

NEURON
POWER

FAB ELEVEN

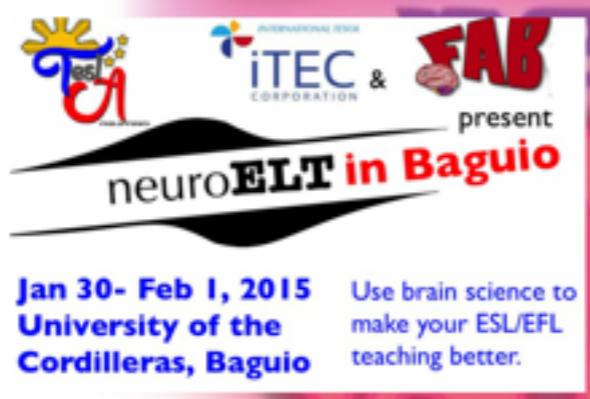
neuroscience

NAT NOTES

ENHANCING LANGUAGE TEACHING



2016
MACAU
NeuroELT
International Conference of Neuroscience and Language Teaching



International Conference of Neuroscience and Language Teaching



Change your perspective...



JALIT

THE JAPAN ASSOCIATION FOR LANGUAGE TEACHING
全国語学教育学会

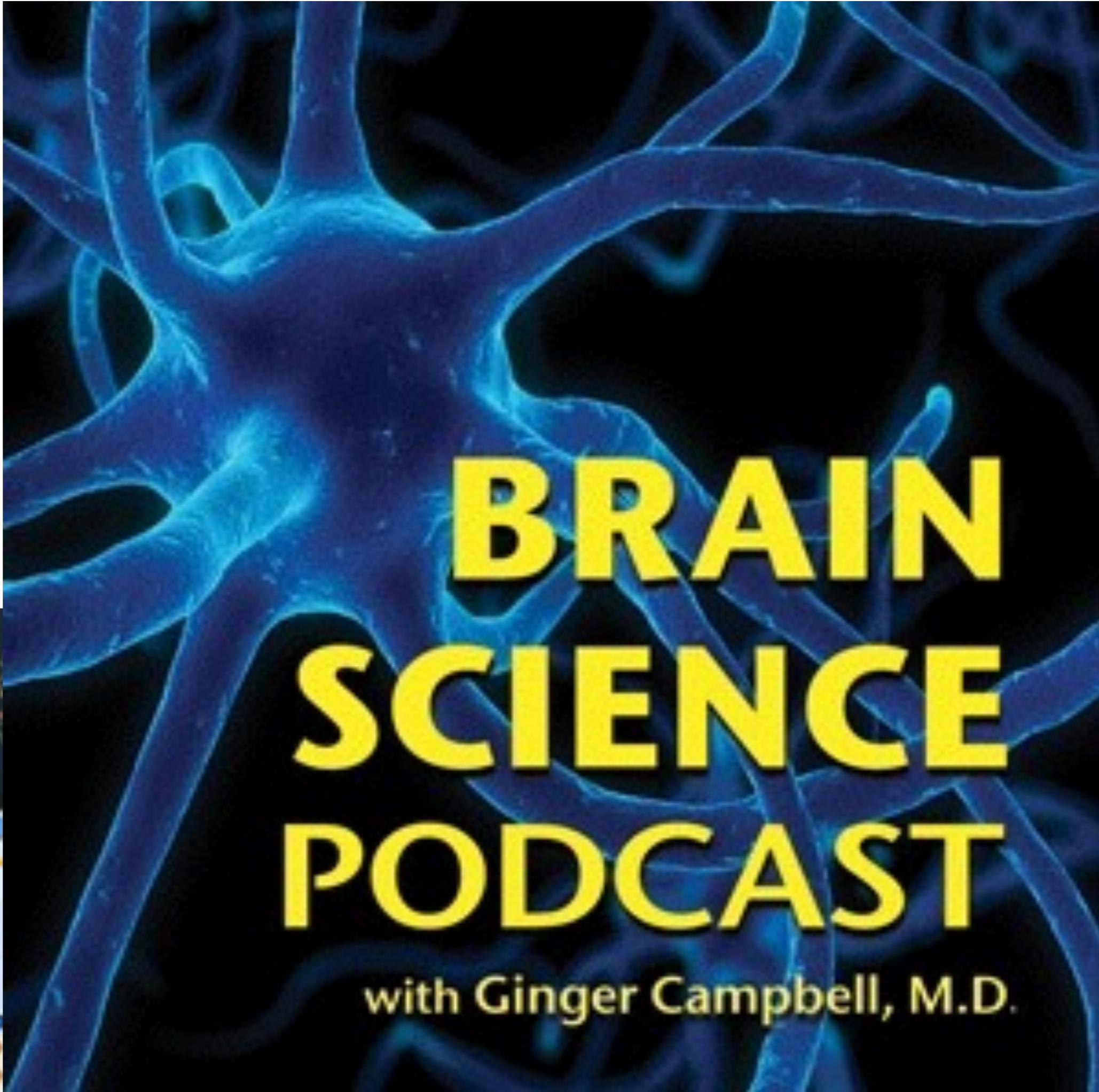
NEURON
POWER

FAB ELEVEN

neuroscience

NAT NOTES

ENHANCING LANGUAGE TEACHING



BRAIN SCIENCE PODCAST

with Ginger Campbell, M.D.



