APHASIA

Raffaella Ida Rumiati
Cognitive Neuroscience Sector

Scuola Internazionale Superiore di Studi Avanzati
Trieste, Italy

rumiati@sissa.it

APHASIA

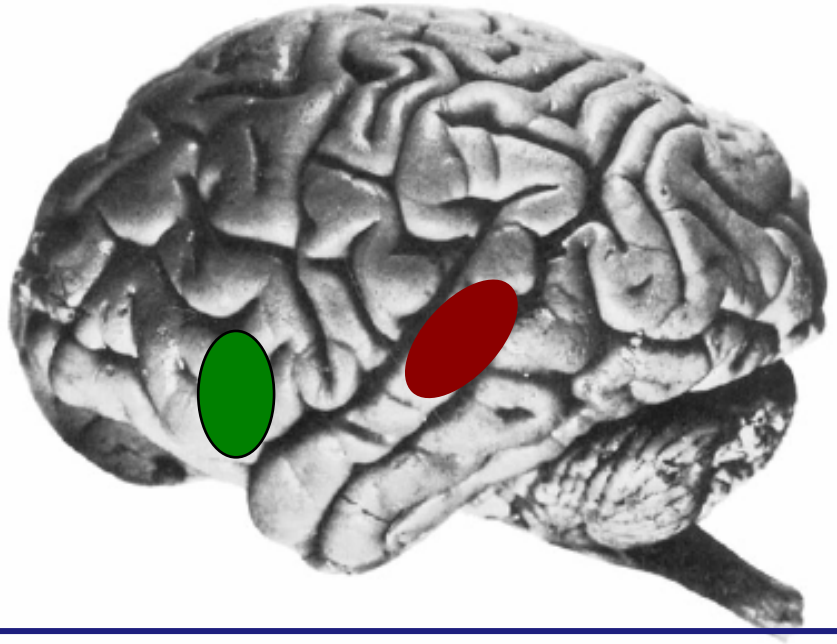
Aphasia is an *acquired* language disorder causing deficits of production and comprehension of verbal messages in individuals with a *normal language acquisition history*.

- Aphasia can involve *the entire linguistic system,* but can also impair *single components* or *modalities:*
  - ✓ phonology, lexicon, morpho-syntax and semantics
  - ✓ input and output, oral and written language

