of beats and offbeats in a specified unit, and by the positioning of same-sounding syllables. In Japanese, which lacks marked stress, permitted lines are defined only in relation to the independent morae recognized within the sound system (this corresponds closely but not exactly with what an English speaker would perceive as syllables). Composers need not undertake to be restricted by all the axes simultaneously, as we may appreciate from the fact that in English it is possible to write verse that does not rhyme. Despite this very considerable variability, there is one significant property common to all the world's major verse forms, and perhaps to all known verse forms (Wimsatt 1972). That is, they impose restrictions on the lengths of utterances available to composers. I shall refer to these under two headings:

1. Element extent restrictions. That is, components such as lines and stanzas, which can be assembled to form larger compositions
2. Total extent restrictions. In other words, a requirement that fixes the total length of an utterance

While it is theoretically possible that verse forms might be constructed by specifying only a total extent, in practice these do not occur. Works are normally either built around element extent restrictions only, such as the blank verse (an unrhymed ten-syllable line with a rhythmic pattern formed by alternating beats and offbeats) used by Shakespeare and Milton, or around both element extents and total extent restrictions, as is found in such forms as the sonnet and the limerick. (A hypothesis to explain this incomplete exploitation of possibilities will be discussed later.)

The consequences of extent restrictions are readily discovered, but normally overlooked, even when they are touched upon. Gilbert Youmans, for example, correctly observes that "the set of permissible iambic pentameter lines in English is astronomically large (albeit finite, since iambic lines have a limited number of syllables)" but does not develop

the point (Youmans 1989:9). Similarly, the author of a recent poetic primer, John Lennard, remarks that "poetic diction, for all its richnesses, is in some ways more constrained than other dictions" (Lennard 1996:103), but, except for a glancing remark about the rarity of scientific polysyllables in verse, this promising intuition with regard to restriction is left undeveloped. Earlier writers also passed close to this matter without recognizing its full significance. In 1605 Bacon described poetry as "for the most part restrained," but his evident contempt for the genre seems to have arisen from its being "in all other points extremely licensed" (Bacon 1956:96). Much nearer to the truth, I shall argue, is John Milton's dismissal of rhyme as constraining authors to "express many things otherwise, and for the most part worse than else they would have expressed them" (Milton [1668] 1952:4). However, Milton does not seem to have appreciated that his own blank verse, "apt numbers, fit quantity of syllables," would force his hand in a similar though lesser degree. For a clearer understanding of this matter, particularly the restrictive features of rhythm in addition to rhyme, we must look to Schopenhauer, who remarked that "violence is done to an idea or to its correct and pure expression" not only by rhyme but by the effort required to ensure that the "syllables . . . may present a certain hop and jump" (Schopenhauer [1844] 1966:428). Putting aside the less than helpful invocation of the right and the immaculate, we may single out his position as unusual in tactlessly pointing to the obvious, to the torsion, the violence as he puts it, that limits the communicative flexibility of metered language:

> If we could see into the secret workshop of the poets, we should find that the idea is sought for the rhyme ten times more often than the rhyme for the idea; and even in the latter case, it does not come off easily without flexibility on the part of the idea (1966:428).

These and similar views have had almost no acknowledged impact in the literary intellectual world, for reasons well-understood by Schopenhauer himself:

> the art of verse bids defiance to these considerations; moreover, it has on its side all ages and nations, so great is the power that metre and rhyme exercise on the feelings, and so effective the mysterious *lenocinium* [seductive charm] peculiar to them (1966:428).

For a sensitive reader logical qualms are feeble beside the impact of a poem, and consequently we normally find authors following Hegel's insistence that "it is obviously untrue that versification is a mere hindrance to the free outpouring of inspiration," and echoing his resonant declaration of creative liberty:

> A genuine artistic talent moves always in its sensuous element as in its very own, where it is at home; it neither hinders nor oppresses, but on the contrary it uplifts and carries. So as a matter of fact we see all the great poets moving freely and assuredly in the field of their own self-created metre, rhythm, and rhyme (Hegel [1823–1829] 1975:1012–1013).

Matthew Arnold, for example, paraphrasing Goethe, wrote of the "boundaries and wholesome regulative laws" of meter (Arnold [1853] 1979:671), while Emerson, justifying the use of verse, claimed that "In true poetry, the thought and the metre are not painfully adjusted afterward, but are born together, as the soul and the body of a child" (Emerson [1840s] 1972). Less emphatically, Cardinal Newman concluded, as many readers would today, that "verse, far from being a restraint on the true poet, is the suitable index of his sense" (Newman [1829] 1950:200); and a more recent formalist, the American poet Yvor Winters, cast this position in an aesthetico-demotic idiom reminiscent of Hemingway:

> The complexity of the poetic medium does not hamper the great poet. The great poet is like the great athlete in two respects: he must have a great natural talent, and the talent must be trained. The great poet resembles the great boxer in the ring. Joe Louis was trained by a great scholar, Jack Blackburn. He was taught every move and when to make it; he was born with the ability to make it instantaneously and with great precision. His knowledge did not bind him; it set him free—with the result that he seemed to move by instinct. So with the great poet (Winters 1967:xix).

However, a simple process of reasoning will show that the position taken by these writers, and many others, is false, and that Schopenhauer is, broadly speaking, correct: "Metre and rhyme are a fetter" (1966:427).

Whereas sentences in unrestricted language are, thanks to recursion, potentially infinite in length (see Pinker 1994:101 for an approachable discussion of this point), and the potential combinations of these sentences are also infinite, the extent specifications involved in verse, either at the level of elements or at the level of groups of elements, limit the composer to a finite set of possible solutions. It might be objected here that the set specified by a particular verse form is closed but not finite, and indeed this is true from one perspective, for the lexicon is not finite over time and there are consequently an infinite number of solutions, even for an extent-specific verse form such as the limerick. However, this is not the perspective which confronts a particular writer, who approaches a form with a limited vocabulary and hence is limited to a fixed number of solutions for the chosen design. As of a specific time, for a particular composer there is a finite set of possible Shakespearean son-

nets. The number is obviously very large, but regarded as a percentage of the entire set of possible utterance available it is only an infinitesimal fraction. Similarly, there is a finite number of blank verse lines, though presumably this number is even greater than the number of sonnets, because, though grammaticality is required of the blank verse lines, it is not necessary that each one should be grammatically complete, whereas this is a requirement for sonnets.

