Biological foundations of Language

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Two perspectives of Language study

- A Biological Capacity
- A Cultural Capacity

Biological Capacity

- Morphologically predisposed to the language acquisition.
- Genetically predisposed to the language acquisition.

Evidences in support of Morphological Predisposition

- Chimpanzees have their tongue completely at rest, horizontally, with in oral cavity, whereas in man the posterior (back) part of the tongue is in a vertical position forming the anterior (front) wall of the supra-pharyngeal cavity.
- In chimpanzee, the soft palate and epiglottis can be approximated (moved together), whereas they are widely separated in case of the adult man.
- Chimpanzees lack pharyngeal zone which is the possession of the adult human.
- The vocal chord of the chimpanzees are situated near the fourth cervical vertebra. In case of the human being it is between fifth and sixth.

These types of physiological differences impose a relative amount of constraint in case of sound production

Ex. Chimpanzees can not produce the basic vowel triad [i-a-u], because of lacking a supra-laryngeal pharynx at right angles to the oral cavity.

Study of morphological predisposition fails to take an account of the following facts:

- Nature of language
- Origin of language
- Man’s linguistic capacity

Nativist's account

- Man has an innate capacity for language.
- It is genetically determined.
- It is invariant across the speech community.

Pidgin vs. Creole

- The birth of Pidgin does not reflect any kind of coherence as a structural whole, over the speech community.
- Creole emerges as a highly developed linguistic system by attaining the principle of coherence, over the speech community.

What does it reflect?

- The acquisition of the Pidgin, in case of the second generation learner, is mediated by an **innate device**.
- The **innate device** provides the second generation learner with a single and fairly specific grammatical model.
- This newly emergent **innate device** is the root cause of the coherence.

Nativists: Poverty of Stimuli

The Poverty of Stimuli refers to the insufficient information obtained from the out side, thus the individual implying the idea of some sort of compensating internal biological mechanism.

2 basic questions

1. Why language evolved in humans only?
2. Bilologically where is language located in humans?

There are different theories about the origin of the language

(a) Divine theories.

(b) Theories about the evolutionary development of organs.

(c) Language as human invention.

(d) 1756- Johann Peter- Human beings could not have invented language without thought and that thought depends upon prior existence of language.

(e) Monogenetic theory

(f) Humans used cries , gestures, but gesture proved to be insufficient for communicating so they invented language.

(g) Humans use language to code memory.

(h) 1769- John Harder

- Human existence is impossible without language. So language was neither invented not gifted.
- He believed in monogenetic theory of human origin and therefore of language.
- He called it biologically determined linguistic ability.
- He claimed that all humans are equally genetically equipped with unique language learning abilities.

(i) Psychedelic hypothesis-

- Language evolved by fungal infection- Tryptamine intoxicication.

- Psychoactive fungi- symptom is Glossolalia- commonly known as speaking in tongues.

- **But the major questions are**

1. Is language evolution related with Lungs, pharynx, Larynx, Vocal cards, oral cavity etc?
2. Do other species lack Evolutionary development and neural control?
3. Had language evolved once or stepwise?
4. Are we talking about hearing, speaking or distinguishing speech sounds?
5. What's lacking in other species?
6. is language a bi-product of human brain or related to social environment?
7. Is language biologically and genetically determined?

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- Is language an innate tendency?
- It has been found that some birds will sing a fully developed song even if they don't hear it. so its innate and biologically determined.
- In case of some birds – if they are not exposed to the song of their species for a particular time song acquisition dose not occur.
- In some birds – if they are deaf during critical period , they produce songs different from their species and if deafness occurs after critical period songs are normal.
- Its not speech but language which is innate.

- Humans do not have any primary organs for speech only.
- Different experiments were carried out by providing human like environment to chimpanzees. It was found that

1 they learned after a lot of efforts and what they learned can not teach to others or their off-springs.

2 they can not create it as humans.

3 they produce sounds but do not acquire it fully as humans.

4 they lack combinatorial property system (grammar) which makes human language infinite.

- Suggestive Biology-Language Homologies

CELL	HUMAN LANGUAHE
• Nucleotide bases	Alphabet
• Amino Acids	Words
• Axons	Phrases
• Folding	Syntax
• Proteins	Word Senses
• Protein Circuit	Sentences
• Biological function	Semantics
• Regulation of Gene expression	language generation

- **Is Language genetically determined?**
- Foxp2- gene is claimed to be involved with the development of language which is absent in other species.
- In the history of man no language was genetically transformed to next generation.
- But some language disorders are genetically transmitted.
- Sometimes fathers sound resembles his son.

Is language located in human brain?

1. 1861- Paul Broca- We speak with the left hemisphere and damage to left side (Left hemisphere) resulted in loss of speech where as damage to right side did not.
2. So language is lateralized.
3. Although both left and right hemispheres are structurally same, but during the development 2 sides of brain are specialized for different functions. So lateralization (i.e. One side ness takes place).