LANGUAGE AREAS IN THE LH

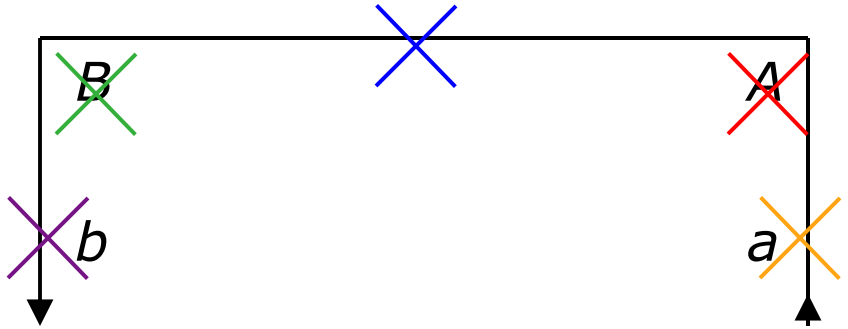
Paul Broca

left hemisphere



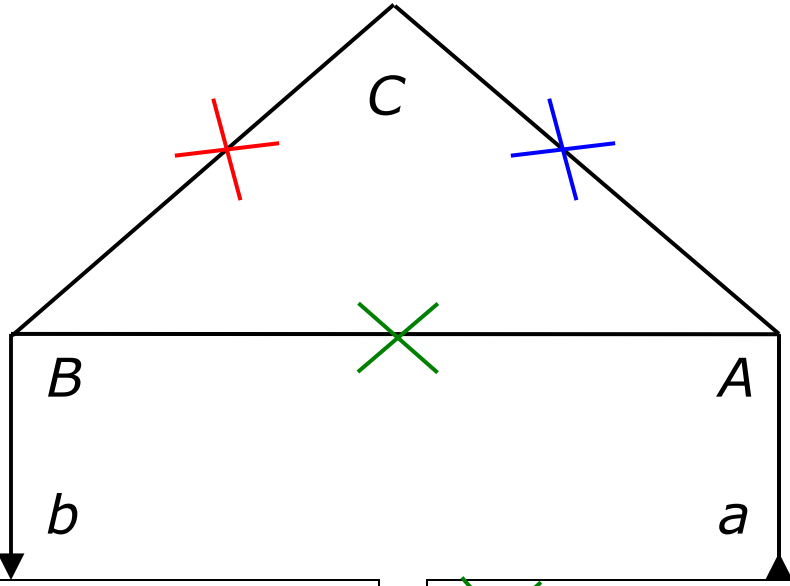
- *Aphasia usually follows left hemisphere damage:*
  1st report of the asymmetry of human brain functions (Broca, 1865).
- Language is organized around the *left Sylvian fissure*:
  - Broca's area: left premotor frontal cortex (Brodmann area 44)
  - Wernicke's area: left superior temporal cortex (BA 22).

MAJOR TYPES OF APHASIA
following *WERNICKE* (1874) & *LICHTHEIM* (1885)



A	center of *auditory representations* of words *(22)*
B	center of *motor representation* of words *(44)*
a	*auditory analysis*
b	*articulatory programming*
AB	*arcuate fasciculus (exter.caps.)*

A	sensory aphasia *(Wernicke's)*
B	motor aphasia *(Broca's)*
a	*pure verbal deafness*
b	*pure anarthria*
AB	*conduction aphasia*



A	centre of auditory representation of words *(22)*
B	centre of motor representation of words *(44)*
C	conceptual knowledge
a	*auditory analysis*
b	*articulatory programming*
AB	*arcuate fasciculus (exter. caps.)*

AB = conduction aphasia

comprehension	+
repetition	-

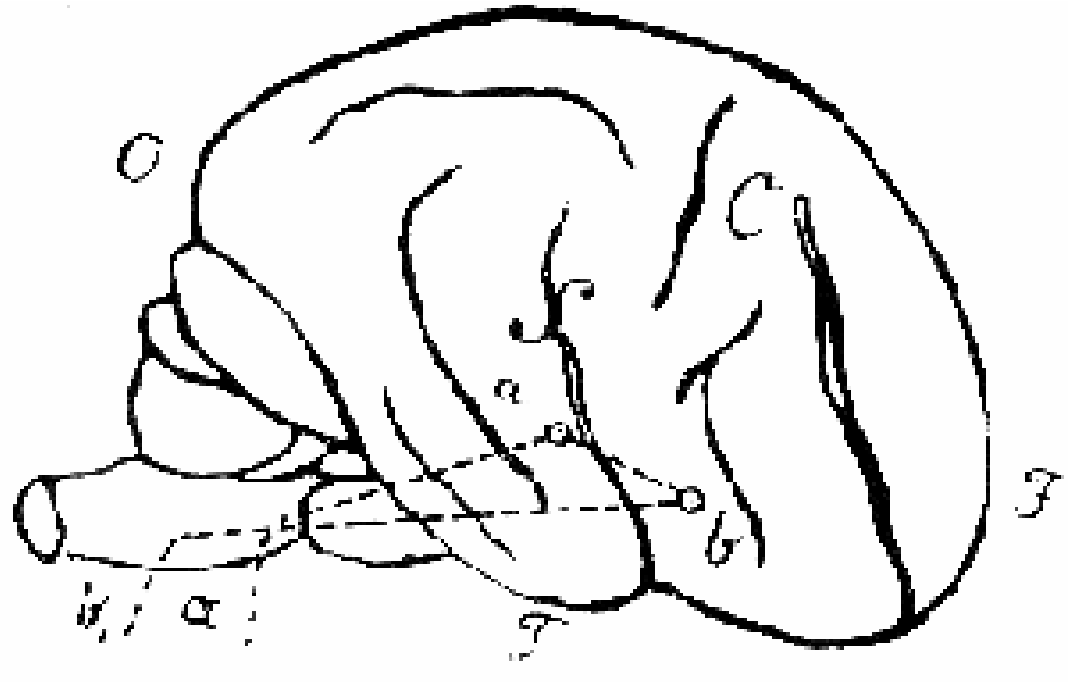
AC = transcortical sensory a.

