

# A Story About Parked Cars: The Intersection of Neurobiology, Linguistics and Sociology

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TriCo Language Seminar Series  
Haverford College  
Dec. 2, 2004

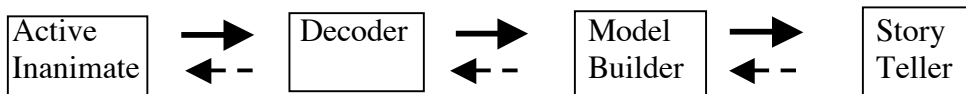
"It is important to emphasize again that the way that sensory inputs are grouped by our nervous systems determines the patterns that we perceive"

Albert S. Bregman *Auditory Scene Analysis*

## 1.0 Grobstein's Bipartite Brain Model

- Grobstein (2004) proposes that aspects of brains (and other biological entities) can be usefully distinguished into three types of entities

(1) Grobstein's Revised "Bipartite Brain" Model

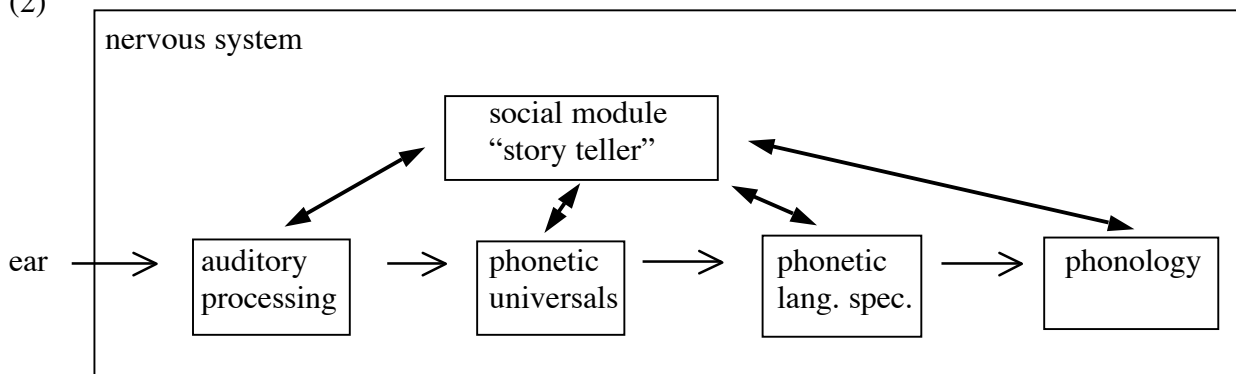


- All of these entities share the characteristic that they convert a 'non-random configuration of energy/matter into another non-random configuration of energy/matter'
- Difference in these type of 'Grobstein Entities' is based on the amount of plasticity in their behavior
  - 'decoder'- biologically determined and relatively fixed in behavior
  - 'model builder'- guided by biologically determined biases which produces flexible but constrained behavior
  - 'story teller' - input from multiple cross-modal modules, biologically guided (!?) to produce higher level patterns from distinct unrelated patterns

## 2.0 The modular organization of linguistic grammars

- Main goal of presentation is to provide a concrete example of how Grobstein's 'bipartite brain' model is useful in understanding human behavior (among other things) by providing a linguistic example

(2)