4. More evidence is that patients who have right hemispheres removed language remains intact.

5 Brain has a cross function, i.e. right part controls left side of the body and right side controls the right side.

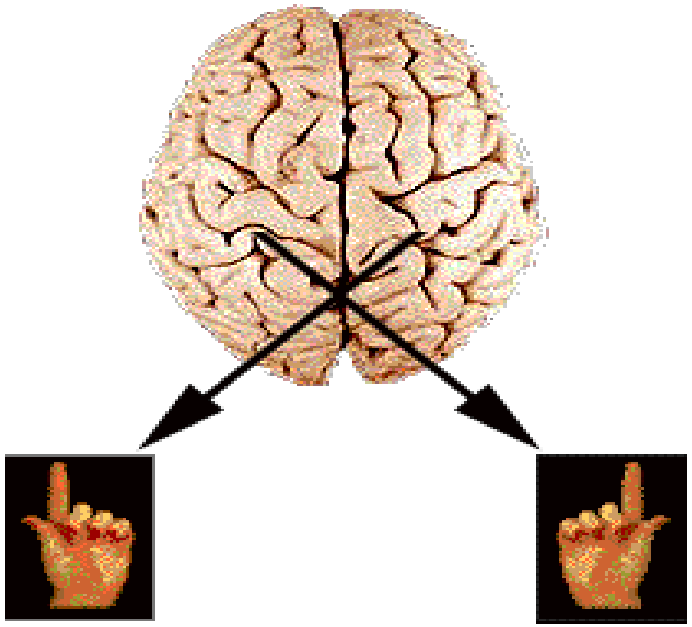
6. Further proof of lateralization is *Dichotic listening*- shows that left hemisphere is specialized for language not for all sounds

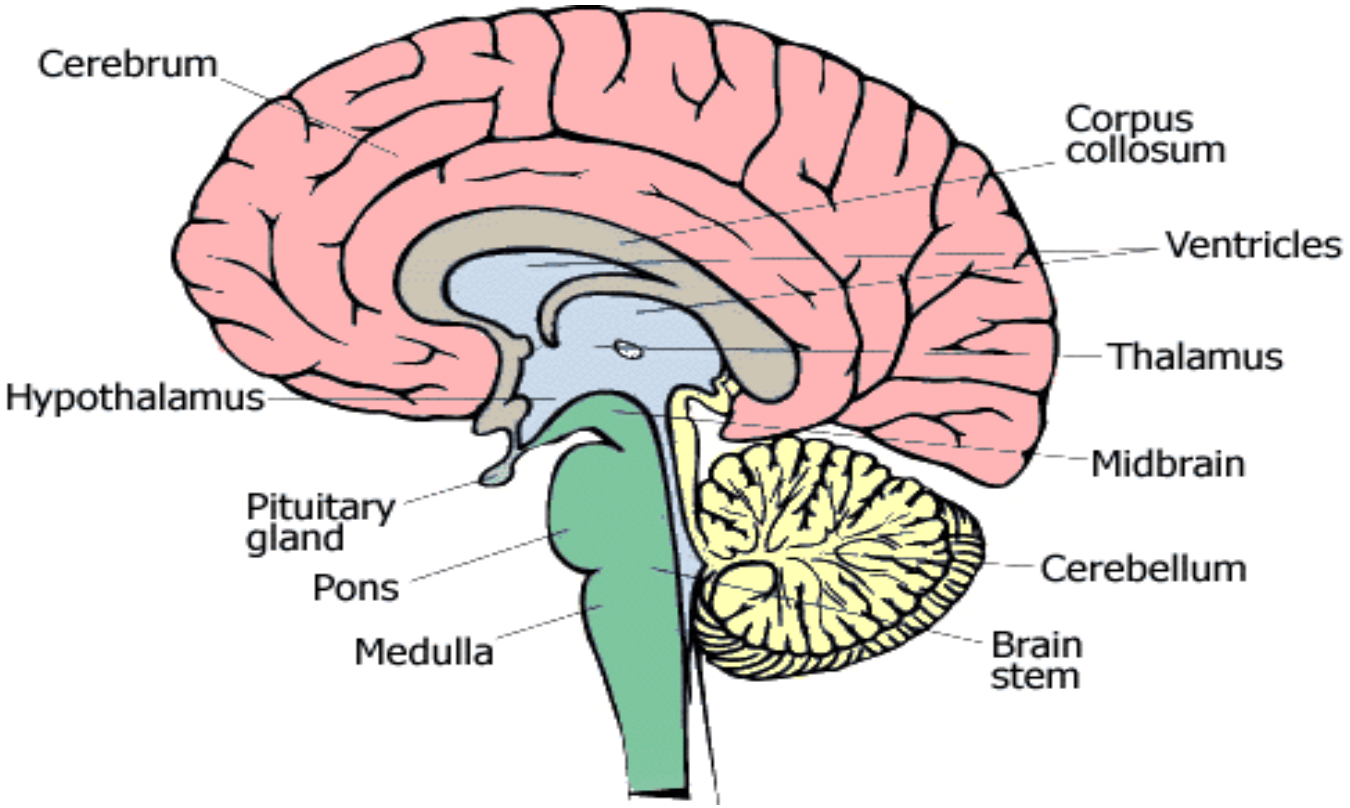
But

- It is assumed that at birth- 2 hemispheres are equipotential and non- specialized. So if the damage occurs in left hemisphere, right hemisphere can equally well acquire and use language.
- Because of corpus-callosum- 2 billion fiber connecting cells.
- When left hemisphere was removed (because of tumor) it was found that their language differ syntactically from normal language development.

- Language learning and lateralization may go side by side- but the relation between 2 is not clearly understood. we are not certain whether language is prerequisite for lateralization or whether lateralization proceeds language acquisition.
- Sep.1884 when Phineas Gage (one man show) became a famous figure in medical history, and a question for neurolinguists.
- Lateralization also takes place in birds and other monkeys.
- So lateralization is not sufficient for language development.
- One claim is that vocal tract of non- human primates is incapable of producing large amount of speech sounds so speech could not develop in them.
- So it may be evolutionary development of brain, speech production and perception apparatus.

- Language developed after a large number of evolutionary steps, and major evolutionary development is that of brain.




Cerebrum
Corpus collosum
Ventricles
Thalamus
Hypothalamus
Midbrain
Pituitary gland
Cerebellum
Pons
Medulla
Brain stem

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Thank you!