comprehension	-
repetition	+

CB = transcortical motor a.

comprehension	+
repetition	+
ideational-verbal inertia	

WERNICKE's MODEL (1874) & ITS ANATOMICAL CORRELATE



LIMITS OF WERNICKE & LICHTHEIM's MODEL

- The *sensory* (auditory) / *motor dichotomy* is not sufficient to account for the fact that the majority of the patients may have a damage that involves *both input* and *output* modalities, oral and written language.

- The model cannot explain how non-lexical strings (non-words) are processed.

- Nor can it explain the existence of category-specific impairments (nouns vs verbs) and part of speech effects.

Neurolinguistics

- Investigating aphasic deficits is very useful because *language* is a function that is specific of the *human behaviour* and *brain.*

- In addition to the classical classification of aphasias, we should use also a classification based on *linguistic components:* phonology, lexicon, semantics and syntax, each of which can result selectively damaged.

- In this way we can both:
  - Provide a clinical diagnosis and evaluate the effect of the rehab treatment
  - Test cognitive models of linguistic functions

PRINCIPLES FOR ASSESSING APHASIC DEFICITS

- **Anamnesis**
- **Spontaneous Speech**
- **Modality- specific Tasks**

ANAMNESIS

General Anamnesis

- *handedness*
- *past and recent clinical history*

Anamnesis about pre-morbid language use

- Did the P use to talk a lot or not?
- Did the P speak other languages or dialects and when?
- How frequently did the P read (rarely, frequently, only for work)?
- How frequently did the P write (rarely, frequently, only for work)?
- Did the P use to watch TV (which programs) or to go the cinema or to the theatre?

- **Anamnesis of the linguistic deficits** *(P & relatives)*
- Evolution of the deficit since the illness onset.
- What does the P say when s/he communicates with the relatives?
- Ask for previous linguistic assessment and rehab when available.

SPONTANEOUS SPEECH

- Qualitative phenomena
  - *content*
  - *pragmatics*
  - *comprehension*
  - *articulatory difficulties*
  - *phonological deficits*
  - *lexical (and/or lexical-semantic) deficits*
  - *morpho-syntactic deficits*
  - *automatic elements*

- Conversation or description of a complex drawing

- *Content*
  - Amount of information that is communicated

- *Pragmatics*
  - alternating roles
  - anaphora (pronouns, temporal adverbs etc)
  - irony
  - indirect communicative acts

- *Comprehension*
  - questions posed by the interlocutor (who, where, when)
  - lexical-semantic decoding
  - syntactic analysis (passive, relative sentences etc)

Articulatory difficulties

A patient affected by brain damaged can show articulatory deficits which can be:

- *paretic* in nature → ***dysarthria***

- due to a disorder of *programming the movements* necessary for producing linguistic sounds → ***speech apraxia or anarthria***

Qualitative phenomena of articulatory deficits

disartria
[paresis, ataxia]

- reduced intelligibility
- slurred speech
- dysphonia
- nasality
- rhythm anomalies
- volume anomalies

speech apraxia
(or *anarthria*)
[deficit
of the articulatory
motor
programming]

- *staccato speech*
- *dysprosody*
- *phonetic disintegration syndrome:*
  - *voiced* sounds → *voiceless*
  - *fricative* sounds → *occlusive*

