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TEN

Rhetoric in the Age of Cognitive Science

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THE LAST FEW DECADES have seen the creation, expansion, or renaming of departments, institutes, programs, and centers around the world dedicated to studying the brain, the mind, and "cognition." Researchers and students now pursue "cognitive studies" or "cognitive science" in places such as the Institute for Research in Cognitive Science of the University of Pennsylvania, the Keck Center for Integrative Neuroscience at UCSF, the Doctoral Program in Neuroscience and Cognitive Science at the University of Maryland, the Riken Brain Science Institute in Japan, the Centre de Recherche Cerveau et Cognition in France. Journals have been founded, conferences held, grants bestowed, and books published, including a large number of popularizations ranging from primers describing how the brain works to highly speculative accounts of consciousness.[1] In the United States, George Bush declared the nineties the "decade of the brain" in a Presidential Proclamation, July 17, 1990. The impetus for this attention came in part from a growing awareness of the prevalence of diseases of the brain such as Alzheimer's, schizophrenia, autism and chemical dependency, but such medical interests drive basic research. An unprecedented amount of funding for individuals and research programs has stimulated progress on one of science's last great frontiers: understanding how the brain produces the mind.

In a history of the "cognitive revolution" written in 1985, Howard Gardner traced the "cognitive turn" to a disenchantment with behaviorism in the fifties and to the subsequent synergy among several disciplines, including linguistics, psychology, and anthropology, that began to investigate the mental

processes behind the phenomena they studied.[2] At the same time, computer science and especially artificial intelligence research offered an apparent model for cognitive processes, while neurophysiologists became more sophisticated in their probing and imaging of the physical brain. Decades later, researchers on brain and mind can be roughly divided into a speculative subdiscipline that usually appropriates the term *cognitive science* or *cognitive studies,* and a "hard" science subdiscipline that gathers under the term *neuroscience* or *cognitive neuroscience.* The whole enterprise, however, seeks to understand how mental processes such as sensation, classification, memory, language, and ultimately consciousness itself are produced from a biological system. Pieces of the puzzle such as visual perception are known in some detail, and research on other areas is being produced prodigiously. Yet despite all the activity and prestige surrounding cognitive science, researchers at the beginning of the twenty-first century acknowledge that little is firmly known about how the brain works overall, and there are fundamental disagreements on the mental processes that enable basic human abilities such as memory or language.

Why should rhetoricians, and especially historians of rhetoric, be interested in cognitive science? Cognitive scientists certainly are not and have not been interested in rhetoric. Surely these two enterprises inhabit opposite sides of the humanities/science dichotomy despite the work of a few intrepid scholars such as Mark Turner (e.g., *Reading Minds; The Way We Think*). Rhetoricians are interested in phenomena on an interpersonal scale—complex human interactions, historical trends, contextual factors, ideological issues. They have not typically, or at least recently, been concerned with what might happen in an individual mind as it produces or responds to a text or an image. And cognitive scientists have not been interested in phenomena that involve groups or in complex cognitive skills that concern functions such as the perception of plausibility or the generation of lines of argument. Indeed the neuroscientists, more interested in the physical brain, often devote their research to primates other than humans. Yet there is an area of overlapping concern for both rhetoricians and cognitive scientists, and that area is language. Though admittedly in very complex manifestations, language in use is the object of study for rhetoricians, and language is absolutely central in studies of brain and mind by both cognitivists and many neuroscientists.

If cognitivists and neuroscientists ever reach agreement on a model of the brain and mental processes, and particularly of how people produce and use language and images, that model should be compatible and even continuous with the characterizations of human communication available in the rhetorical tradition. The specific answers that cognitive scientists or neuroscientists come up with are not likely to be interesting to rhetoricians. Knowing that the concentration of a certain neurotransmitter in a certain area of the brain affects attention is not likely to be cited as a satisfactory explanation of the kind of phenomena rhetoricians usually study. Nevertheless, these two disciplines, because they deal with dovetailing or overlapping phenomena, should eventually be compatible. They should "touch" at certain points, the one handing off its accounts to the other, cognitive science to rhetoric, though they operate on different scales and answer to different systems of explanation. Ultimately an understanding of the brain should lead to a better understanding of language, and that in turn should lead to a better explanation of effective language, of persuasion, and hence of the complex behaviors and historical processes, mediated by language, that rhetoricians study.

The purpose of this chapter is to make rhetoricians aware of the enterprise being conducted by their academic neighbors and in the process to revisit elements in the rhetorical tradition. No overview of cognitive science is attempted here. Instead, after acknowledging discontinuities between the assumptions and goals of cognitivists and rhetoricians, the discussion that follows examines elements from the rhetorical tradition that might be useful to cognitive neuroscientists. This chapter also considers a few of the findings in contemporary neuroscience that suggest the viability of rhetorical stylistics as it is embodied in the classical and early modern attention to language.

Assumptions about Language in Cognitive Science and the Rhetorical Tradition

There are many impediments to assessing potential connections between cognitive neuroscience and rhetoric, and these impediments reveal fundamental differences in basic assumptions.[3] To begin with, the terms that cognitive scientists use for fundamental mental skills or operations seem far removed from a rhetorical lexicon. They seek the neural substrates of sensation, attention, categorization, and learning, and none of these mental processes necessarily even involves language. Indeed categorization has been studied in monkeys where a surprisingly robust all-or-nothing response to different images by different neurons in the prefrontal cortex has been discovered (Freedman et al. 315; see also Thorpe and Fabre-Thorpe 260).