- Roles of each of the modules:
  - ear*– biological structure that determines aspects of what we hear e.g. 20-20,000hz response
  - auditory processing*– biologically determined processing of auditory stimuli e.g. 'streaming' (Bregman 1990) of auditory stimuli, DECODER
  - phonetic universal*– biologically determined processing that identifies 'language' and begins language specific processing, DECODER
  - phonetic language specific*– emergent module (guided by biologically determined biases) that encodes specific phonetic characteristics defined on a language by language basis  
MODEL BUILDER
  - phonology*– emergent module (guided by biologically determined biases) that encodes language specific symbolic sound patterns, MODEL BUILDER
  - social module*– emergent module that encodes social aspects such as SEC, beauty/ugly, smart/stupid, race, gender, etc., STORY TELLER
- Evidence for higher level modules:
  - phonetic universal*: neonates discriminate between language and non-language from birth (Jusczyk 1997)
  - phonetic language specific*: judgments on different dialects (Purnell et al. 1999), L1 'foreign accents'
  - phonology*: different languages, L2 effects
- 'Information' becomes more abstract as higher level processing occurs:
  - Auditory Processing*: raw frequency analysis, periodicity, 'timber', etc.
  - Phonetic Universal*: only phonetically relevant analyses, formants, transitions, etc.
  - Phonetic Language Specific*: abstract phonetic categories, gestural score
  - Phonology*: distinctive features
- Lower level 'information' is discarded at higher levels:
  - Phonology*: accommodates dialectical differences, difference in male/female/child vocal tracts, etc.
  - Phonetics Language Specific*: accommodates 'intradialectical' variance (VOT, different formant values for vowels), acoustic differences e.g. 'high tone' for male may actually be lower in frequency than 'low tone' for female in a tone language (Mandarin)
  - Phonetics Universal*: accommodates computer generated language and parrots vs. human language
- Work accomplished by each module is reduction of variability and enhancement of the stability of the pattern (analog to digital conversion)
- CITI Bank Fraud Protection Commercials- the 'story teller at work'
  - mismatch between appearance and language
  - effect is only obtainable if we have 'patterns' of relationships between 'appearance' and 'language'
  - if we separate the visual and auditory components of the commercial, there is no effect

### 3.0 'r-dropping' in Eastern Massachusetts English

- 'r-dropping' is a famous characteristic of dialects of English spoken in the Northeast (among other places)
- Data (from Halle and Idsardi 1997:332) in (3) presents example cases of 'r-dropping' (note: [∅] marks 'dropped r')

#### (3) 'r-dropping' of Eastern Massachusetts English

a. <i>spar = mast on boat</i>	the spa[∅] seems broken
b. <i>spa = hot tub</i>	the spa seems broken
c. <i>Homer = ancient Greek poet</i>	Home[∅] bores me
d. <i>Homer = ancient Greek poet</i>	the study of Home[∅]
e. <i>algebra = type of math</i>	algebra bores me
f. <i>algebra = type of math</i>	the study of algebra

- There is also an 'r-insertion' process active in this dialect which produces the homophones seen in (4) (note: [r] marks 'inserted r')

#### (4) 'r-insertion' of Eastern Massachusetts English

a. <i>spar = mast on boat</i>	the spar is broken
b. <i>spa = hot tub</i>	the spa[r] is broken
c. <i>Homer = ancient Greek poet</i>	Homer is difficult
d. <i>algebra = type of math</i>	algebra[r] is difficult

- /r/s remain in the memorized forms of words based on the lack of 'r-insertion' in certain contexts
- (5) shows derived forms with suffix 'ic' which does not trigger 'r-dropping' or 'r-insertion'

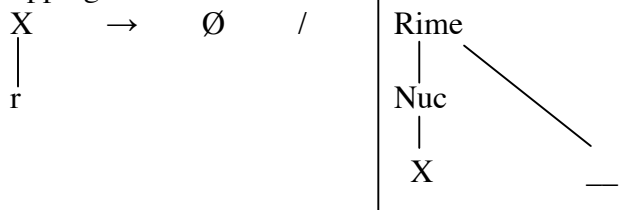
#### (5) underlying /r/

a. <i>algebra does not have [r]</i>	algebra > algebr[ej]-ic	*algebr[er]-ic
b. <i>Homer does have [r]</i>	Homer > Hom[er]-ic	*Hom[ej∅]-ic