(/f/ → /p/)

Qualitative phenomena of aphasic deficits

Phonological deficits

phonemic paraphasias

omissions

additions

transpositions

duplications

conduites d'approche

phonemic neologisms

neologistic jargon

Lexical-semantic deficits

anomias

anomic latencies

circumlocutions

semantic paraphasias

passe-partout forms

semantic jargon

Morpho-syntactic deficits

agrammatism

simplified sentence structure

telegraphic speech (omissions of function words, verbs in infinitive form)

paragrammatism

agreement errors (gender, number)

substitutions of grammatical function words

Automatic elements

Recurring utterances (recurrent syllabic fragments: TAN)

Automatisms

Perseverations

Echolalia

Automatic-voluntary facilitation

Patients, who are not able to retrieve a lexical element when asked to do it or when they would like to do it (*voluntary condition*), can sometimes manage to retrieve it if it is facilitated by the context (*automatic condition*).

MODALITY SPECIFIC TASKS

- *Repetition*
- *Naming*
- *Lexical decision*
- *Comprehension*
- *Written language*

- *Repetition*
  - sounds and syllables
  - words
  - non-words
  - sentences
- *Naming*
  - confrontation (line drawings, photographs)
    objects and actions (nouns and verbs)
    oral and written
  - to definition
  - fluency
    category
    Initial letter

Lexical effects: Worf Frequency, Age of Acquisition

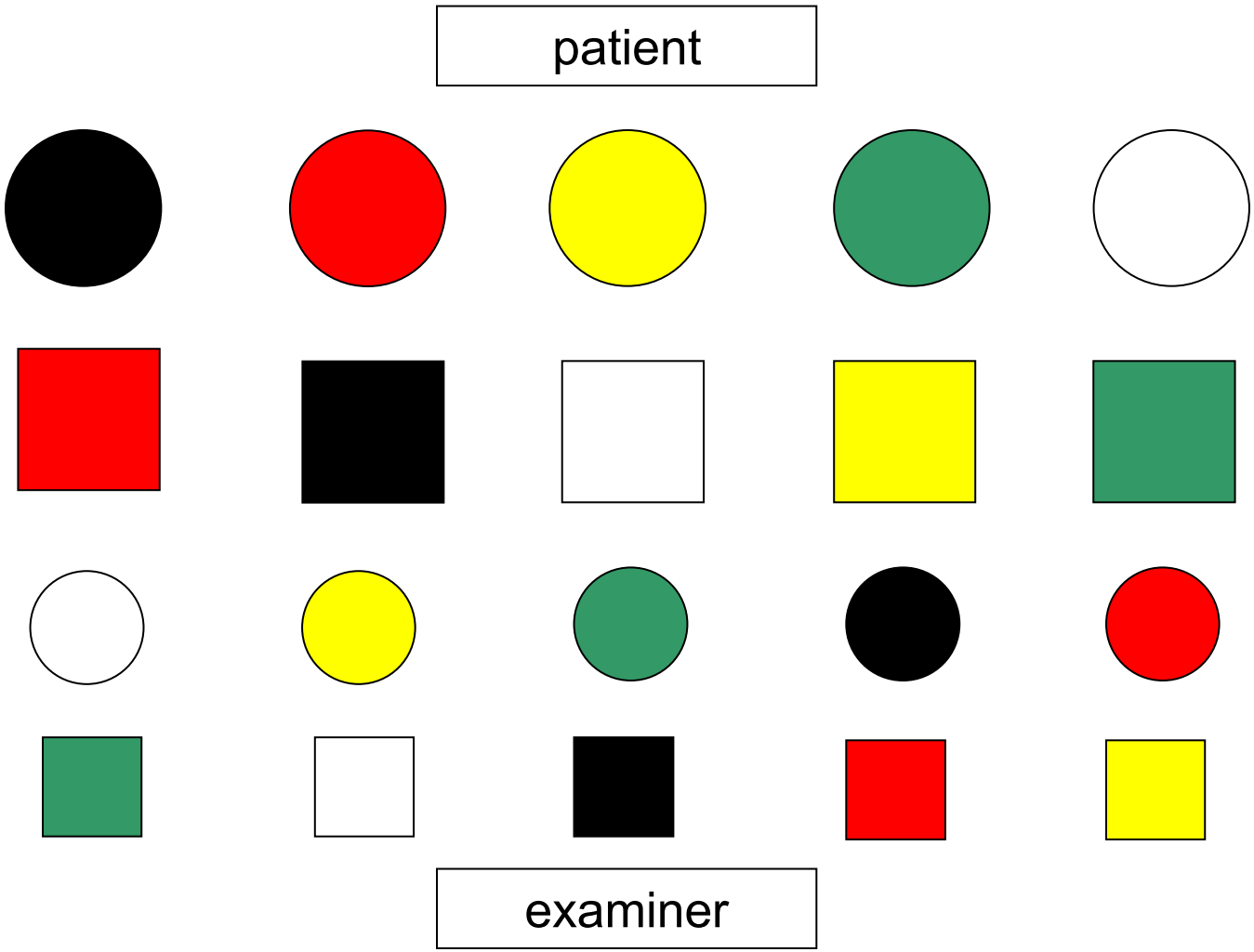
- *Lexical Decision*
  - presented orally and written
- *Comprehension*
  - words and sentences
  - presented orally and written