The importance of this may be clarified by considering the situation of a writer sitting down to compose with a particular communicative intent. Each writer will choose from the infinite set of potential utterance some combinations that are expected, more or less adequately, to cause the desired changes in another brain (the physicalist model of communication adopted here is that found in Sperber and Wilson 1986). Note that this point is independent of the sort of communication to be made; it will be true regardless of whether the communication is of technical information, how to operate a computer perhaps, or of an emotional state, a lament for the snows of yesteryear. Now compare this situation with that of a writer choosing to compose in an extent specific verse form such as a sonnet. By accepting the limitations of a particular structure this composer has confined his or her choice to an infinitesimal subset of the superset that was available to our first writer. Admittedly, with a form that does not fix the poem's total length the case is different, because it is presumably possible to communicate as broad a range of brain states as may be communicated with unrestricted language (the finite number of units is almost certainly large enough to contain components that can be put together in an infinite number of ways). It is obvious that forms whose total extents are unlimited are communicatively more flexible, a fact which almost certainly accounts for their predominance in religious or philosophical works. However, the extent restrictions on the component elements remain, and this will force the author into ellipsis and circumlocution, with all the communicative risks that they entail.

In summary, then, *it is highly unlikely, though of course possible, that the verse set confronting an author will contain, or be suitable components for, the most effective stimulus sentences for realizing a randomly nominated communicative intent, and this is true regardless of the character of the communication.*

It may seem possible to rebut this suggestion by observing that since verse creates patterns from which deviations are highly salient to a reader, it must also create new communicative possibilities not available to unpatterned language (Winters 1962:85). While this is true, it does not justify the rejection of the earlier observations. To see why, we must recall that because the number of possible deviations is itself finite, the

total verse set remains an infinitesimal fraction of all possible utterance. Further, an argument that invokes uniqueness of meaning to defend verse can be no more than trivially true, since any unique sequence of words will have unique consequences on the receiving brain. To reply that "verse" as a category has a unique class of meaning is equally vapid, since any rule-specified group of utterances will be composed of items that are communicatively unique and will hence appear to be representatives of a unique class of meaning.

At this point an exasperated reader may feel that it is quite futile to produce theoretical arguments demonstrating that verse cannot be the most effective mode of human communication, because, after all, we know from experience that it really is so. This appeal, I believe, is only speciously convincing and should carry no more weight with us than the very obvious facts that the earth is flat and orbited by the sun. It would indeed be pointless to deny that many readers derive an intense degree of satisfaction and interest from their reading of verse poetry, but it is not necessary to accept the further hypothesis that these feelings result from any remarkably deep or powerful communication. Traditional literary criticism, still dominant in the public world and, despite appearances and protestations, in the practice of most academics regardless of their theoretical positions, tends to assume that extremely important communication has taken place and, therefore, attempts to reconstruct a mental condition which would have chosen the verse under consideration as its best expression. Having inferred the brain state from the message itself, the critic then proceeds to demonstrate in great detail that the verse is perfectly designed for the communication of this postulated state. Thus, the argument from common sense is doing no more than showing that language in verse is perfectly adapted to communicating the states of mind that it does in fact cause in the reader. This is unsurprising and does not entitle us to conclude that verse is a general communicative technique of unmatched power. In default of a better counter-argument we should accept that there are good theoretical reasons for thinking that verse is not well-formed for general communication, and consequently that its wide distribution must be accounted for, if it is to be accounted for at all, by formation for some other function or functions.

Detailed explanation of a restriction and its effects will lead to the framing of various hypotheses capable of explaining, wholly or in part, the epidemiology of verse. Specifically I will examine the restriction of line length, by which a line is restricted to a certain number or range of syllables, and show that this regulation tends to encourage writers to use shorter words than they would otherwise have chosen.

CONSEQUENCES OF RESTRICTION: EMPIRICAL DATA

Meter can be constructed by regulating any surface feature of a language, and insofar as the surface features of languages differ the metrical rules commonly used by speakers of those languages will also differ. The fact that verse traditions use very few of the surface features available is of great interest, but attempts to explain it are best deferred until the function of those that are employed has been clarified. As has been noted above, the axes of restriction can be small in number, as in Japanese, or rather numerous, as in English. Furthermore, not all of these features are obligatory or, more importantly for my purpose, readily studied. In order to simplify the investigation we need to concentrate on one feature, preferably a feature that is common to all permitted verse forms in a language, and it is fortunate that the most tractable in English is also the most important, line length. Moreover, line specification has the added advantage of being the one feature that is, as far as I know, found in verse regardless of language type, and is used by languages with and without writing systems, a point which will not only facilitate future cross-population comparisons but also enhance the probable relevance of modern literary data to the preliterate period.

Initially, we need an abstract definition of a line restriction for English verse. The following is of my own making, since I have failed to trace a better in the literature:

> **In every consecutive section of *n* syllables there must be only complete words.**

A sample from Milton will illustrate this:

> 1 Things 4 unattempted 1 yet 1 in 1 Prose 1 or 1 Rhyme

This fits the rule "In every consecutive section of ten syllables there must only be complete words," but it is excluded by a rule such as "In every consecutive section of eight syllables there must only be complete words." In practice these rules are rarely expressed so strictly, and it is normal for an author to make use of permitted variations, which might be expressed as defining the syllable count as a range. The blank verse line, one of the commonest forms in English, is mostly defined as having the range of 9–12 syllables. Since the ten-syllable line is assumed as the core set in such cases, it is best to conceive of this as a rule specifying 10 (−1 or up to +2) syllables.[1] It should be noted here that these rules may not be present to the composer, whose attention will probably be concentrated on the more salient patterning of beats and offbeats; however,

the line rule is implicit in the rules governing such patternings (Attridge 1982:357–362, 1995).