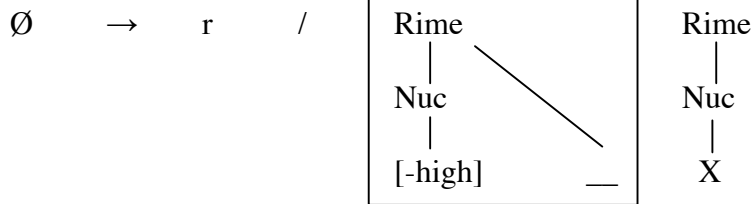
- 'r-insertion' only occurs in dialects of English that have 'r-dropping' and the question I want to focus on is why is this the case?
- Halle and Idsardi (1997) provide formal analyses of 'r-insertion' and 'r-deletion' according to the rules in (6)

#### (6) Rules for Eastern Massachusetts English

##### a. 'r-dropping'



b. 'r-insertion'



- Halle and Idsardi draw attention to the important fact that the structural description of (6b) contains the structural description of (6a) which has important ramifications according to the 'Elsewhere Principle' (i.e. more specific instructions precede and block less specific instructions)
- Halle and Idsardi further suggest that the origin of the 'r-insertion rule' is hypercorrection
- Hypercorrection (Chambers 2002) is a sociolinguistic term that refers to when an individual or group changes their behavior to model it after another group's linguistic behavior
- Perfect imitation is never achieved (post critical period), the hypercorrecting group generally 'overshoots'
- 'r-insertion' achieves the goal of 'more /r/s' which is socially desirable but the rule nevertheless still marks the hypercorrecting group as 'outsiders'

#### 4.0 Why we need a 'story teller' for hypercorrection to work

- A 'story teller' module is the exact type of entity that we want to explain hypercorrection phenomena
- Phonology itself is insufficient because one of its main tasks is to extrapolate away the particular type of information that is necessary
- Phonology itself is impervious to 'social information', i.e. no phonological process is sensitive to:
  - male vs. female
  - child vs. adult
  - black vs. white vs. Chicano
  - SEC distinctions
- All of the above distinctions are calculated at some level because of judgments people have about these social categories (Labov 1970, Purnell et al 1999)
- The speaker who 'hypercorrects' must notice at least the following things:
  - (1) they speak differently from 'others'
  - (2) a particular 'linguistic marker' that is socially significant and associated with the 'others'
  - (3) how to use this marker to become like the 'others'
- Specifically, for a speaker with an 'r-dropping' dialect:
  - (1) they notice 'others' speak differently
  - (2) the 'others' have more /r/s
  - (3) add more /r/s to my speech
- The interaction between the 'story teller' and 'model builder' can be investigated by considering how the behavior is altered
- Phonology as a module is 'fixed' at a point in time during the acquisition process where its rules and representations are impervious to change

- The 'story teller' module can thus only manipulate the phonology in limited ways:
  - attenuation of a rule- surface effect is 'variable rules' which appear to have percentages of application on them (i.e. 'r-drop' 45% of the time)
  - add a more specific rule (Halle and Idsardi 1997)
- Both types of effects are seen in 'hypercorrection'
  - attenuation of 'r-dropping' can be seen in style shifting
  - new rule is 'r-insertion'

### **5.0 Caveats and where to go from here**

- The story here is only about the genesis of 'r-insertion'- once it has occurred in the dialect, children will learn both rules without recourse to the 'story teller'
- All modules discussed here are drastically simplified- each module will have multiple representations and processes within them
- 'Social module' here is by far the most neglected:
  - most likely (definitely) separable from the general 'story teller module'
  - probably has similar architecture (modular) as for the 'sound stream' presented here
  - question as to what representations are in the brain for this module
- Yang (2003) based on language change and language acquisition proposes a new view of adult linguistic grammars:
  - adult 'grammars' consist of multiple grammars which are under probabilistic control
  - this approach accounts for variability in both adult speech and child acquisition
- Relevance of Yang (2003) to current proposal is that grammar choice may not be completely probabilistic in nature:
  - interaction with 'story teller' will bias choice of particular grammars
  - this will explain variable rule application that correlates with social factors
  - requires much future research to fully develop what kinds of extra-linguistic factors influence probabilistic grammar choice
- Open question about other ways 'story tellers' can interact with 'model builders'-provided evidence about how the 'story teller' modifies phonology but what about other modules, 'vision'

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