- *Written language*
  - **reading aloud**
    - *words, non-words, sentences*
  - **dictation: writing and oral spelling**
    - *words, non-words, sentences*

MAIN APHASIA BATTERIES

Test	Authors	Theoretical frame	Language	Length
Aachener Aphasie Test (AAT)	Huber, Poeck, Weniger e Willmes, 1983	Neuro-linguistics	G, D, I	3 h
Boston Diagnostic Language Examination (BDAE)	Goodglass e Kaplan, 1983	Neuro-linguistics	E, F, I, S, P	2 h
Esame del Linguaggio (2 ed)	Ciurli, Marangolo e Basso, 1996	Neuro-linguistics	I	2-3 h
Western Aphasia Battery (WAB)	Kertesz, 1979; 1982	Neuro-linguistics	E, P	1-2 h
Batteria per l'analisi dei deficit afasici (BADA)	Miceli, Laudanna, Burani e Capasso, 1996	Psycho-linguistics	I	8 h
Psycholinguistic Assessment of Language Processing in Aphasia (PALPA)	Kay, Lesser e Coltheart, 1992	Neuro-linguistics	E	1-6 h
Communication Abilities in Daily Living (CADL)	Holland, 1980	Pragmatics	E, I	1 h

TOKEN TEST
(De Renzi et al, 1962, 1978, 1980)



SPONTANEOUS SPEECH
Cookie theft
(BDAE, Kaplan e Goodglass, 1983)

FLUENT & NON-FLUENT DEFICITS

Deficit	fluent aphasias	non-fluent aphasias
• *speech characteristics:*		
Amount of speech	abundant	reduced
length of sentences	long	short
• *qualitative phenomena :*		
speech apraxia	--	+/-
agrammatism	--	+/-
paragrammatism	+/-	--
jargon	+/-	--

- absence / + presence

FLUENT APHASIAS

	Wernicke's aphasia	conduction aphasia	transcortical sensory aphasia	anomia (a.nom.)
Deficit	Ph,Lex,M-Synt	Ph	Lex-Sem	Lex(output)
Oral expression:				
Speech apraxia	--	--	--	--
agrammatism	--	--	--	--
paragrammatism	+/-	-/+	+/-	--
jargon	+/-	--	+/-	--
Other verbal tasks:				
comprehension deficit	±/+++	-/±	+++	-/±
repetition deficit	+/+++	++	--	-/±
naming deficit	+/+++	-/+	++(+)	++

