

1

FRONTIERS OF KNOWLEDGE: LANGUAGE AND COGNITION¹

Vaishna Narang

Study of language and cognition, language, mind and brain are of interest to people from various disciplines including psychology and psychiatry, neurology and neurobiology, and genetics, people working in the area of Artificial Intelligence and Neural Networks, TTS and Speech Recognition, etc to name a few. Human mind and the way it functions remains a mystery for researchers from all these disciplines. Pondering over the issue of consciousness, Tandon, a neuroscientist raises several questions which according to him have been examined by scientists from a variety of disciplines including neurobiology, molecular biology, physics and mathematics. These questions are: Is consciousness the function of brain? If so, does it have a seat in the brain (localization)? Can brain mechanisms explain consciousness in its entirety? Are consciousness and mind synonymous? What is mind? Is brain the organ of mind? (Tandon, 2001: 33)

Since Language is the most complex and yet structured and organized aspect of human behaviour and can provide a window into the human mind, Language Science, is the discipline that has gained currency, legitimately, in the past half a century if not

¹ Keynote address presented in the Proceedings of The International Seminar on *Perspectives in Linguistics*, 2008.

more. This area is highly dynamic, both in theoretical research and in clinical application of neuro-cognitive linguistics.

Ballmer, author of "*Biological Foundations of Linguistic Communication*" moved from Theoretical Biology and Theoretical nuclear physics to language. His search for a topic of biology "structured richly enough to allow theoretical investigation" led him to linguistics. He says he found language "as an especially explicitly structured domain of conceptual behavioural biology." (Ballmer, 1982).

Earlier in 1967, Eric Lenneberg presented a general theory of the biological basis for language which has affected the views of linguists and psychologists all these years. In summary, Lenneberg claimed that language is determined by species specific biological features, which includes cerebral function, oropharyngeal morphology and others; which makes certain features of languages universal. He further says that ontogenetic development comes through physiological, cognitive maturations which leads to "language readiness" and "critical period" hypotheses. (Lenneberg, 1967: 371)

In 1980 the Harvard Medical School Biolinguistics Group was formed under the sponsorship of Allan Maxam's Laboratory of Molecular Biology to provide an interdisciplinary forum for researchers interested in the biological foundations of language. According to Chomsky the central questions for *biolinguistics* today are: What constitutes knowledge of language? How is this knowledge acquired? How is this knowledge put to use? What are the relevant brain mechanisms? How does this knowledge evolve (in the species)? (as cited in Jenkins, 2000: 1- 2)

ON ACQUISITION

Cognitive scientists and social scientists, parents and lay persons often marvel at the ease with which little babies acquire language and master it to perfection (of a native speaker's competence) even before they complete four / five years of age. The complexity of linguistic structure and mastery of very fine subtle distinctions of speech which they exhibit as early as 3 years of age surprises one and all.

It is a wonder of wonders that a child is able to extract emotive and affective meanings, from sentences with affective intonation very early (within the period of babbling) and learns to fill in the details in the form of single words and phrases later on- in the second and the third year. I propose it is the creativity in form and function, aesthetics of language use, and its emotive functions which accelerate the process of learning rather than a highly saturated dose of perfect, grammatical sentences, sans emotive/affective meanings, without any real life situations to provide the requisite contexts and domains of use.

A child as young as 3 years has the so called 'grammar' and 'counter grammar' to generate sentences, and semi sentences, and interpret new (semi)/ sentences as well and to use them in the most appropriate contexts of situations. 'Semisentences' are used not only in literary texts but in verbal communication too all the time. Katz says 'a generative grammar should generate not just grammatical sentences but also 'semi-sentences' and 'counter grammar' (1997).

I like to quote Leech (1969) and his example from E.E. Cummings "A Grief Ago" an example of 'semi sentences' which can only be explained by "counter grammar" rather than grammar. The poet uses 'grief' in place of a temporal marker for a finite duration of time. A finite duration of time when in grief seems to be much longer as compared to happy times which appear to fly away just too soon. The poet exploits this mismatch between time that is quantifiable as a finite duration, as objective time and time that is experiential and subjective which is interpreted by the reader/ hearer accordingly; the subjective time being perceived by the reader as per her/ his experience of time, grief and happiness.^{*1}

Language as a verbal discourse or a written text, is full of metaphor, similes, literary accretions / dead metaphor enlivened by (the socio-cultural) context of use, and yet a child is able to extract rules which are by no stretch of imagination, non-complex, simple and straight forward.