**Have you ever
been to Tokyo?**



Harvard Graduate School of Education

Dr. Kurt Fischer



Mind, Brain, and Education
Program



Harvard Graduate School of Education

Dr. Kurt Fischer



Mind, Brain, and Education
Program

DYNAMIC SKILL THEORY



Harvard Graduate School of Education

Dr. Kurt Fischer



Mind, Brain, and Education
Program



DYNAMIC SKILL THEORY

What Neuroscience Tells Us about Language Learning

Curtis Kelly & Robert Murphy



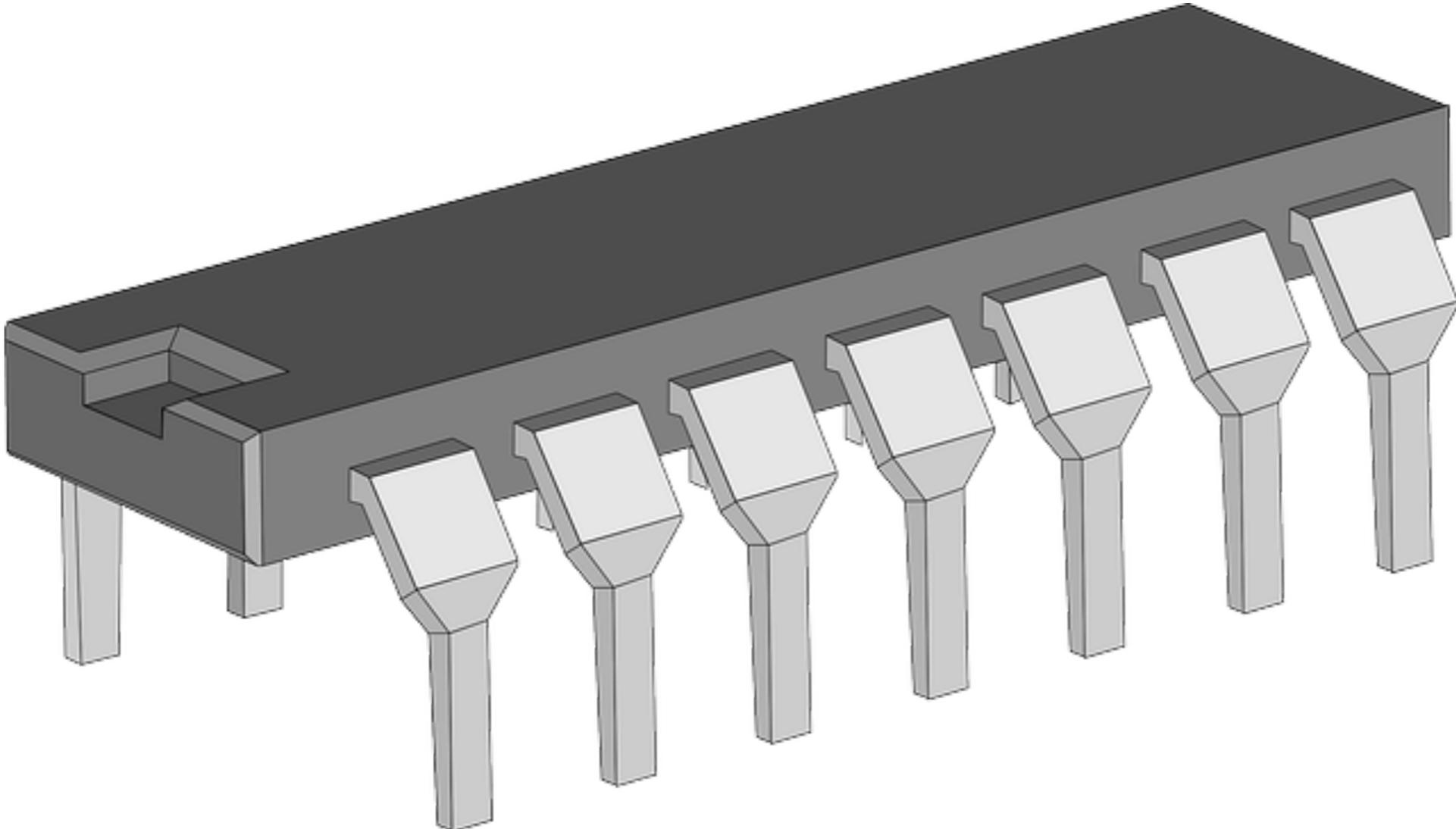
Intro

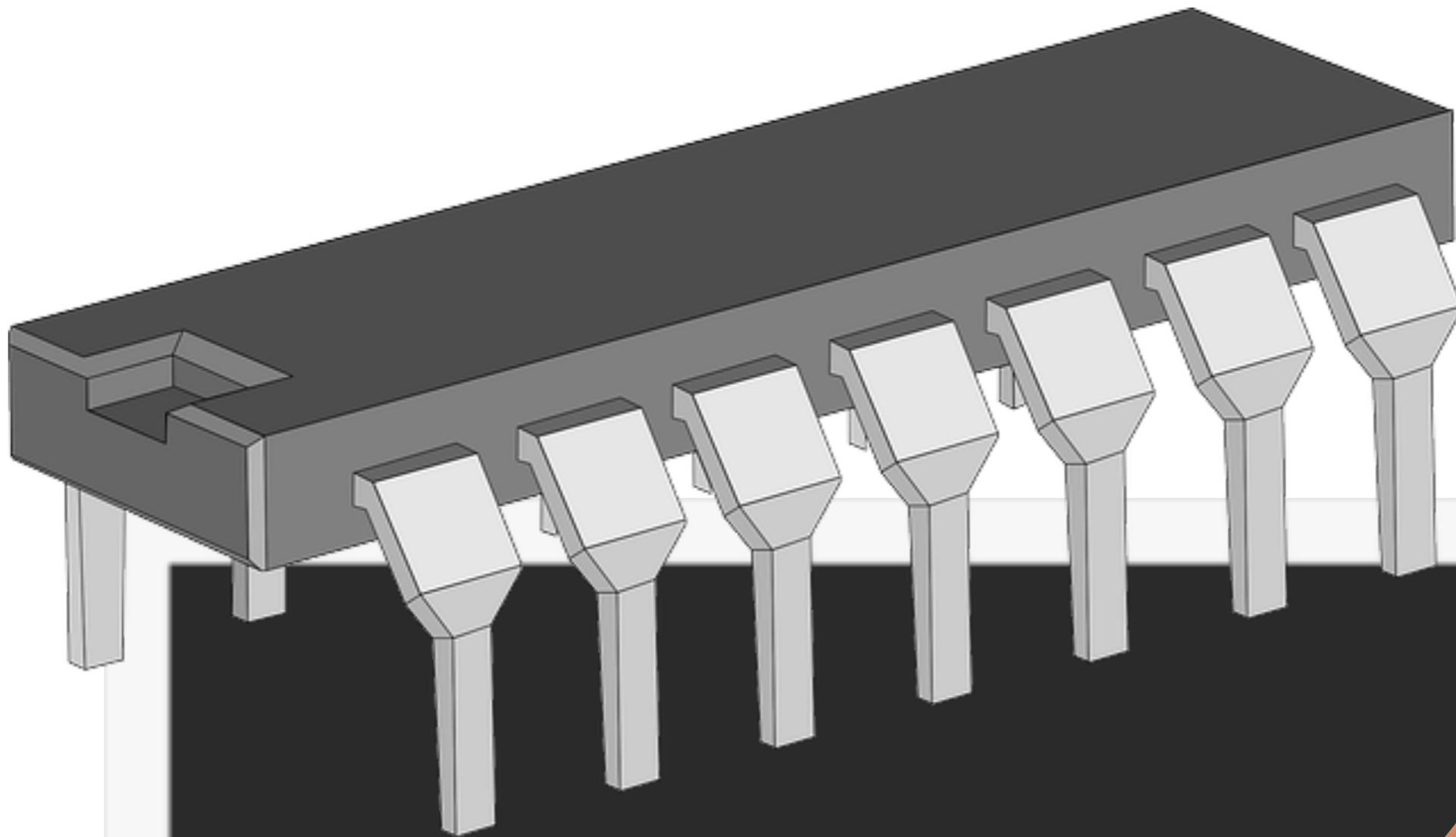


HOLY

**NO COUCHES
IN KOREA**

KEVIN M MAHER





You



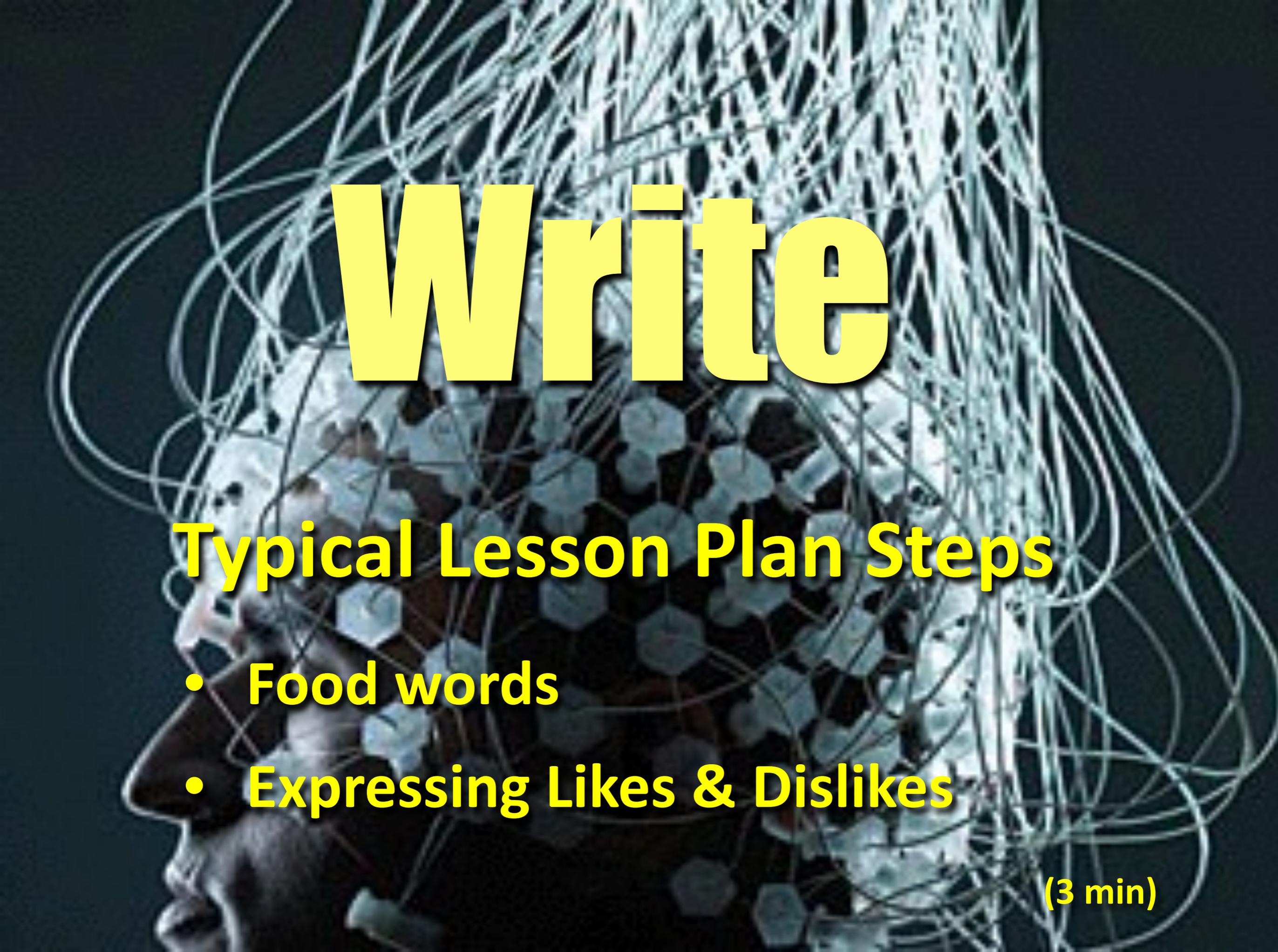
Different from abstracts

Different from abstracts

Why?