- absence / + presence

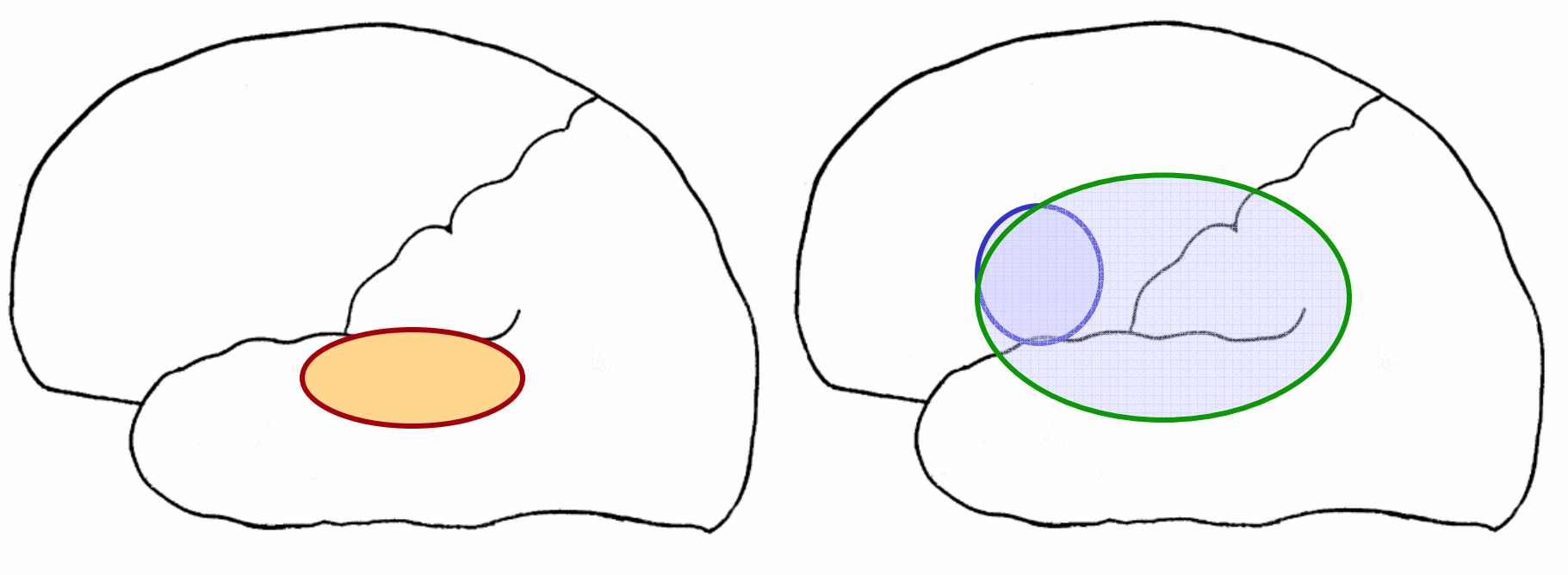
NON FLUENT APHASIAS

	Broca's aphasia	global aphasia	transcortical motor aphasia	double transcortical a.
Deficit	Ph,Lex,M-s	Ph,L-S,M-s	v. inertia	Lex-Sem
Oral expression:				
speech apraxia	+/-	+/-	--	+/-
agrammatism	+/-	+	+/-	+
paragrammatism	--	--	--	--
jargon	--	--	--	--
Other verbal tasks:				
comprehension deficit	+/±	+++	--	+++
repetition deficit	+/++	+++	--	±
naming deficit	++/±	+++	--	+++

- absence / + presence

FLUENT VS NON-FLUENT APHASIA

- ***Fluent*** aphasia is usually caused by left *temporal* damage;
- ***Non-fluent*** aphasia by left *premotor* damage, or – much more frequently – by lesions ALSO involving the left *premotor* area.



Wernicke's (fluent) aphasia

Broca's (non fluent) aphasia