Furthermore, when cognitive scientists, particularly those of the speculative variety, describe mental operations overall, they often resort to the term *information processing,* and talk about input and output. These and other cognate terms show the influence of computer science and the governing analogy between the brain and the computer, an analogy that persists despite criticism.[4] This reductive analogy between the brain and a computer reveals a more serious discontinuity between rhetoric and cognitive science over the basic nature and purpose of language, a difference that can be traced to the influence of analytical linguistics, and particularly of Chomskyan linguistics, on cognitive scientists.

As a theory of language, Chomskyan linguistics could almost be called "arhetorical" or even "antirhetorical." First, Chomsky posited a radical dissociation between competence and performance; he was after a person's innate "knowledge" of a language, not his or her actual use of it (Chomsky, *Knowledge* 9–10, 19–32). Second, given this orientation toward abstract competence, he emphasized a model of language that was formal and logical. The language system posited into a person's head had to conform to principles of mathematical logic, and he criticized other theories of language that lacked this presumed explanatory rigor (Tomasello 134). (Even though the ever-changing Chomsky is now in a "minimalist" phase, he and his followers still postulate some universal hard-wired, uniquely human syntactic component [Chomsky, "Chomsky's Revolution" 64]) Third, and most interesting ultimately for rhetoricians, Chomsky dismissed figures of speech from his competence modeling, relegating them to the less interesting category of language use (Lakoff 248).

Analytical linguistics then, of which Chomskyan linguistics has been the most widely known version, is not rooted in a theory of language as a communicative medium. It is rooted in a theory of language as a referential or representational medium or as a formal/logical or computational system. No one would deny that humans use language to refer to things or to express thoughts. But are referring and, as Pinker puts it in the opening of his recent *Words and Rules*, filling "one another's heads with so many different ideas" (1) the primary functions of language?

Any *rhetorical* theory of language will be rooted instead in the interactional and functional. Language, from a rhetorical perspective, cannot simply be a system for the unmotivated pairing of spoken or graphic symbols with referents, nor does it exist to exercise a "language module" in the brain that generates syntax. A mental lexicon and a mental grammar may be necessary constituents of the human language apparatus, but why do humans engage in pairing, referring, or syntax generating in the first place? Clearly, *homo rhetoricus* uses language as a means to satisfy needs and achieve intentions and purposes. This view of language makes sense to any observer of language in action in the world, and it also makes sense from an evolutionary perspective since one can readily imagine selective pressures on an instrument that enhances the survival of the organism. It may then be better to describe referring and expressing as secondary functions that serve primary functions such as securing cooperation, communicating danger, or establishing dominance.

To emphasize again impediments to mutual understanding, cognitive scientists have not typically investigated "language processing" in a way that connects directly to the purposes, goals, actions, and intentions of speakers, precisely the issues that concern rhetoricians. They concentrate instead on the processes that they assume must underlie these functions: for example, how the brain decodes speech signals or how seeing one word leads to the recognition of a similar word. This limitation to the basics of construal may be necessary for the psycholinguists and neuroscientists who are constrained by their experimental methods and devices. When human subjects are confined in an MRI apparatus, it is difficult to investigate natural language use, and in the interest of statistical rigor, psycholinguists have used highly artificial experimental protocols such as dichotic listening, that is, input to one ear and hence one hemisphere. But even if these researchers wanted to connect the basics of language processing to human purposes, there is no currently available rhetorical theory of language to bring to the attention of cognitive scientists in a form they could readily use.

If a rhetorical theory of language were available, what would it look like, and how could it serve cognitive science? Rhetoric arguably has a clearer grasp of the teleology of language than analytical linguistics. But an overarching conception of the purpose of language, while crucial, is not enough for a theory of language. A robust theory of language must also offer explanations connecting small-scale features to the attempted achievement of large-scale schemes. Such a theory must, therefore, also include some system of feature identification. We can call this system a "parser." Though that term has computer connotations, it also connects to the older notion of "parsing" a passage in Latin or Greek by identifying certain formal features. With a "parser" one can identify elements of a language. Any grammar—traditional, generative, construction—that identifies types of sentences, clauses, phrases and words is a kind of parser. No matter what elements are ultimately identified, a parser describes formal linguistic features irrespective of their content. A rhetorical parser would include higher level structures like the enthymeme and the *topoi*, and it would connect the features identified to their potential uses.

Language Theory in the Rhetorical Tradition

There once was a body of rhetorical theorizing on language that both provided a detailed parser for formal features and connected those features with their potential effects. This "theory" of language originates in classical rhetoric where it is tied to oral language, also considered the primary object of attention by linguists (Lamb 18). But its greatest development occurred in the early modern period, from the fifteenth through the seventeenth centuries. This age saw the production of full rhetorical treatises with expansive sections on style and of many separate treatises on the figures of speech. It is the age of curricular reform by humanist educators who emphasized mastery of Latin grammar, composition, and oral performance, as well as the close reading of ancient texts according to rhetorical principles of style.