Making units that satisfy such rules is a pattern-matching exercise, as it presumably is for all the other rules of verse. That is to say it is radically different from the generation of ordinary unrestricted language. The process may, for convenience, be divided into two parts. First, writers generate source language relevant to the subject in hand, and then they search through it for sections that either satisfy the specified line rule or can be used as components of such a line. The ease of performing this task is determined by the frequency of satisfying sections in the source language, and, crucially, *this frequency can be manipulated by the composer, since it is dependent on the mean length of words, in syllables, in the source language.*

We can demonstrate this by taking a passage of prose and tallying the frequency of word sequences of varying lengths. For example a sentence such as "It is Tuesday and very hot" would be tallied as follows: "It" 1 syllable, "It is" 2 syllables, "It is Tuesday" 4 syllables, "It is Tuesday and" 5 syllables, "It is Tuesday and very" 7 syllables, "It is Tuesday and very hot" 8 syllables. We would then move to the second word in the sentence and count forward from that position: "is" 1 syllable, "is Tuesday" 3 syllables, "is Tuesday and" 4 syllables, "is Tuesday and very" 6 syllables, "is Tuesday and very hot" 7 syllables. The process would be repeated for the third, fourth, fifth, and sixth words. Such a method is, however, somewhat misleading, since the text used is finite, while mental source language is not, and a finite text leads to the underrepresentation of longer elements in the final tally scores. However, we can evade this problem by treating the text as circular. With such a model the last word of the original text is the last starting word for our counting, but we can count forward into the repeated words: "hot" 1 syllable, "hot. It" 2 syllables, "hot. It is" 3 syllables, and so on. A short sentence of this kind does not produce illuminating results, but longer texts do.[2] For example the first 1,007 words of Jane Austen's *Pride and Prejudice* contain 756 sequences of complete words totaling one syllable, 752 sequences of complete words totaling two syllables, 757 words totaling three syllables, and so on up until sequences of words totaling twenty syllables, of which there are 767. The mean frequency, 757, proves to be the total number of words (1,007) divided by the mean length of words in syllables (1.33). In texts with a lower mean, say 1.2 syllables per word, there will be approximately 840 sequences of complete words for each of the line-length counts. It should be noted, of course, that this is only a rough demonstration. If we were to compose a text consisting entirely of disyllabic words there would obviously be no solutions of line rules specified by odd numbers, and a dramatic increase in the proportion of

any of the polysyllabic groups may cause significant differences between the numbers of solutions for lines of differing lengths. This is potentially of considerable interest in relation to the convenience of employing lines of particular extents if other formal restrictions, say a requirement for polysyllabic rhyme (scenery/machinery), happen to enforce a higher than normal proportion of polysyllabic words of particular lengths. In linguistic communities where the language has substantially different proportions of monosyllables, relative to English, which is predominantly monosyllabic in output, it will also, in all probability, have a considerable bearing on the metrical rules used, in particular the sorts of line forms that are adopted. Italian for example has extremely generous rules governing elision, and its prestige line is eleven syllables in length (Giamatti 1972), a line twice as syntactically flexible as the ten-syllable line which is standard in English.[3] It would also be interesting to know whether the status of verse composed in languages that are richly polysyllabic is significantly different from that of verse composed in languages which are not.

For the present purpose, however, I shall ignore these complexities and, bearing in mind this simple model of pattern matching and its relation to word length, pass on to interim conclusions and related predictions:

1. In normal source language, the number of satisfactions for any line rule is determined by the mean word length in the source language.
2. We should therefore expect that when writers choose verse they will tend to broaden their choices by reducing the mean length of words in the source language from which they construct their verse lines.
3. The lower mean word length will then, as a matter of course, be reflected in the verse composed, and thus *when authors chose to write in verse they will tend to use shorter words than they would otherwise have used.*

This will be true regardless of whether the authors search for the entire specified object, such as a whole ten-syllable line, which is probably a relatively uncommon procedure, or whether they look for component subsections.

This is not to suggest that any randomly chosen sample of prose will have a longer mean word length than any randomly chosen sample of verse. The vocabularies available to different authors at different times and in different places vary considerably, and corresponding variations

in mean word length are to be expected even between texts written by the same author at different times. Questions of function and audience are also liable to confound random comparisons; a children's story in prose will almost certainly have a lower mean word length, for example, than a philosophical poem in verse.

In order to test the hypothesis given in item 3 it is therefore necessary to select samples of verse and prose composed at roughly the same time by one author on comparable themes. The comparison of the prose and verse elements of mixed forms, for example from a prose drama with lyrics such as John Gay's *Beggar's Opera*, might seem an ideal test, since it can be assumed that the audience and general function are similar. However, such forms are often short on either verse or prose, usually verse, and it might be well argued that their function is obviously different, since the author chose to use two forms within the same work. In order to meet this difficulty I have also compared separate works that could reasonably be said to be comparable on the basis of their date and type; for example John Milton's *Paradise Lost* is an extended narrative, involving both political and military discussion, and the text chosen for comparison, his prose *History of Britain*, which was written shortly before his major poem, contains, as might be expected, large elements of both these areas of discourse. These texts, which were obtained from various public on-line sources, were processed using custom-written software and dictionaries. In addition to calculating the mean word length in syllables the software also recorded the word length distributions in each text. Table 1 lists the author, the work title, the total number of words, and then a series of percentage figures for words of lengths between one and six syllables. The final column records the mean number of syllables per word for each text. For two of the works, Milton's *Paradise Lost* and his *History of Britain*, figures have been provided for subsections so that the consistency of the data throughout the entire text can be appreciated.[4]

All these figures may be represented by graphing any one of the pairs of matched verse and prose, so similar are they. Figure 1 compares the entire text of John Milton's epic poem with his less often admired *History*. The tabulated data show a marked tendency for authors to use shorter words in their verse as compared to their prose when writing on a similar subject (the number of authors studied is admittedly small, but the results are significant: $t = 4.71$, $df = 4$, $p = 0.01$). This tendency normally manifests itself as a substantial increase in the number of monosyllabic words and a reduction across the board for all other word lengths, though other distributions are presumably possible. It is probably also the case that some shortening occurs through adjustments within the polysyllabic category, preferring a word of two syllables to a word