PPP

Lesson

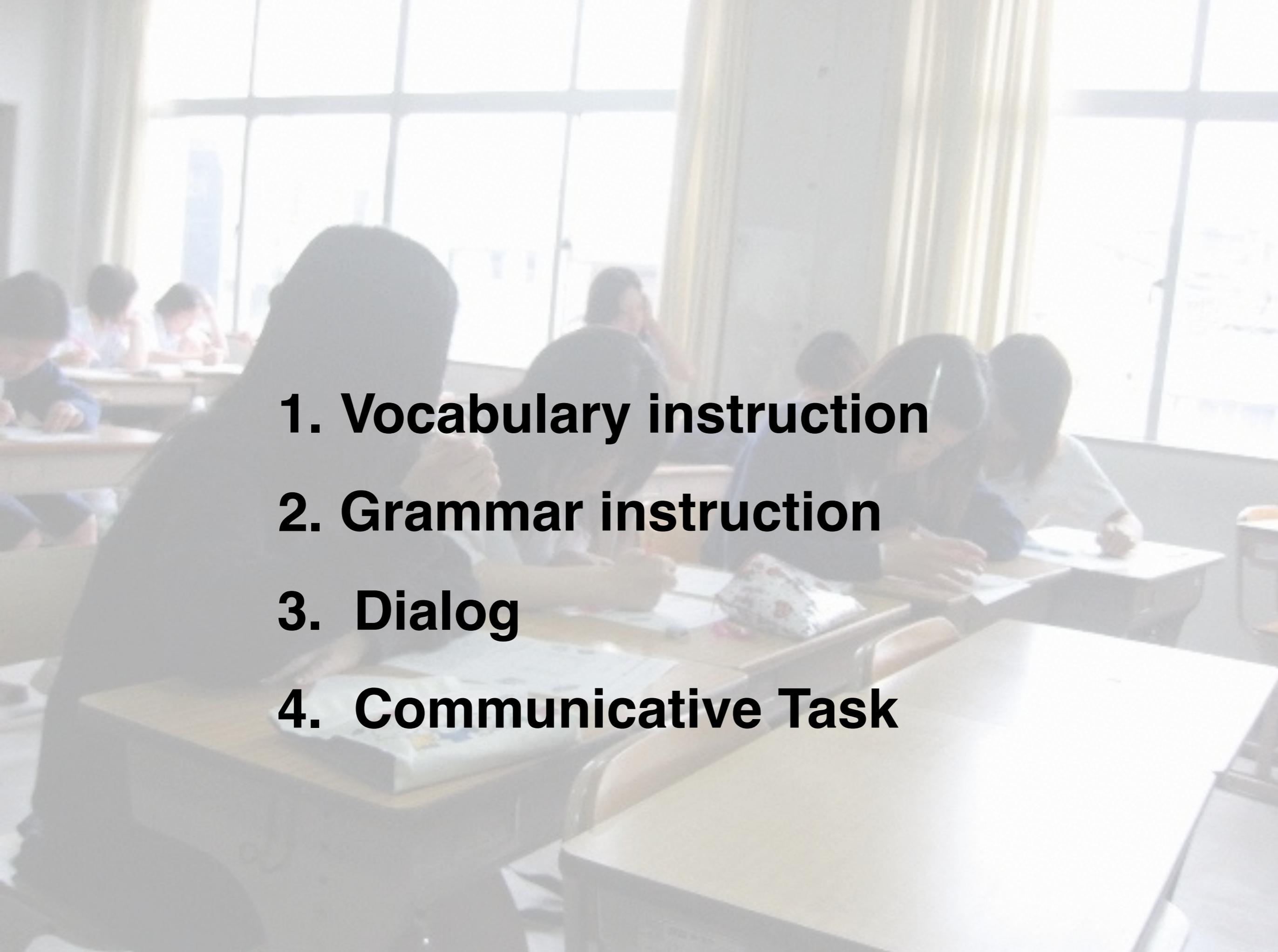


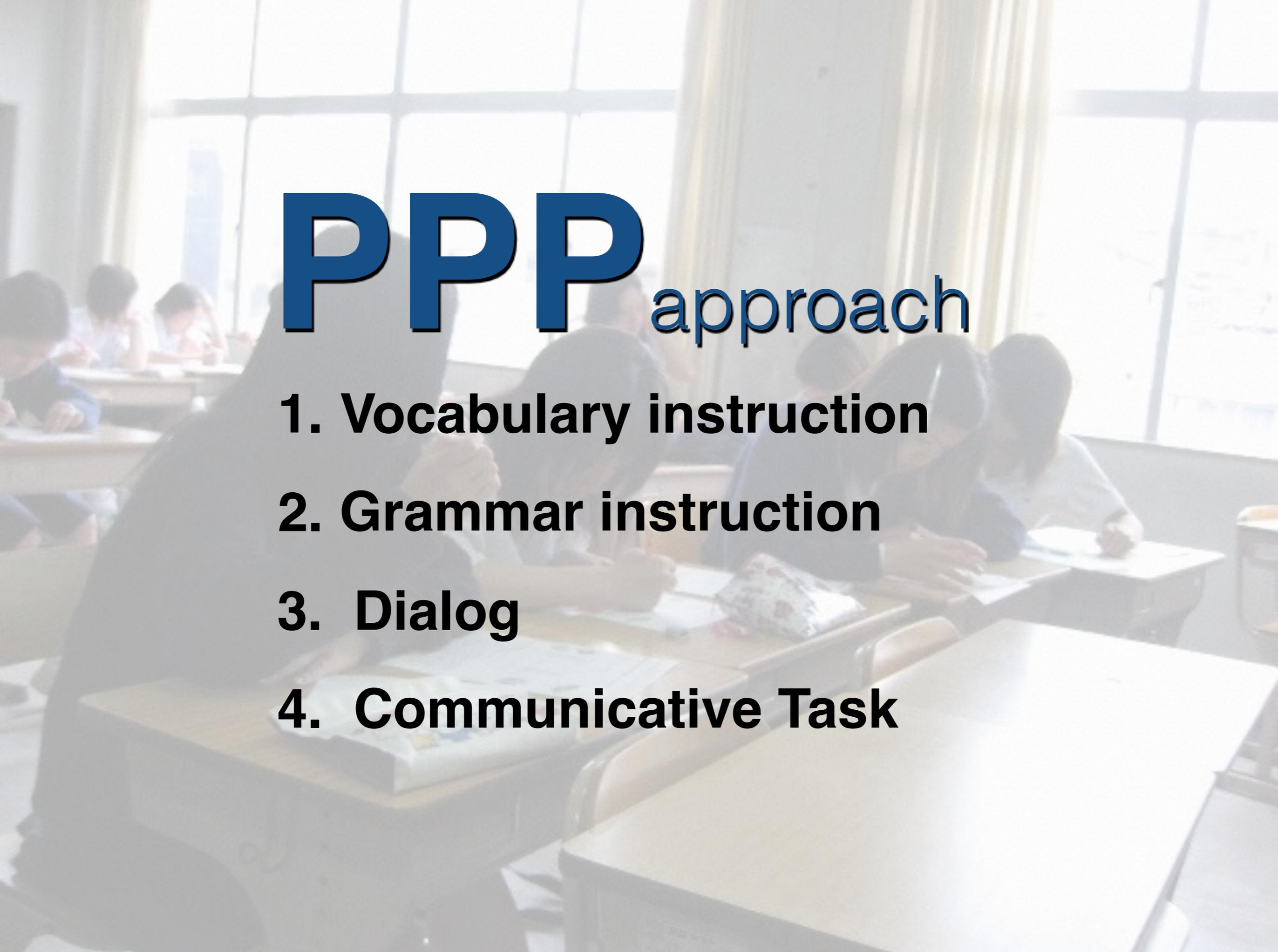
Write

Typical Lesson Plan Steps

- Food words
- Expressing Likes & Dislikes

(3 min)

- 
- A classroom scene with students at desks and a teacher in the foreground. The teacher is wearing a black hijab and is looking down at a book or paper on the desk. The students are also looking down at their papers. The classroom has large windows in the background, and the lighting is bright. The text is overlaid on the image in a bold, black font.
- 1. Vocabulary instruction**
 - 2. Grammar instruction**
 - 3. Dialog**
 - 4. Communicative Task**



