

Processing the elementary visual information is implemented not according to the regularities described in traditional psychology... the naturalistic approach to perception is constraining and should be complemented with a broader social-historical approach (Luria, 1973)



**Methodological Application of the Cultural-
Historical Theory
for Developmental Synaesthesia**

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“Shereshevsky is to be polished as a diamond, sparkling and precious, that will cut across a range of issues solving them the way a diamond cuts glass”
(L.S.Vygotsky, “Mind without Words”)





- Explicit synaesthesia – 50% in children and 15% in adults
- Less pronounced types are “colouring” numbers, days of the week and months

- Implicit synaesthesia can be found in any person
- More frequent in ambiguous situations



What is synaesthesia?

syn – together
aisthesis – perception



joint perceptions or crossing of the senses

Characteristics

sensations in an unrelated modality



involuntary, automatic, and stable



categorical



often inherited



increased links
between sensory
regions

Definition

- “...phenomenon of transference of properties of one sense modality upon another... “ (A.R. Luria)
- “convergence of different sensory domains in which properties of one modality get transferred into another” (S.L.Rubenshtein)



Types of synaesthesia



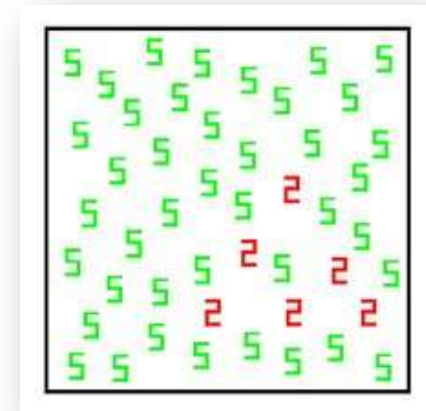
52 stimulus/reaction varieties



Methods of research



RED
BLUE



“A” of weathered wood

"The long 'a' of the English alphabet . . . has for me the tint of weathered wood, but a French 'a' evokes polished ebony.

Since a subtle interaction exists between sound and shape, I see 'q' as browner than 'k', while 's' is not the light blue of 'c', but a curious mixture of azure and mother-of-pearl."



Vladimir Nabokov





"When I see equations, I see the letters in colors – I don't know why. As I'm talking, I see vague pictures of Bessel functions, with light-tan j's, slightly violet-bluish n's, and dark brown x's flying around. And I wonder what the hell it must look like to the students."

-Richard Feynman

n + X = yellow

Genetics?



- Occurrence of 4/100
- Polygenetic inheritance
- Sibling / parents variations
- “Silent” generations

What synaesthesia is *NOT*

Memorised associations

Overactive imagination

Extrasensory perception

Pathological symptom

Associations or memories

What synaesthesia is *NOT*

~~Memorised associations~~

~~Overactive imagination~~

~~Extrasensory perception~~

~~Pathological symptom~~

~~Associations or memories~~

What synaesthesia IS

- Uncritical and involuntary
- Inherited
- Endogenous
- Categorically selective

Controversy-in-experience



A human brain is shown in the center, with the text "NATURE VS NURTURE" overlaid. The background is a blurred image of a typewriter keyboard. The text "NATURE" is on the left, "VS" is in a red circle in the center, and "NURTURE" is on the right.

NATURE VS NURTURE

Cultural perspective

- Culture-driven reconfiguration of brain plasticity
- Formation of sensory standards
- Distinct variations of sensoria across cultures
- Different culture – different synaesthesia



Mohawk colour system



kahtn:tsi



kenra:ken



yo'kin:rare



athehsa



onekwenhtara



otsinekwar



ortn:ya



ohonte



oharenahta

Sensoria: cultural calibration of the senses

- Anlo-Ewe – bodily intuition (seselelame)
- M'buti – depth/distance invariance
- Mohawks – heights resilience
- Desana – colour symbolism
- Hopi – vibrations