What theory of language does the rhetorical tradition provide from the era of rhetoric's greatest interest in language that might be of use in the age of

cognitive science? In particular, what does the traditional lore of the figures of speech, now largely absent from rhetorical theorizing, reveal about a rhetorical theory of language? Some answers to these questions can be provided by examining treatments of style and of the figures in the sixteenth and seventeenth centuries.[5] Elements of a rhetorical theory of language are implicit in the great sixteenth-century Latin style manuals such as Susenbrotus' *Epitome troporum ac schematum et grammaticorum et rhetorum* (1541) or Sturmius' *De universa ratione elocutionis rhetoricae libri tres* (1576), or in their English equivalents such as Sherry's *Treatise of Schemes and Tropes* (1550) and Peacham's *Garden of Eloquence* (1577, 1593). These early modern texts built on contemporary editions of Quintilian and Cicero as well as on the continued influence of the *Rhetorica ad Herennium* whose fourth book provided the model of a rhetorical description of language analysis and production. Peacham's *Garden of Eloquence* is particularly useful because it sums up earlier Latin works, gives detailed definitions, examples, uses, and warnings about individual figures, and is conveniently in English. Examples from Peacham will be used as representative in the discussion that follows.

As theories of language, both rhetorical stylistics and analytical linguistics share the categories of traditional grammar. (Rhetoric does by long historical association since grammatical and rhetorical pedagogy were intimately linked.) Both systems identify parts of speech (nouns and verbs) and phrases, clauses, and sentences, and both identify how words and concepts are paired and how arrangement (syntax) constitutes meaning. But the theory of language implicit in the style manuals offers several differences beyond these commonalities. For example, rhetorical stylistics places great emphasis on the sound dimension of linguistic choices, on patterns of arrangement beyond the isolated sentence, and on the overriding importance of communicating the speaker's intentions since in human communication the "why you are telling me" may often be more important than the "what you are telling me." Furthermore, all the formal features identified in a rhetorical style manual are ultimately linked to the potential achievement of the speaker's goals. Analytical linguistics (the words and rules equal input/output school) does not pay attention to these functional elements of language as it is used by humans with emotions and purposes. It therefore cannot offer a theory of language, general or detailed, that is likely to reflect the evolved organization of a brain that can support language.

Processing Language in the Brain

A rhetorical view of language then is likely to be a better resource for cognitive scientists. At the same time, cognitivists, and especially the neuroscientists, would be right to insist that elements of rhetorical stylistics correspond

to what they already know with some confidence about how language is processed in the brain. Their discoveries will either reinforce or rebut the insights into language that are provided in rhetorical doctrine. Is there any evidence from research on the brain and language that would support the view of language implicit in rhetorical stylistics?

Early research on the physical brain concerned, first, the localization of brain functions, carried out initially by researchers who matched a known impairment with an underlying pathological condition in a specific area of the brain, whether produced by tumors, lesions, strokes, or injuries, as in the war victims examined by A. R. Luria or the hideously injured Phineas P. Gage made famous in Antonio Damasio's *Descartes' Error*. Neurosurgeons have added to this knowledge by direct electrical stimulation of the exposed cerebral cortex during surgery to remove the focal lesions of epileptics.

Recent research has investigated brain function from the nonpathological end of the spectrum, starting with normal or elicited behavior and observing the brain with newer imaging technologies. These techniques presumably reveal where the brain is receiving an increased flow of oxygenated blood (fMRI) or concentrating radioactively labeled tracers (PET) and hence what areas are active when a particular task is being performed. Still other imaging techniques use EEGs or MEGs, measuring electrical or magnetic changes from the outside of the skull. The most precise studies of brain localization are achieved by inserting tiny microelectrodes into individual neurons to record their electrical impulses. But such invasive surgery is usually performed only on animals, typically cats or monkeys. The result of all these various research fronts is, currently, a detailed functional topography that identifies areas of the brain devoted to processes as precise as judging the angular orientation of an object in the visual field.

The mapping of functions onto physical areas of the brain—the visual cortex here, the sensory-motor cortex there—has been criticized recently as a kind of neophrenology (Lieberman 23). While areas of ever-increasing specificity have been identified, much of the newer imaging evidence also demonstrates that large, diverse areas of the brain are involved when complex processes such as language production and comprehension are occurring. In other words, though there may be an area of the cortex associated with proper nouns (presumably because electrical stimulation of this area interferes with recall), that does not mean that only that area is used when someone recalls a name (Calvin and Ojemann 46–47, 120). Recent research also suggests the unsurprising conclusion that the more complex the language task, the more extensive the neural activity (although as usual this research was based on subjects reading lists of decontextualized sentences [Just et al. 114]).

While neuroscientists in the last twenty years have discovered that widespread areas of the brain are involved in different operations, they have also discovered that localized groups of neurons (minicolumns) are highly specialized

and that specialized activities are handled at the same time in different regions. Neuroscientists, in their computer idiom, call this dispersed specialization "parallel processing," and the discovery of these simultaneous but distinct pathways has also led to the "binding problem," the process by which the brain presumably recombines what it first partitions.