The input almost always comprises 'semisentences', incomplete, ungrammatical sentences, with enormous variety and heterogeneity in form and function, in speech and language, literary accretions and dead metaphor enlivened by sociocultural contexts of use, etc. Not one child receives 'perfect input'. 'perfect grammar' or 'perfect pronunciation' and yet every child acquires competence that is 'perfect grammar' which enables the child exploit the total language potential creatively, produce and understand creative use of sentences and non-sentences as well. Perhaps they learn faster when the input provided is used creatively, aesthetically rather than grammatically.

A number of theories have been put forth to explain the process of "language acquisition" which according to Chomsky is one of the five main concerns of linguistics/'biolinguistics' today. The theories of acquisition range from the earlier suggestions that the process involves 'hypothesis testing' to discover the grammar of language from the language in the environment, to more complex system of 'problem solving' or later assuming that there is an innate mechanism at work; 'grammar' which is genetically predetermined passes through a normal process and like any

other 'organ'; follows a predetermined 'maturational schedule". 'Language' as a 'mental organ' is a much stronger claim of Chomsky.

Studies on Learning based on babies' output are an important source of data to draw inferences about the cognitive processing involved in learning. It is only as recent as the seventies, when in addition to studies on child's output (LL studies), there is focus also on what the child is exposed to, the so called 'language input'. Studies since the (70's) have focused on mother - child interaction, turn taking and development of communication routine, (Scheffer, 1975. Trevarthen, 1975, Bruner 1975, Messer, (1978, 1980). "Talking to children: Language Input and Acquisition" edited by Snow and Ferguson (1977) has interesting studies on what children receive from the environment. A systematic study of 'Motherese' can be seen in various publications, viz. Garnica (1977), on pitch variation and intonation of Motherese, Snow (1972) on syntactic complexity/ simplification in Motherese, Cross (1977, 1978); and later publication on 'Motherese' as input to hearing and hearing impaired children (Cross et al. 1980). A comprehensive account of "Language Processing in Children and Adults" by Harris and Coltheart (1986) also provides an overview of studies on phonetic, phonological, syntactic features of input provided by the caregiver, mother and generally a few others in the child's environment. Some recent studies such as Tanksley (1993) on *Interactions Between Mothers and Normal-Hearing or Hearing-Impaired Children*, Brodsky, et al. (2007), *Characterising Motherese: On the Computational Structure of Child-Directed Language*. Huttenlocher et al (2007) on *The Varieties of Speech to Young Children*,

The significance of child language studies, input processing to understand the process of cognitive and linguistic development, also input hypotheses for SLA to understand language and cognition in adults can not be underestimated. These studies help to enhance our understanding of the process of acquisition and provide a feedback on various theories on language as a mental organ.

DISRUPTION IN COMMUNICATION: STUDIES ON DISORDERS OF COMMUNICATION

Language and mind (and brain) relationship becomes all the more important and intriguing when there is disruption in communication. Physical or emotional injury to brain can cause complete/partial loss of language, (as in aphasias of various kinds) impaired concept formation, expressive dysfunction of language and space-time disorientation (as in schizophrenia). Thought disorder in schizophrenic patients may also arise from improper timing of activation of semantic networks; lack of co-ordination or integration between different semantic and linguistic networks.

With a renewed interest and focus on cognition and study of mind, consciousness, which can only be pursued with multidimensional, multidisciplinary paradigms and

approaches, researchers and educators are fast discovering that discipline boundaries are collapsing. These rigid boundaries between disciplines serve limited pedagogic function, beyond which they are rather restricting and become a hindrance in the pursuit of knowledge.

It is not surprising that the thought disorder in aphasics and /or schizophrenics, or even in a dyslexic may show up as impairment of the ability to abstract and generalize, impairment of the ability to symbolize, impairment of the integration and coordination faculty in brain, which is yet to find a localized 'centre'.

In fact as early as 1885, German physician Ludwig Lichtheim found it necessary to postulate a third language center with an unspecified localization, the "concept center", in the model of language function. A holistic school of neurologists and psychologists in the 20th century claimed that "symbolic activity" is the main mental process and that brain damage results in a reduction of this function. And that the description of behaviour and psychological analysis was more important than physical examination of the brain.