Symbolic categories

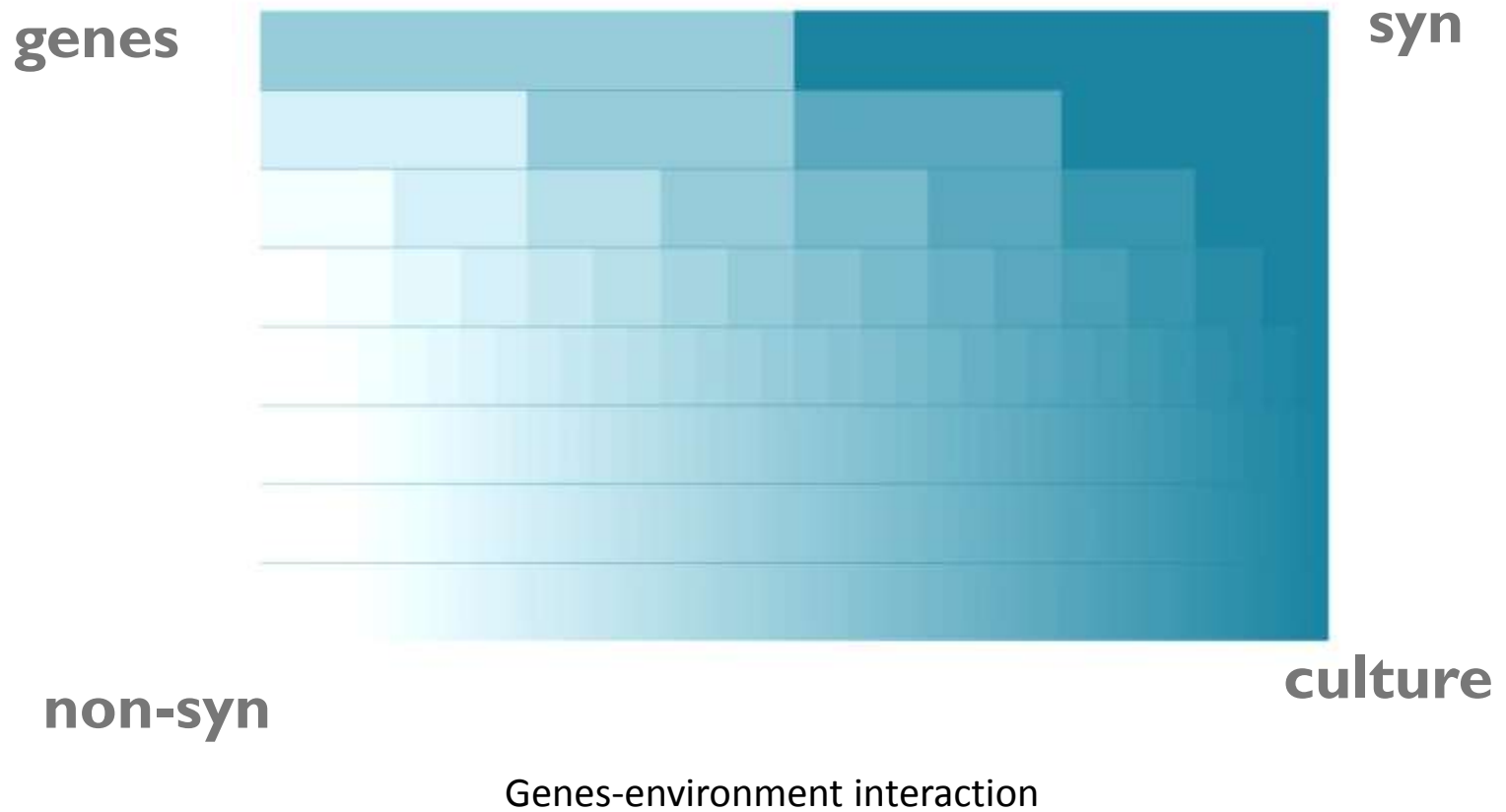


Different culture – different synaesthesia



- Different categories of stimuli
- Different sensory reactions

Epigenetic scenarios



Nature vs Nurture



Obligate

Selective

Plastic

Facilitative

Discriminating

Reactive

Applicable domains



- Numerical notions
- Body scheme
- Literacy skills
- Emotion and interoception
- Empathy, social cognition
- Concepts of time, place
- Human speech
- Musicality, etc.