The specialization involved in vision is the best known of the senses and provides the model for the others. A visual stimulus is analyzed into separate components: its color, shape, intensity, spatial position, and movement (Dubin 25). Signals from nerve cells in the retina go to the thalamus and specifically to a group of neurons called the "lateral geniculate nucleus" (LGN) and from there to the V1 or primary visual area of the cortex. Studies in animal brains show the exquisite sensitivity of neurons in this primary visual cortex. Some are so specialized that they respond differentially (i.e., in their rate of firing) according to the orientation of an object in the visual field, some responding to 45 degrees of rotation and others to 60 degrees, and so on, around the full 360 degree circle.

Speech is an aural phenomenon, and like visual stimuli, aural stimuli are broken down into constituent parts including loudness, pitch, duration, and direction of origin. Modern imaging techniques have demonstrated, again and again, the recruitment of different areas of the brain in responding to these separable features of speech. A study by Robert Zatorre and colleagues at the Montreal Neurological Institute demonstrates both how this research is done and what its typical conclusions and limitations are. Subjects in Zatorre's experiments were asked to press a button when they recognized first noises, then separate syllables, then pairs of syllables ending with the same phoneme, then pitch differences in a pair. PET scans during these discrimination tests revealed the successive involvement of different areas of the brain. The primary auditory cortex registered noise, the right and left temporal gyrus were involved in the "passive" recognition of a syllable, Broca's area in the left hemisphere, usually associated with speech production, became active when finer phonetic discriminations were made, showing that subjects had to "access an articulatory representation" when noticing the similar endings on syllables such as "big" and "bag" (Zatorre et al. 846, 848). Finally, when subjects were asked to make pitch discriminations, other areas of the right hemisphere showed activity. The authors conclude, "Our results, taken together, support a model whereby auditory information undergoes discrete processing stages, each of which depends on separate neural subsystems" (848). The separation revealed in such imaging studies suggests not only the evolutionary layering of language perception but also, and most important for an assessment of rhetorical stylistics, the manipulable parameters of a language, the features that can remain the same when others change.

Human speech presents the ear with a profile of sounds of differing durations at differing pitches and intensities producing the overall prosodic contour of an utterance. English speakers, for example, are familiar with the difference in meaning when an utterance ends in a rising tone versus a falling tone. The former converts a statement into a question, "He has a PhD" versus "He has a PhD?" Most language processing is done in the left hemisphere, but neuroscientists have discovered that the right hemisphere has the special role of analyzing the prosody of an utterance, the "tone" that is produced by variables of pitch, duration, and loudness.[6] The right hemisphere's analysis of prosody, of stressed syllables and rising and falling intonation, has been tied to decoding the emotional value of an utterance.[7] The right hemisphere's role in the affective dimension of language was suspected in the late nineteenth century when Hughlings Jackson noted that patients who had lost most of their speech through left hemisphere damage could still utter curse words (Borod, Bloom, and Santschi-Haywood 290).

The special role of the right hemisphere in emotional speech has since been repeatedly confirmed. In one type of experiment, subjects heard sentences in only one ear, each ear feeding its information to the opposite hemisphere. The words in some test sentences were then obscured, while the intonation was preserved. In these trials, "an le-RH [left ear, right hemisphere] advantage has been demonstrated for processing the emotional tone of natural speech, nonverbal vocalizations, and musical passages" (Borod, Bloom, and Santschi-Haywood 289). This hemispheric specialization has been confirmed repeatedly in humans; epileptics being evaluated for brain surgery are often anaesthetized in their right hemisphere, and the test for shutting down the right side of the brain is an inability to identify simple musical rhythms (Calvin and Ojemann 60). Also, patients who have had stroke damage in the right hemisphere tend to speak in a flat monotone (65). It is interesting that the right hemisphere areas involved in prosodic construal are the same as those identified in social monkeys who have a system of alarm calls for communicating various dangers to one another, creating a strong suggestion of the evolutionary origins of the brain's ability to decode sound patterns for their affective content (Deacon 54–57, 313).

Nothing could seem less useful to rhetoricians than knowing how many or which areas of the brain are involved in language comprehension or production. But while the details may not be useful, the overall results of these imaging studies do provide certain interesting insights into and even affirmations of traditional rhetorical stylistics. To begin with, they support the attention paid in traditional rhetorical stylistics to the sound dimension of phrasing. The fact that prosodic construal has a separate location in the brain suggests that this dimension of an utterance can be manipulated separately. The separate manipulation of prosody was thoroughly appreciated in classical and early modern rhetorical stylistics, but its importance in human language has been neglected by most linguists (Dwight Bolinger being a distinct exception) until recently when the results of brain imaging studies have forced its consideration (Tomasello 150).

Illustration: The Case of Parallelism

The case of syntactic parallelism illustrates the importance of prosody in rhetorical stylistics and hence the potential richness of the rhetorical tradition for contemporary cognitive studies. Attention to parallelism begins in Aristotle's discussion of equal cola in book 3 of the *Rhetoric*. His remarks can seem trivial or confusing, in part perhaps because, having lost a rationale for their significance, contemporary readers do not take his observations about the sound dimensions of language choices as seriously as he did. Aristotle, however, placed a great deal of importance on paired cola (i.e., paired phrases or sentences) that could produce an impression of segmented, equivalent units for a listener (Kennedy 243). One means of producing this impression of equal duration was to produce units of equal syllable length, or in the case of prose as opposed to rigorously metrical poetry, approximately equal syllable length. Harmonies between clauses could also be created by the repetition of opening or concluding sounds, or short of rhyming, two phrases could end with the same inflectional ending (see Fahnestock, "Verbal" 129–31).