Table 1. Word Length in Prose and Verse

Author	*Work*	*Total Words*	*Percent of Total Words by Number of Syllables*						*mspw*
			1	*2*	*3*	*4*	*5*	*6*	
John Milton	*Paradise Lost* (Complete)	79,836	74.32	18.47	5.58	1.42	0.2	0.01	1.35
	Bk 1	5,999	72.8	19.8	5.92	1.17	0.22	0.02	1.36
	Bk 2	7,959	73.98	19.02	5.15	1.58	0.23	0.03	1.35
	Bk 3	5,597	73.88	18.76	5.45	1.77	0.14		1.36
	Bk 4	7,788	75.12	18.26	5.44	1.05	0.13		1.33
	Bk 5	6,810	74.07	18.55	5.45	1.64	0.29		1.36
	Bk 6	6,784	73.2	18.65	6.35	1.5	0.28	0.01	1.37
	Bk 7	9,690	74.59	17.77	5.57	1.86	0.18	0.02	1.36
	Bk 8	9,049	74.79	18.58	5.34	1.06	0.22	0.01	1.33
	Bk 9	8,282	74.76	17.57	5.89	1.52	0.24	0.01	1.35
	Bk 10	11,856	74.83	18.41	5.44	1.2	0.12		1.33
	History of Britain (Complete)	91,471	67.01	22.58	7.99	2.1	0.29	0.02	1.46
	Bk 1	8,392	67.64	21.64	7.65	2.74	0.3	0.04	1.47
	Bk 2	20,333	66.13	22.63	7.82	2.89	0.51	0.01	1.49
	Bk 3	12,987	67.68	22.01	7.76	2.16	0.34	0.05	1.46
	Bk 4	15,886	66.35	22.53	8.92	1.92	0.25	0.03	1.47
	Bk 5	14,515	67.64	22.46	8.1	1.65	0.13	0.01	1.44
	Bk 6	19,358	67.3	23.44	7.63	1.45	0.17	0.02	1.44
John Bunyan	*Pilgrim's Progress* (Verse)	3,459	81.99	14.34	2.75	0.75	0.09		1.23
	Pilgrim's Progress (Prose)	52,504	79.02	16.23	3.65	0.95	0.14	0.01	1.27
John Gay	*Beggar's Opera* (Verse)	3,067	79.59	17.93	2.38	0.1			1.23
	Beggar's Opera (Prose)	13,231	75.11	18.61	4.78	1.26	0.2	0.03	1.33
Lewis Carroll	"Hunting of the Snark" (Verse)	4,396	77.3	16.95	4.5	1.11	0.09	0.5	1.3
	"Hunting of the Snark" (Prose)	564	72.34	17.73	6.74	2.3	0.89		1.42
Rudyard Kipling	*Jungle Book* (Verse)	2,691	80.71	16.05	2.64	0.56	0.04		1.23
	Jungle Book (Prose)	49,072	77.89	17.8	3.52	0.73	0.06	0.01	1.27

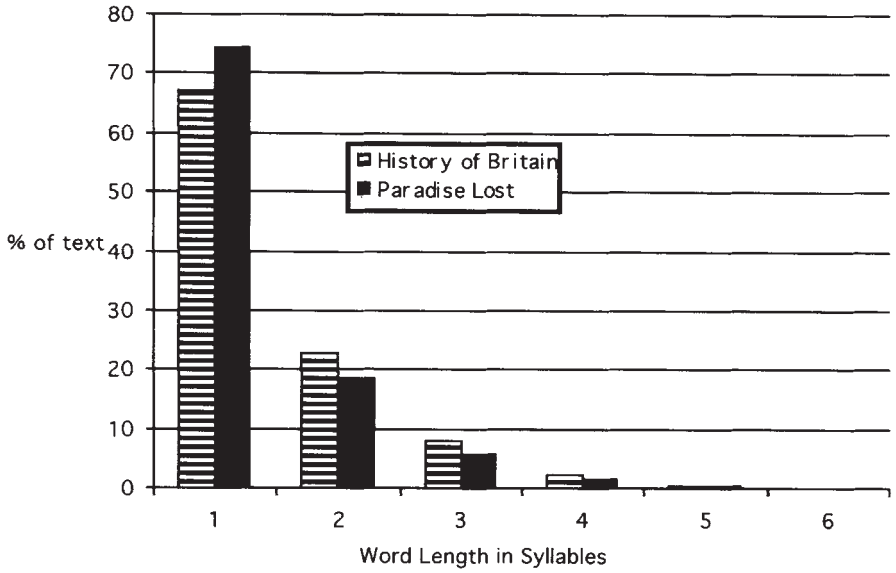

Figure 1. Frequencies of words of various lengths in prose and verse by John Milton: *Paradise Lost* and *The History of Britain.*

of three, and so on, but the numbers involved are much smaller, and I shall not consider them further here.

Confirmation that this shortening almost certainly takes place as a result of line rule restrictions can be found in the fact that lines which vary from the core metrical set will tend to have longer mean word lengths than lines which do not. For example, if the lines of Milton's *Paradise Lost* (10,549 lines) and Shakespeare's *Sonnets* (2,141 lines),[5] both of which have a core metrical set of ten syllables per line, are sorted into groups according to line length, and then the mean word length for each of those groups is calculated, we find that when these authors vary their line lengths, they almost always do so in tandem with an increase in mean word length, as can be seen from Figure 2.[6]

The importance of this point cannot be overstated. Anyone maintaining that the frequency of short words in verse is due to a justifiable communicative choice must now explain why this frequency is not also found in longer lines. If no such explanation is forthcoming we can assume that the data support the view that line-length rules inconvenience composers and that the variations possible within the rule system are usually used as a means of broadening choice, presumably in order to improve the efficacy of the communication.

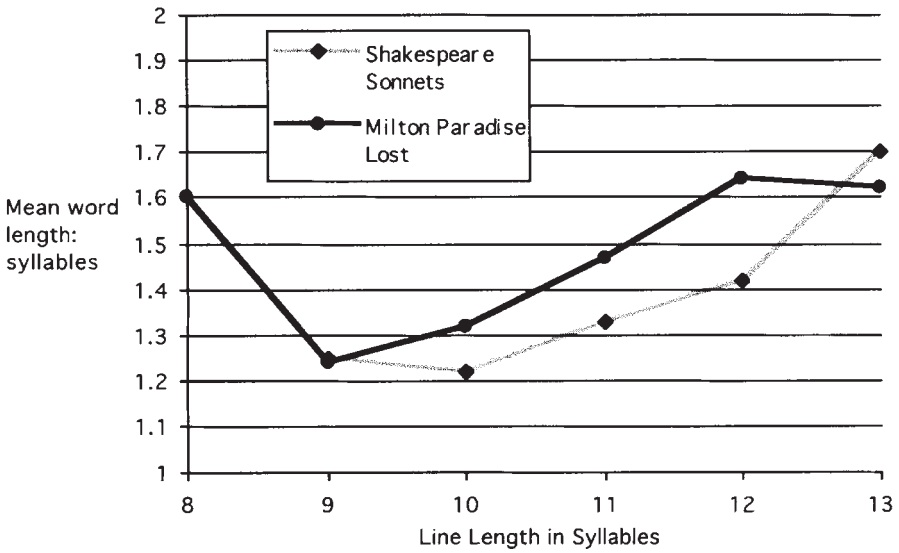

Figure 2. Mean word length and its relation to line length: John Milton, *Paradise Lost*, and William Shakespeare, *Sonnets*.