Developing appropriate methodologies and procedures for working on brain damaged cases, several empirical cognitive neurolinguistic research paradigms have evolved which are generally collectively referred to as *cognitive neurolinguistics research paradigms*. Put together by Ahlsen (2006) these include a whole range of approaches and models from 'Single Case Study Models' to 'Computational' (Kosslyn & Intriligator, 1992, p.102), and insights from the neurosciences about the realization of cognitive functions in "neural hardware" (Kosslyn & Koenig, 1992), one finds new set of assumptions - in line with the parallel distributed processing (PDP) framework (Rumelhart, McClelland, 1986) for drawing inferences about the functional cognitive architecture, followed by connectionist network model (Farah & Mc-Clelland, 1991).

'Model-Based Research', evolved under the name of '*Cognitive Neuro-Psychology*', which has a strong clinical tradition, including, for example, the PALPA investigation (Kay, Lesser & Coltheart, 1992; Whitworth, Webster, & Howard, 2005), the Pyramids and Palm Trees test (Howard & Patterson, 1992), and the documentation of model-based clinical work (Byng, Pounds, Lindsay, & Swinburn, 2001) have contributed extensively to studies in lexical semantics and reading. (Ahlsen, 2006:47)

Recent studies using fMRI and PET techniques (as summed up in Price, 2000, and Susan Bookheimer, 2002) on new approaches to understanding the cortical organization of semantic processing also bring further information on brain- language relationship, bringing to light new points of consideration as far as Localization Hypotheses are concerned. Some of these studies suggest that large areas like

Broca's and Wernicke's which have so far been associated with language and discourse/cognition respectively, are in fact comprised of several small centres and subcentres processing smaller pieces of information, and a number of similar centres located within or outside these regions are perhaps engaged in integrating the information processed by these small centres.

Developmental and acquired disorders of communication, aphasiology and dyslexia studies, language of the schizophrenics, all are therefore of great research interest in linguistic theory/ biological theory of human language as well as in practice of developing appropriate models for the study of language.

Early in the 21st century, in the year 2008, as we examine our research goals and objectives we realize that language scientists today have a much greater responsibility, if language, the object of our study, 'an especially explicitly structured domain of conceptual behavioural biology', is meant to be the best if not the only means to access the depths of human mind, to understand cognition and consciousness. Language Sciences pursued under various labels, such as Biolinguistics, Neuro-cognitive Linguistics, Cognitive Neuro- Psychology etc (also Evolutionary Linguistics, and Gene Linguistics) will determine the research goals and paradigms in the 21st century, since that is the way to the knowledge of man's mind.

NOTES

*1. I have a parallel example to compare with 'a grief ago' from child language. My daughter was barely three when her grandmother commented - '*one morsel ago she liked vegetables and now she doesn't like vegetables.*' The girl immediately responded- "*one 'roti' ago I liked vegetables, but now I do not like it any more*". 'One roti' implying at least five times longer duration of one morsel, and the girl responds at once, implying it is not just a short while ago, but a much longer time ago that she liked vegetables.

Language as a verbal discourse or a written text, is full of metaphor, similes, literary accretions/dead metaphor enlivened by (the socio-cultural) context of use, and yet a child is able to extract rules which are by no stretch of imagination, non-complex, simple and straight forward.

The same child, my daughter was just five when I took her to the book fare, in Delhi. She used to love visiting book fairs, especially the then USSR book stalls selling a huge variety of colourful books for children at a highly subsidized price. They had picked up a phrase and used it in banners, as book marks, in a number of different languages which read as:

A room without windows

is like

a house without books

It could also be read as on the two sides of a book mark/ banner:

A house without books

is like

a room without windows.

My daughter was fascinated by this. She read it again and again and wanted to talk to me about it, interpret the same for me in her own child like manner.

(She tells me- 'if there are no windows, we cannot see anything, cannot understand anything, we don't know anything. Similarly if we do not have books to read then we don't know anything about the world, we do not understand anything, we do not know anything...).

REFERENCES

Ahlsén, E. 2006. *Introduction to Neurolinguistics*. Amsterdam/Philadelphia: John Benjamins Publishing Company.

Ballmer, Thomas T. 1982. *Biological Foundations of Linguistic Communication: Towards a Biocybernetics of Language*. Amsterdam/Philadelphia: John Benjamins Publishing Company.

Bruner, J. 1983a. "The Acquisition of Pragmatic Commitments". R.M. Golinkoff (ed.) *The Transition from Prelinguistic to Linguistic Communication*. Hillsdale, N.J: Lawrence Erlbaum Associates.