These sources of aural parallelism were taken up separately in later catalogs of the figures, beginning with "isocolon" [compar] defined in the first century BCE in the *Rhetorica ad Herennium* as "that figure comprised of cola which consist of a virtually equal number of syllables" ([Cicero] 299); almost seventeen hundred years later, Peacham's *Garden of Eloquence* defines isocolon in precisely the same way (58–59). The recommendation of units of equal length is then consistent in rhetorical stylistics. The discovery of the right hemisphere's separate construal of prosody provides a potential rationale for why this feature was singled out.

From the perspective of brain processes, any utterance is analyzed simultaneously but separately for its syntax and semantics and for its prosodic contour, including the variables of duration (that is length), loudness, and pitch. Thus two phrases that have roughly the same length have at least one variable among several in common. They may be perceived (not necessarily consciously) as similar in at least one dimension in the brain, by duration. In addition, they may or may not have the same rising and falling intonation or the same syntactic pattern or make lexical choices from the same semantic categories. But the more of these potential variables they have in common, the more similar they will be and the more redundancy, and presumably efficiency, in their consecutive construal or processing in the brain.

Same syllable length:

The blue jays chased the finches in the trees
When the wind turned, the temperature fell.

Same syllable length and syntactic pattern:

The blue jays chased the finches in the trees.
The dentist pulled the tooth in her office.

Same syllable length, syntactic pattern, and semantic categories for lexical choices:

The blue jays chased the finches in the trees.
The sparrows woke the robins in the bush.

The second of each of these pairs is, to a lesser or greater degree, predicted or prepared for by the first. There are several ways to think about the effects of such patterning. First, similarity in at least one dimension (e.g., syllable length or duration as recommended under isocolon) can impose a connectedness on consecutive sentences, even when their content is different. Next, the more features that correspond, the more redundant the neural processing of the second sentence. Psycholinguists have in fact recorded quicker recognition time for highly constrained, predictable sentences (Faust 177). When two or more phrases or sentences in sequence share multiple features—prosodic, syntactic, semantic, in any combination—they are more likely to be construed as a set. Place these similar sentences in a text with variation around them, and the tendency to group them and to have them perform the same discourse function, as in the following famous example, will be increased.

> The attack yesterday on the Hawaiian Islands has caused severe damage to American naval and military forces. I regret to tell you that very many American lives have been lost. In addition, American ships have been reported torpedoed on the high seas between San Francisco and Honolulu.
>
> Yesterday the Japanese government also launched an attack against Malaya.
> Last night Japanese forces attacked Hong Kong.
> Last night Japanese forces attacked Guam.
> Last night Japanese forces attacked the Philippine Islands.
> Last night Japanese forces attacked Wake Island.
> And this morning the Japanese attacked Midway Island.
>
> Japan has therefore undertaken a surprise offensive extending throughout the Pacific area. The facts of yesterday and today speak for themselves. (Safire 142).

Franklin D. Roosevelt's situation before Congress on December 8, 1941, was unique, but the stylistic principles and the underlying mental processes he called on were not. By the time readers, or the original listeners, reach the third sentence opening "Last night," they are familiar with the pattern being used, the clauses of roughly similar length repeating the same opening words. They anticipate the reoccurrence of the pattern and participate in its

fulfillment. Because of the verbal similarity of presentation, all these items become a single unit in the argument, parallel supporting examples of Japanese aggression in the Pacific. Basic features of human language construal are put to effective use.

Residual Orality

A critic might complain at this point about an emphasis on sound since in our culture important texts are read not heard, and the sound dimensions of written texts are unimportant. But brain imaging studies challenge that view by showing that reading has an aural and even an oral dimension. Indeed these imaging studies show a surprising involvement of the "output" areas of the brain in the decoding of different kinds of "input." In one experiment, subjects were instructed to move a finger and then to watch a moving finger in a movie. In both cases, doing and watching, the same area in the premotor cortex showed heightened activity. In fact, the same area was stimulated when a subject was told simply to imagine the finger movement (Dubin 41). It seems as though the brain "rehearses" motion even when only thinking about it.[8]

An overlap between reading and hearing, two means of consuming language, is perhaps not surprising. But an overlap between reading/hearing and speaking, that is between consuming and producing language, is. Formerly these activities were thought to be quite distinct. Their separation was based on the well-known and endlessly repeated midnineteenth-century findings of Paul Broca and Carl Wernicke who correlated their observations of language deficits exhibited by stroke victims with later autopsy findings showing areas of brain lesions. The result was the association of Broca's area (posterior part of the inferior frontal gyrus) with Broca's aphasia, a compromised ability to speak, and Wernicke's area (posterior half of the superior temporal gyrus) with Wernicke's aphasia, a compromised ability to comprehend. These findings created a tidy separation, or reinforced a preexisting antithesis, between the production and comprehension of speech.