On the basis of the change in frequency of monosyllabic words we can now assume that somewhere in the region of five percent of all words in verse are the result of a forced choice. It might be further observed that this percentage is the effect of line length alone, and when other restrictive features, such as rhythmic patterning and rhyme, are taken into account the figure must be expected to rise, but there are at present no means for quantifying the effects of these other restrictions.

CANDIDATE HYPOTHESES FOR THE PREVALENCE OF VERSE

The precise significance of the argument presented above is twofold. Firstly, some very long words, those referred to by Lennard as being unusual in verse (Lennard 1996:103), are totally excluded. But since very few words in English exceed five syllables in length (the dictionaries compiled for my software contain 38,000 word forms of which only 80 exceed five syllables) this exclusion with regard to lexical choice can be by no means sharp, though the combined restrictions of line length and rhythmic requirements might conceivably exclude some common polysyllables. Secondly, and much more importantly, *line rule requirements exert a pressure on word length which encourages the composer to surrender*

some degree of freedom in conjugating, deriving, and combining words. This is likely to be misunderstood as suggesting that, as a general principle and for any purpose, the longer the words the more expressive the language, a position which is not tenable. The tests described here employ the difference in the mean length of words between two samples by the same writer as a measure of freedom of choice, the assumption being that within the confines of their vocabulary authors are free with regard to word length in their prose. For theoretical reasons we should expect authors of verse to confine their choice to shorter words (monosyllabic verb forms rather than polysyllabic verb forms, for example) than they would use in prose for a communicative purpose in a comparable area of discourse. The empirical data documenting the consequences of restriction confirm that this is so, and we may conclude that verse is not optimized for general communicative power. We must therefore seek other answers for the first epidemiological question, "why is verse so commonly found in the cultural repertoires of the world's peoples?"

Alternative hypotheses may be divided into two groups. The first group supposes that verse is well-fitted for some other function or functions benefiting those who produce and consume it, including a narrower band of communicative purpose. I shall refer to these as "Hypotheses of Function." The second supposes that verse survives in the cultural pool for reasons unconnected with any benefits to those who produce and consume it. I shall refer to these as "Hypotheses of Susceptibility."

Under the first heading, Hypotheses of Function, we may list three major candidates compatible with the theory and data presented above:

1. Language patterned in terms of extents and rhythms has remarkable mnemonic properties.
2. The composition of verse is an excellent registration of differing levels of verbal intelligence, and verse is commonly used as a means of displaying that intelligence.
3. A text composed in verse is an easily appreciated demonstration of commitment of time to a composition.

Under the second heading, Hypotheses of Susceptibility, I shall offer only one suggestion, though mnemonic effects might also be discussed here with a different inflection:

1. The number of forced word choices in verse creates texts which we can neither parse satisfactorily, nor reject as incoherent.

Hypothesis of Function 1: Mnemonic Properties

The suggestion that verse is easy to recall is relatively uncontroversial and, as far as I know, has never seemed worth demonstration in any rigorous way, though Sir Philip Sidney long ago remarked that "verse far exceedeth prose in the knitting up of the memory":

> the words being so set . . . as one word cannot be lost but the whole work fails: which accuseth itself, calleth the remembrance back to itself, and so most strongly confirmeth it; besides one word so, and as it were, begetting another, as, be it in rhyme or measured verse, by the former a man shall have a near guess to the follower (Sidney [1583] 1903:182–183).

The observed facts are so surprising that a more explicit attempt than Sidney's seems well worthwhile. In anecdotal, but extremely valuable, proto-epidemiological discussions of English playground lore, Iona and Peter Opie record that "the speed with which a newly made-up rhyme can travel the length and breadth of the country by the schoolchild grapevine seems to be little short of miraculous," recording the distribution during the 1936 abdication crisis of the rhyme "Hark the Herald Angels sing,/ Mrs. Simpson's pinched our king" to very widely separated parts of England within three weeks (Opie and Opie 1959:6). Given the seditious nature of the rhyme, which makes it unlikely that it was printed or broadcast, the account is quite astonishing, but it is hardly an isolated case, and phenomena of this kind cry out for explanations in cognitive terms. Epidemiologically, the success of such an object is presumably determined by its stability during transmission. To paraphrase Sidney with technical language, the relevant properties appear to be those that enable an individual who has been exposed to a public representation to readily reconstruct that representation even if its detailed informational content has not been committed to memory, or has been only partially committed to memory. The feature of verse which enables this is precisely that which makes it inefficient as a communicative instrument, the restriction of choice. Reconstituting a prose statement from a psychological representation is a daunting task, since the infinite utterance set lies before the composer. Also, the task is not simply that of communicating the psychological representation, but depends on imagining how the original composer would have chosen to communicate a mental representation the existence and character of which can only be inferred by the imagining party. To recall a verse utterance, on the other hand, requires merely that the normally simple, abstract pattern of the form be recalled together with the subject matter, and any of the words which have been committed to memory. Blank spaces can be measured by reference to the verse form and then filled with words that are rele-

vant to the context, of the right size, and of the correct rhythmical form, or, in some cases, of the correct rhyme sound. There is, needless to say, no guarantee that these will be exactly the same words, but given the restrictions involved there is a high probability that an accurate reconstitution has been made, a view which is consistent with the opinion current in folklore studies that there is very little true "memorization," the commitment of large bodies of words to long-term memory, in the oral tradition (Finnegan 1977:52). Forms using element extents in combination with total extents will be much more resistant to degradation than forms where the total extent is not specified. Consequently, from this perspective the fact that no use is made of the theoretically possible verse form in which a total extent is specified, but element extents are not, ceases to be mysterious, since such forms lack an adequate number of internal reference points for accurate reconstitution. Moreover, since the probability of accurate reconstitution is higher for shorter forms than for longer, it is expected that epidemically widespread verse, particularly oral verse, will tend to use shorter line forms than less widely distributed and literate forms.