Updated definition

Developmental synaesthesia is a non-pathological condition in which perceiving or merely thinking of *a category-based unit - notion, sign, name, sensory standard* (letters or phonemes, numbers, music, abstract nouns, etc) - triggers an additional, statistically atypical, pseudo-sensory property (colour, taste, haptic effects, etc) on a consistent, involuntary and consciously impenetrable basis.



Hypothetical framework

Developmental synaesthesia is a phenomenological manifestation of a psychological system.

This system is a top-down formation that instantiates ingrowth of a symbol set (of primary signs or proto-semiotic units) *within the sensory substrate*.

If we manipulate the notional system of synaesthesia – it will change its sensory aspects.

Experimental design

- 13 Russian-speaking people with synaesthesia (aged 18-44, F=12)
- Story reading (appr. 1800 words) and questions
- Diary completion: completion & find-and-pick
- Realistic calendar

Objective: introduce a novel notion of a non-existing weekday

Experimental sample

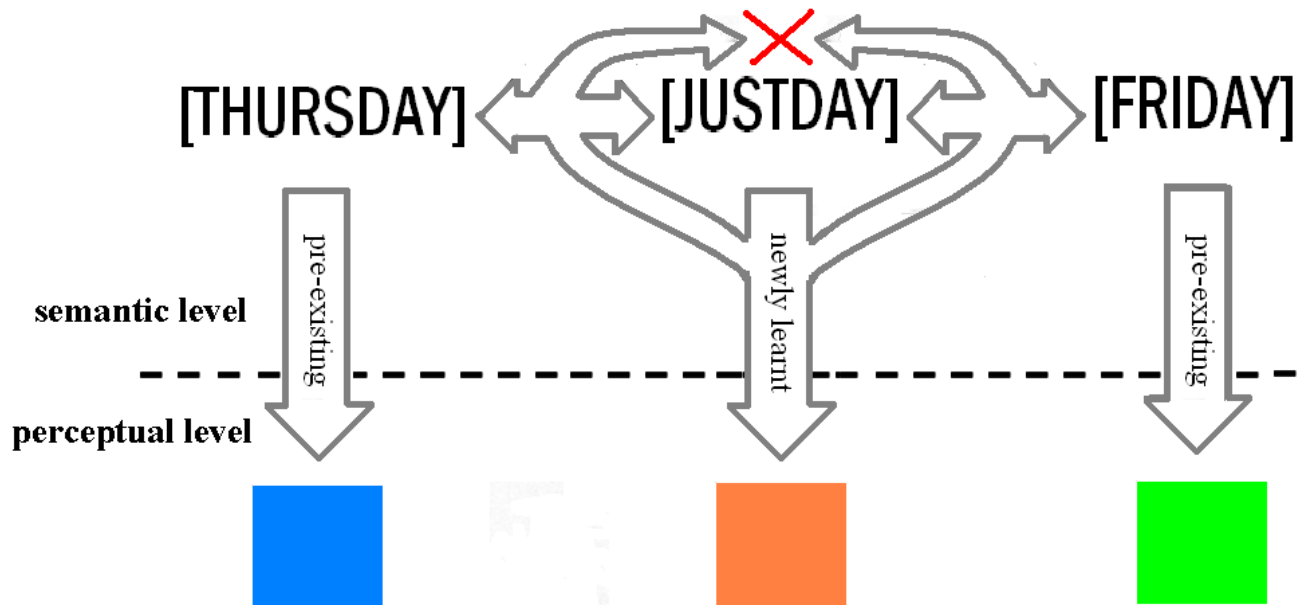
Понедельник	4	12	20	28	5	13	21	1	9	17	25	2	10	18	26
Вторник	5	13	21	29	6	14	22	2	10	18	26	3	11	19	27
Среда	6	14	22	30	7	15	23	3	11	19	27	4	12	20	28
Четверг	7	15	23	31	8	16	24	4	12	20	28	5	13	21	29
Справник	8	16	24		1	9	17	5	13	21	29	6	14	22	30
Пятница	1	9	17	25	2	10	18	6	14	22	30	7	15	23	
Суббота	2	10	18	26	3	11	19	7	15	23	31	8	16	24	
Воскресенье	3	11	19	27	4	12	20	8	16	24		1	9	17	25