However, recent brain imaging studies with the newer technologies have called into question the boundaries and dedication of these areas. Researchers using fMRI have demonstrated that some parts of Broca's area, presumably dedicated only to language production, are activated during comprehension. "An initial explanation of this finding was that silent, covert subvocalization was occurring as part of comprehension. That is, in trying to understand the words being heard, the person was rehearsing the speaking of those words without being aware of doing so" (Dubin 51). A new appreciation of this motor component in higher cognition has come with an increasing appreciation of the role of the cerebellum, which has long been understood as the part of the brain involved in posture, movement of the

limbs, and skilled small muscle movements such as those involved in speaking and writing. Imaging studies have shown, for example, that "verbal working memory for letters, words and names utilized a strategy of silent, nonconscious rehearsal that involves some of the same parts of the brain as actually speaking these items. Studies showed activation of cerebellar regions that would normally be involved in the motor speech task, even though no actual speech occurred" (Dubin 45). Because for all nondeaf humans language is a heard and spoken system before it is a system of visual and written symbols, it persists in the auditory and motor areas of the brain even during silent reading. Hence language as revealed in brain imaging studies is always a residually aural phenomenon. Even an argument that is read is in some sense heard, and the aurally based effects of the figures can persist even in a written text that is read silently. This conclusion would not have surprised the early modern rhetoricians.

Why is this evidence that "production" areas are presumably involved in comprehension of any importance to rhetoricians? The research suggests that as someone listens to or reads a phrase or sentence, some part of the brain is also, in parallel, activated as though it were simultaneously constructing that phrase or sentence. If the relevant segment is constructed according to a pattern with which the language user is already familiar, perhaps because it is established by a figure of repetition in the text, it will be more easily constructed as it is construed. Though Burke would perhaps not be pleased with this source of evidence, these details about language processing in the brain do support his insight about "formal assent," about the ability of a listener to participate actively in the completion of an utterance. He attributed this phenomenon especially to the syntactic figures *antithesis* and *gradatio* because they so strongly predict the pattern for completing an utterance (Burke 58–59). The findings of neuroscientists seem to ratify his insight; they in turn might design a test for the predictability of these figures.

The simultaneous construction of phrases in the process of listening to them is also strengthened by current theories of "verbal working memory" originally developed by A. D. Baddeley and colleagues. Cognitive neuroscientists now postulate an "articulatory loop" as part of comprehension. While a sentence is being parsed, according to this theory, "words are subvocally maintained using neuroanatomical structures that regulate speech production" (Lieberman 70). In other words, listening for comprehension involves a simulated speaking of what is heard. The capacity of this verbal working memory has been tested by seeing how many final words from a series of sentences subjects were able to recall. Those who could recall the final words in four or more sentences were classified as having "high-span" memories; those who could recall less than three were "low-span" (71). Asking for the recall of the final word makes stylistic sense since this word presumably receives more stress from the falling intonation and pause at the end of a sentence. The end

of the sentence also presumably features the new and salient information. However, these tests of the capacity of verbal working memory used a series of unconnected, decontextualized sentences, showing once again how far these typical research protocols are from natural language. The test sentences also ended in different words. Had this research been informed by a theory of figuration, subjects could also have been tested for the effects on verbal memory of *epistrophe,* the repetition of the last word or phrase in a connected series of sentences. A repeated final element in such patterned sentences should be more readily maintained in verbal working memory. Figure manuals recommend the figures of repetition for just this effect.

Illustration: The Case of Paronomasia

One intriguing result of the research on verbal working memory indirectly confirms the attention paid in rhetorical stylistics to another group of figures, those that recommend various forms of word play. Experiments on verbal working memory have shown, for example, that subjects have more difficulty recalling phonetically similar words when they are given lists of unconnected words to remember—hardly a natural task (Lieberman 70). Presumably, phonetic similarities lead to potential confusions; the words are harder to keep distinct in verbal working memory without an effort.

To this result can be added observations on different types of reading difficulties (dyslexias) that afflict patients with noncongenital brain damage, usually from strokes. In testing these reading defects, cognitive neuropsychologists distinguish among several types of words: regular words whose sound can be reliably interpreted from their spelling (e.g., *bat*); nonwords that could follow the same rules (e.g., *dag*); and exception words whose phonetic realization cannot be reliably interpreted from their spelling (e.g., *though*) and that therefore require, in common terms, "sight reading." One interesting group of dyslexics has few problems with words they were formerly able to read, whether regular or exceptional, but they have trouble with nonwords. Their ability to sound out unfamiliar words has somehow been compromised. However, these dyslexics do somewhat better with pseudohomophones (made up words that sound like real words) and with words that have some orthographic similarity to established words, such as *sayl* (Coltheart, Langdon, and Haller 30–33). This observation suggests that words that look or sound alike are somehow grouped together or processed in overlapping ways in the brain, in part because of a separate stage of phonemic processing (Dubin 53).