It is probable that verse is highly resistant to degradation during transmission for purely formal reasons, and indeed one might say that verse is a self-boosting message which makes many errors of transmission easily visible, and to some extent easily corrected. Because the actual fact has seemed so obvious, the details of the matter have been largely ignored, at least within literary studies, but the implications revealed by a more explicit account are not trivial. My discussion suggests that verse with a high mean number of syllables per word (mspw) will prove to be more memorable than that with lower figures (the example quoted from the Opies has, in both lines, an mspw of 1.4 syllables per word, which is relatively high), but that this will only be so when the verse varies very little from the core metrical set. That is to say that epidemically widespread oral verse is unlikely to make much use of the plus or minus rules in its line definitions. When taken together with the fact that shorter units will be much more readily reconstituted, because there are fewer possible patterns from which to choose, it is obvious that verse with a high mnemonic value will also have to be extremely restrictive from a composer's point of view. The metrical regularity of much nursery rhyme, the ballad tradition, and of the metrical psalms, is a byword in literary criticism, but empirical data have yet to be gathered on this point. It seems possible that religious recitations and the various oral narrative traditions would also be relevant here, but I am aware of no statistical data relating to the regularity of such verse.

However adequate they may be in the case of much predominantly oral tradition, mnemonic values cannot be regarded as adequate to ex-

plain the prevalence of verse in other areas, particularly in those areas often seen as constituting the prestigious literary heritage of a people. Verse of this type is, as many university students can attest, frustratingly less memorable than material for which they can gain no examination credit, a fact which suggests a leaning towards communicative flexibility, in the general sense. This encourages us to look for explanations that involve some degree of interpersonal function. While it has been argued that the prevalence of verse cannot be accounted for by reference to its putative general-purpose communicative power, it remains possible that its formal features facilitate specialized categories of communicative act, for example the communication of evidence of verbal intelligence.

Hypothesis of Function 2: Verse as Register of Verbal Intelligence

The role of verses in courtship is well-known, but their function is probably misunderstood. Bearing in mind their formal disabilities we must reject the traditionally approved belief that verse poems are uniquely able to communicate complex emotions, which are a general set of communicative intents, and instead we must turn to a hypothesis consistent with the features of the material. I propose that they have remained common in the global cultural pool, in rock and pop lyrics as well as elsewhere, because they are good evidence of the abilities required for their own production, and these abilities are valued, or at least respected, by many potential recipients of the verses. More simply, verse is a display of verbal intelligence, and as such should be expected to be employed in courtship, and in competitive situations such as the verse duels familiar in many human populations, and famous in Eskimo, Scottish, and Chinese. That verse composition may serve as a male love gift is well-recognized throughout the world, and in aristocratic circles in Heian period Japan it was carried to such an extreme that an exchange of verses, beginning with a poem by the male, was regarded as a necessary preliminary not only before a romantic attachment might be initiated, but before the lovers even met (Morris 1985:225ff provides a useful summary). If the communication of passion were the main purpose, it is obvious, from the reasoning given above, that prose could function just as well, and in many senses better. However, if an economical demonstration of mental verbal agility is required, then verse seems an excellent choice. In this light, such oddities as the ancient Chinese civil service examinations, in which verse was composed against the clock, come to seem less mysterious, and as reasonable, indeed, as the current British custom of making the study of the obsolete English of

Chaucer and Shakespeare a central element in its academic streaming system.

The suggestion that much verse is fundamentally a display technique is compatible with Geoffrey Miller's proposal that the arts in general have been driven by sexual selection, but it differs in certain important respects (Miller 1995, 1996). Miller (1995) surveys the lifetime output of various categories of musician and compares this with the well-known homicide graph compiled by Daly and Wilson (1988). The two graphs bear a strong resemblance to one another, and Miller builds on this to argue that just as high levels of male aggression are predictable as an outcome of reproductive competition, so the arts are or have been driven by the need of young males to display and compete for females. However, since Miller makes no reference to the formal properties of the cultural materials produced, this proposition is open to the criticism that while display may be an important element in individual motivation towards productivity, the status and survival of the cultural forms themselves depends on other features, their beauty perhaps, or their truth (Dissanayake [1992:10] presents arguments of this type). Once a mode of cultural production is accepted, it is almost certain to be employed as a means of display, predominantly by males, and I would expect that a survey of *Current Contents* would produce the "homicide" graph for every discipline. But the character of most cultural materials, certainly in the sciences, is determined not by the displays of which they may form a part, but by other features, such as the accuracy with which they model the world, or their efficiency as pleasure technologies stimulating the evolved reward centers of our nervous systems (Barrow 1995; Pinker n.d.). Miller's proposal seems broadly correct provided that it is understood not as a hypothesis about particular types of cultural production, the arts, but as about the motivations for broad swaths of all kinds of cultural production, and in his most recent remarks (Miller 1996) this is the position that he now seems to take. The study presented here on the other hand suggests that the much stronger version of the hypothesis may indeed apply to certain cultural forms, such as verse, which appears to be well-formed for display at the expense of its ostensible function, communication. It can therefore be contrasted with forms only adventitiously employed for self-advertisement, such as evolutionary biology.

It is tempting at this point to make a distinction between language optimized for communication, as for example in science, and that formally constrained and thus optimized for noncommunicative or emotional ends, "creative" literature. Such distinctions are common and recur repeatedly in discussions of style. De Quincey, the nineteenth-century English critic who divided the literary field into languages

of power and languages of knowledge (De Quincey 1927), and the twentieth-century philosophers Ogden and Richards, who split the verbal universe into emotive and referential meaning (Ogden and Richards 1923), are amongst the most widely known examples, but there are a multitude of similar proposals (see for example Jakobson 1960:357ff). However, none of these distinctions has proved convincing for long, largely because no pure examples of either type can be shown to exist, and because no technique for quantifying the proportions of the types in mixed texts has emerged. Eventually, even in the humanities, the utility of a distinction that cannot actually be employed in practical cases comes to be doubted.

The fault seems to be that the distinction is introduced at too low a level in the model of communication, that is to say at the root. At this fundamental level all communication must be regarded as the same, the provision of stimuli which it is hoped will bring about a particular change in another brain. It is therefore hopeless to attempt to distinguish at this level between languages of knowledge, which are implicitly held to be communicative tools, and languages of power, which are labeled, vaguely, as being noncommunicative in this sense. We can cut through this muddle by observing that heavy use of rhetoric, musical phrasing, or verse form, for example, may make it difficult to communicate a randomly nominated intent but may be optimized for a more limited range of communication. I propose that this is exactly the case with verse, and that while verse composition is not well-designed for general communication, it is extremely efficient at communicating evidence of verbal intelligence. Composers who are able to scan source language at greater speed or with greater efficiency will be able to write verse relatively rapidly compared with others, using a broader range of words and fewer clumsy syntactical constructions. They will thus achieve a higher degree of communicative effectiveness. It might be expected that the interval in mean word length between prose and verse samples by talented writers will be smaller than that for less facile writers. My present data base was not generated with a view to examining this matter, nor is it extensive enough in the range of author type examined. However, with these reservations in mind, it would be dishonest to conceal the fact that the current numbers do not support this conclusion. Table 2 lists data for the works already cited in Table 1. The author's name is followed by the mean number of syllables per word (mspw) for, firstly, the prose work, and secondly, the verse work. The final column expresses this verse mspw as a percentage of the prose mspw. Writers with a high mean word length in prose apparently write verse with a proportionately lower word length in comparison with authors whose prose mean word length is relatively low.