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Experimental results

semantic extension => novel sensory experience
t = 15-20 mins





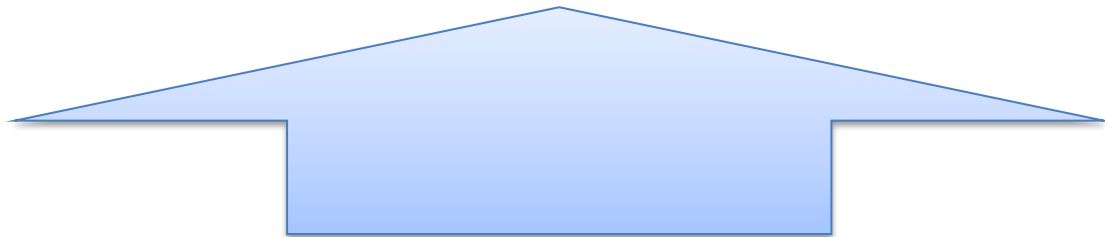
within appr 15 mins

Conclusions

- Synaesthesia is primarily conceptual or semantically mediated
- Conceptual development *directly and measurably* leads to generation of novel sensory experience
- Neurobiological constraints (time and colour of reaction)

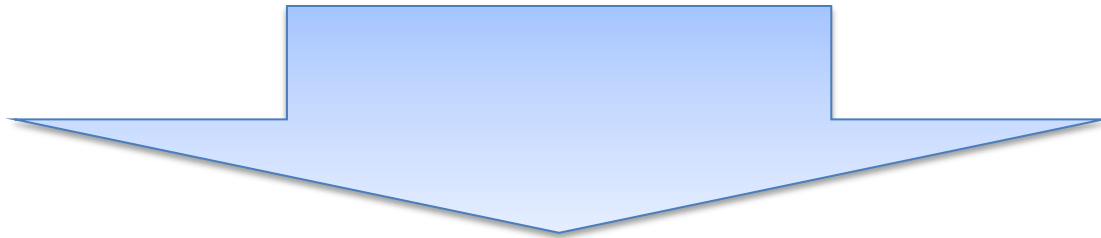
CHT for synaesthesia

- Clarify the specific character of synaesthesia categories (in different synaesthesia types).
- Delineate the influence of experience and learning that might trigger development of synaesthesia.
- Find out what determines or reinforces the sense-modality of synaesthetic reactions.
- Understand the semantic-sensory integration through experience-dependent mediation of the senses.



Synaesthesia for CHT

- Are stimuli of different synaesthesia types based in the same mechanisms?
- What criteria determine the difference between and primacy of the sensor and notional?
- Why do we consider language unique as means of mediation with all other artifacts around?



Major implications

- The notional system also embraces the sensory domain (it is not just the higher level)
- The system can be traced down to identifiable neurobiological constraints.

The image features two large, stylized human figures made of a dense, intricate pattern of letters, numbers, and symbols. They are positioned on either side of the center, facing each other. The background is a sunset or sunrise sky with a gradient from blue at the top to orange and yellow near the horizon. The overall composition is balanced and visually striking.

Thank you!

synaesthesia.ru

Presentation slides include sculptures and installations by J.Plensa