Still another interesting source of evidence that the brain groups sets of similar words comes from the phenomenon known as "priming." A technique used by psycholinguists, priming involves timing the recognition or recall of a target word after the subject first hears or sees another word, phrase, or sentence. Research on word-to-word priming has frequently

demonstrated that related words are retrieved or identified more quickly than unrelated words (Faust 163). This finding has led to the assumption that the recognition of a word produces a "spreading activation" of related words in a neural network. But what counts as a related word? Clearly words can be related to each other in several ways including semantically (vow/pledge) or morphologically (vow/vowed) or merely orthographically (vow/vowel). (These distinctions are observed in rhetorical stylistics in the figures *synonymy, polyptoton* and *paronomasia.*) But researchers using the illustrative pairs offered in the previous sentence have demonstrated that the strongest priming occurs among morphologically related sets of words (Feldman and Prostko 23). They attribute this effect to the combination of orthographic and semantic simiarlities; in other words, these words both look alike and share related meanings (25).

This phenomenon of the relatedness of words that look or sound alike is investigated from an entirely different frame of reference in neurolinguistics: as errors in verbal processing or slips of the tongue (Crystal 261–63). Since these slips follow certain patterns, they, too, are thought to provide evidence of how language is organized in the brain. The fact that people can mistakenly say "pig" for "dig," for example, presumably shows the need to recruit separate phonemes in the construction of a word. Such errors also suggest that the mental lexicon may, at some level, be organized phonetically since it is words that sound alike that are usually mistaken for one another, and it is certainly the case that words that sound alike require similar motor instructions for their articulation.

Many figures of speech in the early modern catalogs draw attention to sound similarities and differences, to aural play, to the potential confusion of pairs of words and the resolution of that confusion. In his 1577 edition of *The Garden of Eloquence* Peacham specified fourteen devices for morphing one word into another by, for example, adding or subtracting a letter or syllable from the beginning, middle or end of a word, changing one letter for another, or transposing letters, and so on (Peacham, E1–E2; Peacham's list of tactics represents virtually all the contrastive features a modern linguist could catalog). Under several different figures *(agnominatio, allusio, paranomasia, polyptoton)* Peacham and other classical and early modern rhetoricians recommended the usefulness of words that closely resemble each. The findings of the neuroscientists, outlined above, suggest a rationale for their advice. In recommending word play with key terms, rhetorical stylistics exploits the brain's grouping of words as they are processed by their phonetic or morphological similarities. This linguistic feature is certainly the basis in, for example, Peacham's recommendation of paronomasia.

> Paranomasia is a figure which declineth into a contrarie by a likelihood of letters, either added, changed, or taken away. Added thus, be sure of his

> sword, before you trust him of his word. Another: so fine a launderer, should not be a slanderer. Changed thus, More bold in a butterie then in a batterie. A fit witnesse, a fit witlesse. Taken away, thus. This is no stumbling, but plaine tumbling.
>
> The Use of This Figure
>
> This figure is commonly used to illude [sic] by the Addition, change and taking away. (56)

An example of using a pair of related and potentially confusable words to great argumentative effect occurs in Glenn Loury's recent study, *The Anatomy of Racial Inequality*. Loury analyzes race relations in the United States as the result not of continuing institutional inequality but of a persistent stigma imputed to blacks by whites. He figurally expresses his point as a difference between what he calls "discrimination in contract" and "discrimination in contact" (95–96). Here in the service of a book-length argument is a serious and intentional use of the verbal "play" recommended frequently in rhetorical manuals. The near and potentially confusable "contract" and "contact" together represent a distinction that, as Loury hopes to convince his audience, has been unappreciated by social theorists and politicians in the United States, namely, that racism endures less as a legal institution than as set of behaviors based on deep-seated stereotypes. Loury's language choices underwrite his argument. Just as his two key terms are phonemically close and hence potentially confusable, so are these two sources of discrimination; the more easily remedied institutional source with the more pervasive social cause. It is doubtful that Loury looked up this device in a sixteenth-century figure manual, but he nevertheless draws on the same feature of language and of the mental construal upon which it is based.

Conclusion

A complete rhetorical theory of language incorporating the detailed parser and functional insights of the great style manuals has never been worked out. Nor is anything like a complete account of language processing in the brain available from cognitive neuroscientists. But there are clearly intriguing correspondences between specific elements in these very different regimes. Many of the formal devices identified in rhetorical stylistics have been given psychological reality in brain research, providing mutual ratification. The brain is uniquely attuned, for example, to sound units of similar duration or to words that are minimally different, and these linguistic features were singled out by rhetoricians in the classical and early modern tradition.

The rhetorical devices have also been identified in terms of function as well as form. That makes it possible to connect rhetorical stylistics with actual

language practices as they are embodied in real situations. At the next level of integration, rhetorical choices such as Roosevelt's or Loury's represent the intersection of the formal (the features available in the language) and the historical (including the exigence, audience, and constraints the individual rhetor faces). The formal possibilities, identified ultimately in both rhetoric and neurolinguistics, and the historical particulars together constitute the "available means of persuasion."