Table 2. Word Length in Verse as Proportion of Word Length in Prose

Author	*Prose Work mspw*	*Verse Work mspw*	*Verse mspw as % of Prose mspw*
John Milton	1.46	1.35	92.47
John Bunyan	1.27	1.23	96.85
John Gay	1.33	1.23	92.48
Lewis Carroll	1.42	1.3	91.55
Rudyard Kipling	1.27	1.23	96.85

It would be unwise to comment in detail at this time, and I shall do no more here than raise the matter as an interesting area for future research, and observe that while poor verse is normally awkward in syntax, verse which is generally agreed to be good is not. This suggests to me that competent writers are able to work to high standards across a broader range of features than less proficient writers, who may focus on one, breadth of diction in these cases, to the exclusion of others. This point may apply to another seeming difficulty for this approach. Anybody glancing over the tables so far will quite rightly wonder whether more able writers probably have longer mean word lengths in prose for any given communicative purpose, and, if so, they may ask why this fact is not used as a means of display. That is to say, it seems eminently reasonable to ask why verse is needed as a means of displaying differentials if they are actually large, or larger, in prose. Three possibilities offer themselves. First, that *poeta nascitur, Orator fit*, "poets are born, orators made" (Lodge [1579] 1903:71); in prose, industry and application, age and experience may conceal a lack of talent, whereas in poetry no amount of craft can compensate. Second, that verse forces weaker writers into syntactical inelegancies, and these are extremely easy to detect, whereas competent writers will not only be able to maintain a respectable proportion of their prose word length but will do so without absurd clumsiness. Third, because verse will register the skill of the writer at every point it is a superior vehicle for display, and this salience compensates for any erosion of the differences it registers. By contrast, the larger differences of prose, if they are that, may, practically speaking, be invisible to a reader. Additionally, one might point out that since the use of a high percentage of polysyllabic words is not in itself a guarantee of efficient communication, the attention of readers is probably, in prose, focused on the communication itself, whereas in verse this may not be the case.

The implications of understanding verse as a form well-designed to register differences between levels of verbal intelligence are numerous, particularly in regard to sex differences in output type and quantity, and

I hope to turn my attention to examining them in the near future. It is to be expected, for example, that males will tend to write more verse, and in more restricted forms than females, even though women show a greater level of verbal fluency, particularly in relation to pattern-matching tasks (Kimura 1993:80), and would be expected to perform very well in complex verse composition. Female writing, on the other hand, may show a bias towards communicative efficiency which will be realized as a strong predisposition towards unrestricted forms, that is to say towards prose.

Hypothesis of Function 3: Verse as an Efficient Gesture of Commitment

It will not have escaped the attention of readers that certain categories of verse, sixteenth- or seventeenth-century funeral elegies for example, do not seem to be explicable as demonstrations of the verbal intelligence of the composer; at least it is hard to see why patrons should wish to provide their poets with opportunities to show off at such a time. This case leads us to a further sort of communicative act for which verse may be well-designed, the demonstration of commitment. In a nutshell, it takes a short time to appreciate the fact that, for its length, a verse text took a long time to write. Imagine that a courtier is trying to catch the attention of a monarch with signs of devotion. He might write a prose tract on her majesty's wisdom and grace, but this type of demonstration, though it would be hard to fake, would also be unlikely to be noticed, since to read it would be to grant the degree of attention that is being begged in the first place. More effective would be to offer a composition that is evidently time-consuming to produce, but can be read or listened to in a short period, or even appreciated as an effective gesture merely by a cursory glance. For this purpose verse is an excellent solution, because its line form registers effort repeatedly. This suggestion may appear superficially compatible with the view that art is a "making special" (Dissanayake 1992, 1995), but it differs in that attention is directed away from general conceptions of specialness and instead towards the qualities that achieve this distinctiveness. These qualities are extremely diverse in kind, and thus we are faced with the need for locally specific explanations accounting for the particular method of distinctiveness employed. Indeed, the account of verse given here supports the view that Dissanayake is mistaken in her attempt to propose "making special" as itself a sufficient explanation for the evolution of an "artifying" faculty, probably by group selection (Dissanayake 1995:110, 114). Simpler explanations that engage more precisely with the material properties of the culture under discussion are possible and preferable, not least because

they are intelligible in terms of individual advantage and do not need to suppose an evolved "behavior of art." Such simpler explanations are readily generated within the epidemiological program, which concerns itself with the fact that, given a psychology that has evolved by natural selection, certain types of cultural representation, even evolutionarily novel ones, are more likely to be generated and sustained than others.

It may reasonably be felt, however, that the three categories discussed above do not promise an exhaustive account of the survival of verse compositions in the cultural pool. Even with regard to that material which can be explained as a convenient method of display, it remains to be shown why it continues to be prestigious long after the composers are dead, and the original recipients also. To begin with, we may note that reflected glory is better than none at all, and that the ability to recite the verse of another poet is itself a demonstration of valued cognitive abilities. Without a printed text the accuracy of a recalled prose passage is difficult to gauge, but the patterning of verse carries evidence of the fact that accurate recall or recomposition is involved, and it doesn't matter which since both are honest signals of skill. This will be particularly true of works that make heavy use of the plus and minus flexibilities built into the line rule system. As Cole Porter's song says, and I cite from memory, "Brush up your Shakespeare,/ Start quoting him now,/ Brush up your Shakespeare/ The women you will wow." Shakespeare's dramatic verse, as it happens, is, particularly in the later plays, free in its use of additional syllables, which may make it hard to recall.

