

Notice

This material has been published in

Brain and Language
Volume 71, Number 1, January 2000, pp. 233 - 236
available online at <http://www.academicpress.com/b&l>

the only definitive repository of the content that has been certified and accepted after peer review. Copyright and all rights therein are retained by Academic Press. This material may not be copied or reposted without explicit permission.

Neuropragmatics in the 21st century

Brigitte Stemmer

*Centre de recherche, Institut universitaire de gériatrie de Montréal, Montréal, Canada and
Lurija Institute for Rehabilitation and Health Sciences at the University of Konstanz, Kliniken
Schmieder, Allensbach, Germany*

and

Paul Walter Schönle

*Lurija Institute for Rehabilitation and Health Sciences at the University of Konstanz, Kliniken
Schmieder, Allensbach, Germany*

Running head: Neuropragmatics in the 21st century

Correspondence:
Brigitte Stemmer
Kliniken Schmieder
Zum Tafelholz 8
78476 Allensbach
Germany

(E-mail: brigitte.stemmer@uni-konstanz.de)

Abstract

One of the great challenges of the new millennium is the continuing search of how the mind works. Although a relatively young field, the study of neuropragmatics can greatly contribute to this search by its interdisciplinary nature, the possibility to be applied to different research methods and by the opportunity to study its nature by taking vastly different perspectives.

In its narrow sense, pragmatics is viewed as dealing with the communicative use of language, that is how an interactant produces or receives the „meaning“ of what is said or written. Neuropragmatics is concerned with how the brain and mind uses language, that is how it comprehends and produces verbal pragmatic behavior in healthy as well as neurologically impaired individuals. Investigating the communicative use of language involves the study of brain mechanisms and how such mechanisms enable motor and mental actions, and the study of the environment that forms, organizes and interacts with such brain mechanisms that enable mind. Knowledge collected throughout a life time (ontogenetic view) and during evolution (phylogenetic view) is reflected in the way we use language. Verbally behaving in a pragmatically appropriate or inappropriate fashion involves perceiving and filtering information, integrating incoming stimuli with current goals, planning, coordinating and monitoring complex behavior, and providing feedback to internal and external stimuli. It is thus unlikely that neuropragmatics is linked to a simple psychological or physiological mechanism but should rather be conceived of as a delicate interplay of various mechanisms that are ultimately reflected in language use. The complexity involved in neuropragmatics requires not only an interdisciplinary effort by researchers in the field of linguistics, neuropsychology, neuroscience, cognitive science, computer science, philosophy, sociology, and anthropology but also an endeavor towards a common theoretical framework. The study of neu-

ropragmatics thus offers the unique opportunity to draw on methods and findings of all these various disciplines in a unified search for how the mind works.

The way we use language depends on internal (for example, arousal, attentional, memory, or linguistic abilities) and external (environmental) factors (for example, situation, social membership, culture). Investigating to what degree and how such factors alone or conjointly influence and are reflected in language use and how this relates to brain mechanisms provides a major challenge. Until today, most research in neuropragmatics has been limited to providing detailed descriptions of aspects of pragmatic abilities in brain-damaged populations, and although some effort has been made to relate the observed behavior to processing mechanisms, there is currently no theoretical model of pragmatic processing (for a summary see Paradis, 1998, Stemmer, 1999). Simple neurolinguistic and neuropsychological descriptions do not adequately account for neuropragmatic impairments. Neuropragmatic functions result from the interplay of diverse cortical and subcortical neural systems, which, in turn, are influenced by internal and external factors. The questions to answer are what are the underlying neural bases of our pragmatic abilities, what are the factors influencing these neural bases, and how do we go about investigating them? Here are some (and by no means exhaustive or mutually exclusive) suggestions and questions to pursue:

The imaging approach. Current evidence indicates that neurons play a central role in information processing. If we view the brain as a constellation of specialized neural circuits and systems, then there must be circuits and systems that „bring about“ mental states such as desires, intentions, and beliefs, and refer such states to the self and to others. By carefully designing stimuli that elicit pragmatic aspects of language and by using imaging techniques that investigate the temporal and spatial dynamics of the brain during language use (such as the evoked potential technique using EEG or magnetic source imaging, functional MRI, PET, or optical imaging), we may be able to identify the neural circuits involved in the creation of mental states.