Though historians of rhetoric sometimes deplore the early modern period's fascination with style, thinking that it somehow detracts from substance and demeans the discipline, they do so without appreciating that a rhetorical perspective requires explanations in terms of means and ends. The elaborate attention to language in the early modern period also offers the most promising source for a rhetorical theory of language that might inform research into brain processes in the way that an arhetorical linguistics has in the past. Such a theory would emphasize the importance of sound patterns in effective language, whether at the passage, sentence, or word level, particularly as these constitute the affective content of a text, spoken or written. A rhetorical theory of language would also emphasize the importance of communicating and deciphering intentions in linguistic exchanges and hence would never factor out the human source of an utterance. At the same time, a neurolinguistics based on rhetorical principles would try to study language as it is normally used through research protocols that mimic real situations. Experiments could also be designed to investigate other features identified as significant in rhetorical stylistics.

Rhetoricians themselves need not and should not imitate cognitive neuroscientists. As humanists, they should continue to concentrate on historically situated texts and the political, social, and cultural events and trends they embody. But rhetorical scholars should not be hostile to potential scientific grounding either. In the days of Campbell, rhetoricians did predict that their discipline could be made compatible with then current scientific explanations of the mind; in the late eighteenth century, that desire also amounted to an attempt to ground the laws of persuasion in the laws of perception. The prospects for such convergence are perhaps better now than they were two hundred years ago, thanks to the impressive functional characterization of the brain coming from neuroscientists. This characterization should enrich rhetorical theory in the long run. For no matter how sophisticated our studies of culturally situated, planned, or spontaneous rhetorical acts, they all come down to human brains acting on human brains.

Notes

1. A surprising number of major theoretical positions in cognitive science have been offered in the form of books presumably intended for general readers. This prac-

tice of conducting disciplinary arguments in public allows proponents of a particular view to present their premises as established to a degree of certainty that their peers would not acknowledge. (See for example on this issue Michael Tomasello's review, "Language Is Not an Instinct," of Steven Pinker's *The Language Instinct*.)

2. In his history, Gardner gave the "cognitive" disciplines five distinguishing features: constructing a level of representation in the mind that is neither neurobiological or cultural (e.g., mental constructs such as schema or images); emphasizing computer modeling of mental processes; removing anything to do with affect, culture, context or history; seeking interdisciplinary connections; and revisiting the major issues of epistemology long of interest in Western philosophy (Gardner 38–45). A recent issue of *Science*, published since this article was written (27 February 2004), features research showing the current importance of an evolutionary perspective on language.

3. The discontinuity of cognitive science from the rhetorical tradition, its very different modeling of the purpose of language, has historical origins. Gardner gave cognitive science roots in the disciplines of linguistics, psychology, and anthropology, as well as in the post–World War II boom in computers and artificial intelligence. Psychology, linguistics, and anthropology formed themselves as disciplines in the late nineteenth century, at the time of rhetoric's decline as an academic subject. Yet the directions of study partitioned in these disciplines, a division that cognitive studies seeks to overcome, were once combined in the rhetorical tradition where language, mental habits and social behavior were combined objects of study in pursuit of the principles of persuasion.

4. This emphasis on information processing and other computer constructs in the discourse of cognitive studies has been frequently criticized, especially by John Searle. But in a recent exchange in this long-sustained contention, Steven Pinker crowed that "Searle's eccentric decree [against the computer analogy] has not kept thousands of cognitive scientists and neuroscientists from invoking signals, codes, rules, representations, neural computation, parallel distributed processing, and other information-theoretic constructs" (Pinker, "'Words and Rules'" 50). In a very recent work (*Wider than the Sky*, 2004), Gerald Edelman has been extremely critical of the computer/brain analogy.

5. Elsewhere I have argued at length against a two-domain theory of language that separates the figures from supposedly unfigured usage. In my view, the traditional figures are especially effective ways of achieving certain functions in a language. The *antithesis*, for example, is the clearest and most succinct way to express an argument from opposites. But the figures listed in manuals are by no means the only linguistic forms that have specifiable functions (see Fahnestock, *Rhetorical Figures* 15–40 and especially 23, 37–38).

6. It is interesting that prosodic differences are not the same as the tonal differences involved in a language that uses pitch differences to make semantic distinctions, such as Chinese. A Chinese speaker distinguishing among three variants of a phoneme on the basis of pitch in order to construe the meaning of a word uses the same area of the left hemisphere involved in phonemic distinctions (Dubin 54).

7. Research has shown that the right hemisphere is not uninvolved in many other aspects of language construal, and in extreme cases, such as children who have lost their entire left cerebral cortex due to Sturge-Weber syndrome, it is possible for the right hemisphere to provide the physical substrate of language abilities (Calvin and Ojemann 189). More intriguing is research that suggests right-brain specialization for comprehending larger language patterns such as narratives (Deacon 311–16), but such ability may also be tied ultimately to prosodic construal.

8. A potential connection between this observation and Aristotle's recommendation of *energeia* is intriguing though admittedly far-fetched. In the little understood third member of the set of the "Asteia" or Urbanities, which also includes metaphor and antithesis, Aristotle recommends visualization through actualization (Kennedy 247); "I call those things 'before the eyes' that signify things engaged in an activity" (248). He praises Homer especially for his ability to make the lifeless living and create activity, concluding, "He makes everything move and live, and *energeia* is motion" (249). It is tempting to credit Aristotle with an intuitive awareness of this stimulation of the motor cortex that can come about with the language of motion.

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