Secondly, the large quantity of words resulting from forced choices in verse may make the task of reaching strong inferences about the intentions of the composer peculiarly difficult, particularly at the level of implicature, which is to say that although the explicit intentions may remain fairly evident, the implications, which form a large part of most subtle communicative acts (see Sperber and Wilson 1986:34ff, 56, 217ff), may be unusually problematic. This opens up a large area in which able individuals may display their talents by inventing imaginary composition histories. On such a view recent debates in literary theory seem to be over whether it is better for business to claim that your fairy stories are true, or to go the whole Disney and admit that they are not. Since much of the text is the result of forced choices, and therefore has what can be called the quality of quasi-randomness, no single overall inference can possibly be correct (though general inferences with regard to the explicit content of the text are likely to remain clear, if slightly troublesome to access). Since there is no correct position to occupy and, further, no inference is likely to stand out as superior to the others, the excellence of the interpretation is heavily dependent on the internal coherence and evident ingenuity of the interpreter. What is more, the

task is never over. The bearing of this on any biopsychological study of human activities relying on microscopic content analysis of verse is considerable (Fox 1995 and Nesse 1995 probably operate at a safe level of generality), and the consequences for much university-level literary interpretative study should be obvious.

Hypothesis of Susceptibility 1: Mental Vulnerability to Quasi-Random Text

It might still further be objected that the previous hypothesis does nothing to explain the hold that verse exerts over some minds, perhaps all minds at some points in their lives. One possibility, which may require integration with those concerning implicature outlined above, is that the degree of quasi-randomness introduced by forced choice hovers beneath the threshold at which a recipient will reject the message as radically incoherent. Because it is consistently just beneath this level throughout its extent, unlike the bulk of linguistic output where difficulties and errors occur in clusters, it will also be a text that stimulates the attention of the error-recovery mechanisms and the inferential systems to an extraordinarily high degree for unusually lengthy periods. The nature of the quasi-randomness produced by the application of metrical rules is such that grammaticality is not significantly damaged, and this results in a continuing assumption of the text's relevance on the part of the reader, despite the fact that no clear or clearly superior interpretation emerges from repeated passes over the material. That is to say that verse, and perhaps this is particularly true of printed matter for which we can assume that our evolved psychologies are not well-designed, throws us into a state of interpretative indecision and confusion. I suggest that this is apparent to readers as the semantic richness, the ambiguity in William Empson's sense (Empson 1930), which forms the major pleasure in poetic reading and the core justification of the academic study of poetry. Critical remarks on this matter are commonplace, but may be well-represented by a single passage from A. C. Bradley's immensely influential Oxford lecture, "Poetry for Poetry's Sake":

> About the best poetry, and not only the best, there floats an atmosphere of infinite suggestion. The poet speaks to us of one thing, but in this one thing there seems to lurk the secret of all. He said what he meant, but his meaning seems to beckon away beyond itself, or rather to expand into something boundless which is only focused in it (Bradley 1909:26).

From this Bradley concluded that poetry must be "a spirit," but mechanical explanations may now be within our grasp.

If this proposal regarding quasi-randomness is valid, then verse would be an excellent example of a cultural form to which we are susceptible but for which we have no need, and accordingly no assumption is made here about the adaptiveness or otherwise of absorption in the reading of poetry, which may vary greatly between individuals, and will depend largely on the ability of that individual to turn knowledge of verse to reproductive account as display.

This description is testable in that if correct it is to be expected that the immense variety of verse patterns found all over the world will converge on the strategic degree of randomness, whatever that is. Since it is not possible at present to estimate, even for one language, the degree of quasi-randomness introduced by all the verse rules when they operate together, this hypothesis must await later developments before it can be regarded as anything other than a curiosity.

CONCLUSION

I have argued that it is almost certainly incorrect to suppose that the choice of verse as a means of composition can be explained by any theory of its general communicative efficacy, such as that offered by Gross and McDowell, or by such mystical poeticists as the nineteenth-century poet-thinker Coleridge when he writes that while prose is "words in the best order" poetry is "the *best* words in the best order" (Coleridge 1990:90), and inherited as an assumption by most scientifically aware commentators (Turner [1992] and Turner and Pöppel [1988], for example, combine interesting speculations about memory limitations and line length with very high-flown claims about its communicative, civilizing, and educative powers). The range of alternative hypotheses generated within the naturalistic epidemiological program is large, and bears on areas which are closely as well as those which are only distantly related to the current concerns of researchers working on biosocial studies of human behavior. Attention is drawn both to detailed aspects of cultural form as it appears in display and in gestures of commitment, and also to hypotheses relating to cognitive processes and *susceptibility* to certain types of cultural representation. Such diversity will inevitably characterize any study of cultural materials, and it is one of the main strengths of the epidemiology of representations as a research program that it can encompass these approaches without losing either subtlety or relevance to human biology.

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NOTES

1. Examination of the entire text of Paradise Lost shows that the rule followed is in fact "10 (−1 or up to + 2)": the vast bulk of the lines are concentrated in the lengths nine, ten, eleven, and twelve syllables, respectively, with a single eight-syllable line: 164 lines of nine syllables (1.55%); 8,315 lines of ten syllables (78.83%); 1,886 lines of eleven syllables (17.88%); 178 lines of twelve syllables (1.69%); 4 lines of thirteen syllables (.04%).
2. The following data were derived using simple custom-written software.
3. There are 512 possible combinations of numbers totaling ten, and 1,024 combinations totaling eleven. Thus the ten-syllable line is syntactically less flexible than an eleven-syllable line. Richly polysyllabic languages may, therefore, often use longer lines.
4. The texts processed are as follows: John Milton, *Paradise Lost* (1667, but begun in the late 1650s), John Milton, *History of Britain* (1670, but probably begun in the 1640s and completed in 1655); John Bunyan, *Pilgrim's Progress* (1678–1684), a prose narrative with interspersed lyrics; John Gay, *The Beggar's Opera* (1728), an opera; Lewis Carroll, "The Hunting of the Snark" (1876), verse with a short prose introduction; Rudyard Kipling, *The Jungle Book* (1894), prose narratives with verse interludes.
5. Sonnet 126 has a core metrical set of eight syllables per line, and has been omitted, leaving 153 sonnets. Sonnet 99 has fifteen lines, and sonnet 126 only twelve; hence 2,141 lines in total.
6. The frequency of the various line lengths is as follows. Shakespeare, *Sonnets*: nine syllables, 60 lines; ten syllables, 1,756 lines; eleven syllables, 299 lines; twelve syllables, 23 lines; thirteen syllables, 3 lines. Milton, *Paradise Lost*: eight syllables, 1 line; nine syllables, 163 lines; ten syllables, 8,315 lines; eleven syllables, 1,887 lines; twelve syllables, 179 lines; thirteen syllables, 4 lines. The relation between line length and word length is a robust finding, and a future paper will discuss the question in detail, providing data from a larger number of authors.

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