The biochemical approach. Neurotransmitters and hormones have a strong effect on human behavior. Malfunctioning neurotransmitter circuits and endocrine pathologies can affect arousal mechanisms, learning and memory, and lead to changed behavior. What is the relationship between hormonal and neurotransmitter circuits and neural circuits? How does a malfunction of such circuits influence the way we use language? Does language use affect such neurotransmitter and hormonal circuits? What is the relationship between such circuits and neural plasticity?

The psychopharmacological perspective. Circulating hormones can be altered by biochemical substances such as medication and drugs, which, in turn, can alter behavior (including verbal behavior). What is the relationship between altered verbal behavior and pharmacological substances?

The rhythmic perspective. Investigating the circadian rhythms such as sleep rhythmus may help elucidate the role of biochemical substances. One could ask whether explanations of phenomena observed during phases of sleep or sleep deprivation help explain pragmatic phenomena observed in brain-damaged populations. For example, dream phenomena such as strange stories or images that are illogical, non-sensical, or unrealistic with reference to the „real“ world, have been related to particular biochemical processes during sleep such as a disinhibited cholinergic system leading to self-stimulation of the brain (Hobson, 1993). Is there a relationship between such observations and impaired language use due to brain damage?

Ontogenetic and phylogenetic perspectives. Neural plasticity alters over a life span. How do such alterations relate to the development of language use? Why is it that young children do not master certain aspects of the pragmatic use of language („theory of mind aspect“)? From a phylogentic perspective, investigating what adaptive problems a species faced during its evolutionary history

may give us insights into the functional circuitry of its neural architecture (Tooby & Cosmides, 1995; see also Luu & Tucker's vertical integration hypothesis)

The cognitive approach. Although it is assumed that cognitive systems such as attention, perception, or memory can affect language use, little is known about how and to what degree such effects occur. Some of the cognitive functions involved in verbal pragmatic behavior have been attributed to the frontal lobes which are seen as integrators of all cortical regions, and which maintain links to subcortical structures. Learning about the organization and processing mechanisms of the frontal lobes will also contribute to our understanding of neuropragmatic processes. What role do attentional, memory and emotional systems play in language use? (Damasio, 1994; for a summary see the collection of articles in Gazzaniga, 1995). Is there a common underlying mechanism for neuropragmatic impairments, or are we dealing with different mechanisms that lead to either similar or different neuropragmatic impairments?

The social perspective. How is verbal behavior socially mediated and which neural circuits are involved in such behavior? (For a summary see Gazzaniga, Ivry, & Mangun, 1998).

A final and central question that needs to be asked is how do these various approaches and perspectives interrelate?

We hope to have shown the merits the study of neuropragmatic functions offers in the search for how the mind works. Only by adopting an interdisciplinary approach, by establishing a unified theoretical basis, by incorporating different perspectives, by combining research approaches and collecting insights from different and converging methodologies will we be able to find answers to our questions. Undoubtedly, a challenging task - but a task worthwhile pursuing in the new millennium.

References

- Damasio, A. R. 1994. Descartes' error: Emotion, reason, and the human brain. New York: G.P.Putnam.
- Hobson, J. A. 1993. Sleep and dreaming: Current Opinion in Neurobiology, 10, 371-382.
- Gazzaniga, M. S. (Ed.) (1995). The cognitive neurosciences. Cambridge, MA: The MIT Press.
- Gazzaniga, M. S., Ivry, R. B., & Mangun, G. R. 1998. Cognitive neuroscience. The biology of the mind. Chapter 11, Executive functions and frontal lobes (pp. 423-464). New York: W. W. Norton & Company.
- Luu, P., & Tucker, D. M. 1998. Vertical integration of neurolinguistic mechanisms. In B. Stemmer and H. A. Whitaker (Eds.), Handbook of neurolinguistics (pp. 159 - 172). San Diego: Academic Press.
- Paradis, M. (Ed.) 1998. Pragmatics in neurogenic communication disorders. Journal of Neurolinguistics, 11, (Special issue). Oxford: Elsevier.
- Stemmer, B. (Ed.) 1999. Pragmatics: Theoretical and Clinical Issues. Brain and Language, (in press) (special issue). Academic Press: San Diego.
- Tooby, J. & Cosmides, L. 1995. Mapping the evolved functional organization of mind and brain. In M. Gazzaniga, The cognitive neurosciences (pp. 1185 - 1197). Cambridge, MA: The MIT Press.