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Editorial

The neurobiology of language: Two years later

As many of you know, we recently concluded our Second Annual Neurobiology of Language Conference (NLC 2010), which was again an enormous success, with over 250 presentations and over 400 registered participants. The magnitude of this success surprised many members of the organizing committee, and in general, far surpassed our expectations. As a result of this level of support by the community, the attendees of NLC 2010 overwhelmingly approved the formal incorporation of the Society for the Neurobiology of Language, with a mission of organizing and managing an annual Neurobiology of Language Conference. We will continue to publish in *Brain and Language* a selection of articles derived from the highest rated abstracts submitted to the annual NLC meetings.

As our readers are aware, *Brain and Language* made a change in its Editorial policies about two years ago, just as the organizing committee, composed primarily of members of the Editorial Board of the Journal, were organizing the first meeting on the Neurobiology of Language (NLC 2009) as a satellite meeting of the Society for Neuroscience in Chicago in 2009. This change in editorial policy aimed to emphasize neurobiology, capitalizing on the recent revolution in available methods to study human neuroscience, and a renewed enthusiasm around the world for the study of the biological mechanisms underlying human language.

Our goal at that time, which remains our goal today, was to publish the very best articles that address the problem of understanding the neural mechanisms of language. Although our focus remains the same, we have learned some important lessons over these past years, one of which is that there is no clear consensus on the very concept of the “neurobiology of language”. In fact, the Editor-in-Chief and the Senior Consulting Editors, who are responsible for determining which papers undergo peer review and which do not, have often found themselves having philosophical discussions among themselves regarding various ways of defining this concept. While there is a clear broad consensus on a definition of what constitutes research on the neurobiology of language, there are some differences on specific details of how best to advance the field as represented in the journal. The board agrees that the neurobiology of language should be viewed as broader rather than narrowly defined and that understanding the neural mechanisms of language requires significant contributions from many areas and approaches, including (at least) neuroanatomy, neurophysiology, cognitive psychology, psycholinguistics, and theoretical linguistics.

Moreover, it has become clear to the Editorial Board that there is no single consensus in the field regarding the definition of the neurobiology of language and without clear guidance, potential contributors to *Brain and Language* cannot have a clear conception of what constitutes appropriate submissions to the Journal. In this Editorial, we want to rectify any perceived inconsistencies and re-

solve any possible misconceptions. To do this, we have two goals: First, we would like to try to explain what we mean by the term “neurobiology of language”, and second, we would like to explain exactly what types of articles we are most interested in publishing in *Brain and Language*.

Our concept of the emerging field of the Neurobiology of Language is that it is first and foremost the study of the human brain, i.e., it is a subfield of neuroscience, and in particular, a subfield of human neuroscience. By saying this, we mean to distinguish it from related fields, such as psychology and linguistics, in which the emphases of investigation are certainly relevant to understanding the brain, but are not *ipso facto* focused on understanding neural mechanisms. Neurobiological studies of language can involve any number of different types of methods that constrain and illuminate the nature of the neural mechanisms of language. Many but not all of these methods clearly involve making brain measurements of various types. One example would be the study of patients with focal brain lesions, in which the anatomy of the lesions is known and in which the nature of the injury is directly related to language behavior. Another would be an electromyographic study of the tongue muscles during speech perception, in which the goal was to investigate activity in the motor system during perception, and the discussion revolved around putative (inferred) neural mechanisms of speech perception. Similarly, measures of behavior such as patterns of response time have been used to constrain inferences about neural mechanism. Behavioral, electrophysiological, magnetic, imaging, and eye tracking studies, as well as many other types of investigation, could easily fit into this rubric, and all would be studies that contribute to understanding the neurobiology of language.

Over the last three years, *Brain and Language* has been directed towards publishing manuscripts in which the scientific questions and experimental designs were more narrowly focused. As a result, a number of submissions were not considered for review because they emphasized psychological or linguistic questions, rather than neurobiological ones. One example would be the study of a cognitive or linguistic theory, in which brain measurements of some type (e.g., fMRI, ERP) would be used to provide evidence in favor of the theory or against the theory. Since the study was explicitly addressing a psychological or linguistic theory, and not a neurobiological one, we might have returned the submission to the authors without review. However our approach may have unwittingly favored neuroanatomical questions over other types of neurobiological questions.

We have come to the view that our topicality criteria have been applied inconsistently, and that we need to rethink our overall editorial policies. In particular, we have decided that although we still want *Brain and Language* to be a journal of the neurobiology of

language, we do not need every article to be about neural mechanisms, as long as each article has relevance to the investigation of neurobiology, whether or not that article itself delves into neural mechanisms. By consequence, the overall goal of the journal will be to have an aggregate publication record emphasizing the neurobiology of language, regardless of the precise focus of any one particular article.

Further, we have come to the view that work involving physiological measures must be treated with the same enthusiasm as work involving anatomical measures for the ultimate understanding of the organization and functioning of the human brain. Because we remain primarily focused on how the brain works (for producing and comprehending language), we would most like to see articles that discuss with intelligence the significance and relevance of the work for the study of brain mechanisms. Discussions of psychology or linguistics with cursory mention of the brain are less interesting than those with careful attention to the true implications of the cognitive result to understanding the brain. In the case of event-related electroencephalography, for example, this means that we would rather see good discussion of the sequencing and timing of cognitive operations and their implications for understanding brain organization than to have gratuitous references to neuroanatomy.

We have thus changed the editorial policy of *Brain and Language* to reflect this shift in perspective. In particular, we are now soliciting any and all articles, independent of method used, and independent of scientific discipline, that would be of benefit to investigators in uncovering the neural mechanisms of language. This reflects a major change in policy: Rather than pursuing exclusively articles that themselves address neural mechanism, we are now equally seeking articles that provide empirical data that would constrain or otherwise impact on our understanding of such mechanisms, even if these articles

do not directly ask questions about neurobiology *per se*. We remain ultimately interested in uncovering this biology, but recognize that not every paper that would help in this pursuit would come from this perspective.

It nevertheless remains our ideal that every submission would explain its importance to the neurobiology of language, and would do so in a careful and reasoned manner. This information is solicited with every submission, and Action Editors will review these carefully and interact with authors to clarify ambiguous or vague statements. Furthermore, reviewers will be asked to include in their evaluations of submitted manuscripts the quality and strength of the discussion section for characterizing the importance of their results for understanding the brain. By publishing research from all disciplines using all methods, we are seeking to establish *Brain and Language* as a fundamental resource for investigators from all disciplines interested in uncovering the neurobiology of language. As in the past our goal is to publish the highest quality scientific research that can illuminate fundamental questions about the neural mechanisms of language.

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