Bruner, J. 1983b. *Child's Talk: Learning to Use Language*. New York: W.W. Norton.

Byng, S. Pound, C. J. Lindsay, and K. Swinburn. 2001. *The Aphasia Therapy File*. Hove: Psychology Press.

Cross, T.G. 1977. "Mothers' Speech Adjustments: The Contributions of Selected Child Listener Variables". C.E. Snow and C.A. Ferguson. (eds.) *Talking to Children: Language Input and Acquisition*. Cambridge: Cambridge University Press.

Cross, T.G. 1978. "Mother's Speech and its Association with Rate of Linguistic Development in Your Children". N. Waterson, and C.E. Snow (eds.) *The Development of Communication*. Wiley: Chichester.

Cross, T.G., J. E. Johnson-Morris and T.G. Nienbuys. 1980. "Linguistic Feedback and Maternal Speech: Comparison of Mothers Addressing Hearing and Hearing-Impaired Children". *First Language. 1: 163-89*.

Fabbro, F. 2001b. "The Bilingual Brain: Cerebral Representation of Languages". *Brain and Language. 7: 211-222*.

Fabbro, F. 1999. *Neurolinguistics of bilingualism*. Hove: Psychology Press.

Fabbro, F. 2001a. "The Bilingual Brain: Bilingual Aphasia". *Brain and Language. 79: 201-210*.

Farah, M., and McClelland, J. 1991. "A Computational Model of Semantic Memory Impairment: Modality-Specificity and Emergent Category-Specificity". *Journal of Experimental Psychology: General*. 120: 339-357.

Garnica, O. 1977 "Some Prosodic and Paralinguistic Features of Speech to Young Children". C.E. Snow and C.A. Ferguson. (eds.) *Talking to Children: Language Input and Acquisition*. Cambridge: Cambridge University Press.

Harris, M. and M. Coltheart. 1986. Reprint 1987, 1989. *Language Processing in Children and Adults: An Introduction*. Routledge and Kegan Paul.

Harris, M., D. Jones, and J. Grant. 1983 "The Non-Verbal Context of Mothers' Speech to Children". *First Language*. 4: 21-30.

Huttenlocher, J. 1974 "The Origins of Language Comprehension". R.L. Solso (ed.) *Theories in Cognitive Psychology*. New York: John Wiley and Sons.

Jenkins, J.B. 2000. *Biolinguistics: Exploring the Biology of Language*. Cambridge: Cambridge University Press.

Kay, J., and R. Lesser. 1985. "The Nature of Phonological Processing in Oral Reading: Evidence from Surface Dyslexia". *Quarterly Journal of Experimental Psychology*. 37A: 39-82.

Kay, J., and K.E. Patterson. 1983. "Routes to Meaning in Surface Dyslexia". K.E. Patterson., J.C. Marshall and M. Coltheart. (eds.) *Surface Dyslexia: Cognitive and Neuropsychological Studies of Phonological Reading*. London: Lawrence Erlbaum Associates.

Kay, J., Lesser, R., and M. Coltheart. 1992. *PALPA: Psycholinguistic Assessments of Language Processing in Aphasia*. Hove: Lawrence Erlbaum Associates.

Lenneberg, E.H. 1967. *Biological Foundations of Language*. New York: John Wiley & Sons.

Messer, D. 1980. "The Episodic Structure of Maternal Speech to Young Children". *Journal of Child Language*. 7: 29-40.

Rumelhart, D., and J. McClelland. 1986. "Parallel Distributed Processing: Explorations in the Microstructure of Cognition". *Foundations* Vol. I. Cambridge MA: The MIT Press.

Schaffer, H.R. 1975. "Social Development in Infancy". Lewin, R. (ed.), *Child Alive*. London: Temple Smith.

Snow, C.E. 1972. "Mother' Speech to Children Learning Language". *Child Development*. 43: 549-65.

Snow, C.E. 1977. "The Development of Conversation between Mothers and Babies". *Journal of Child Language*. 4: 1-22.

Tandon, P.N. 2001. *Consciousness: Clinical and Beyond*. IIAS, Simla. 33.

Tanksley, C.K. 1993. "Interactions between Mothers and Normal-Hearing or Hearing-Impaired Children". *The Volta Review*. 95:33-47.

Whitworth, A., J. Webster and D. Howard. 2005. *A Cognitive Neuropsychological Approach to Assessment and Intervention in Aphasia. A Clinicians's Guide*. Hove: Psychology Press.