PPP approach

- 1. Vocabulary instruction**
- 2. Grammar instruction**
- 3. Dialog**
- 4. Communicative Task**

PPP approach

1. Vocabulary instruction
2. Grammar instruction *Present*
3. Dialog
4. Communicative Task

PPP approach

1. Vocabulary instruction

2. Grammar instruction

3. Dialog

4. Communicative Task

Present

Practice

PPP approach

1. Vocabulary instruction

2. Grammar instruction

3. Dialog

4. Communicative Task

Present

Practice

Perform

- 「時」や「場所」などのたずね方と答え方に注意しましょう。

Pay attention to ways of asking and answering questions of time and place.

確かめよう

Check

when
「いつ」

When can you see fireworks?— We can see them **in summer**.

where
「どこ」

Where is my bag?— It is **under the desk**.

who
「だれ」

Who is Bill?— He is **my brother**.

whose
「だれの
(もの)」

Whose bag is this?— It is **mine**.

Whose is this bag?— It is **mine**.

新しい意味の語

whose だれのもの
[既習：だれの(p.68)]

what
「何(の)」

What is this?— It is **a bird**.

What do you do after school?— I play **tennis**.

What sports do you like?— I like **soccer**.

how
「どう、
どのように
して」

How is the weather?— It is **sunny**.

How do you come to school?— I come **by bus**.

which
「どの」

Which bus goes to City Hall?— Take **Bus No. 3**.

how ...
「どの
くらい…」

How many CDs do you have?— I have **five**.

How long does it take?— It takes about **fifteen minutes**.

How old are you?— I am **thirteen years old**.

やってみよう

Let's Try

_____に適切な語を入れて、次の対話文を完成しましょう。

Complete the dialogs by putting suitable words into the _____.

(1) A: When does Ken study math?

B: He studies math after dinner.

(2) A: Whose camera is this?

B: It's my father's.

(3) A: What does he have for breakfast?

B: He has cereal for breakfast.

(4) A: Where is your dog?

Wh- questions

● 疑問詞ではじまる疑問文 ●

疑問詞は文のはじめに置きます。

疑問詞ではじまる疑問文には

● 「時」や「場所」などのたずね方と答え方に注意しましょう。

Pay attention to ways of asking and answering questions of time and place.

確かめよう

Check

when
「いつ」

When can you see fireworks?— We can see them in summer.

where
「どこ」

Where is my bag?— It is under the desk.

who
「だれ」

Who is Bill?— He is my brother.

what
「なに」
「もの」

What is this?— It is a pen.
What is that?— It is a book.

how
「どう」

How do you go to school?— I go by bus.

how
「どう、
どのように
して」

How is the weather?— It is sunny.

How do you come to school?— I come by bus.

which
「どの」

Which bus goes to City Hall?— Take Bus No. 3.

how ...
「どの
くらい...」

How many CDs do you have?— I have five.

How long does it take?— It takes about fifteen minutes.

How old are you?— I am thirteen years old.

やってみよう

Let's Try

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Wh- questions

● 疑問詞ではじまる疑問文 ●

疑問詞は文のはじめに置きます。

疑問詞ではじまる疑問文には

Language

● 「時」や「場所」などのたずね方と答え方に注意しましょう。

Pay attention to ways of asking and answering questions of time and place.

確かめよう

Check

when [いつ] **When** can you see fireworks?— We can see them **in summer**.

where [どこ] **Where** is my bag?— It is **under the desk**.

who [だれ] **Who** is Bill?— He is **my brother**.

what [なに] **What** is this?— It is **my bag**.
what [なに] **What** is this?— It is **my bag**.

what [なに] **What** do you like?— I like **soccer**.
what [なに] **What** do you like?— I like **soccer**.

how [どう, どのようにして] **How** is the weather?— It is **sunny**.

how [どう, どのようにして] **How** do you come to school?— I come **by bus**.

which [どの] **Which** bus goes to City Hall?— Take **Bus No. 3**.

how ... [どのくらい...] **How many** CDs do you have?— I have **five**.

how ... [どのくらい...] **How long** does it take?— It takes about **fifteen minutes**.

how ... [どのくらい...] **How old** are you?— I am **thirteen years old**.

やってみよう

Let's Try

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(3) A: What does he have for breakfast?

B: He has cereal for breakfast.

(4) A: Where is your dog?

Wh- questions

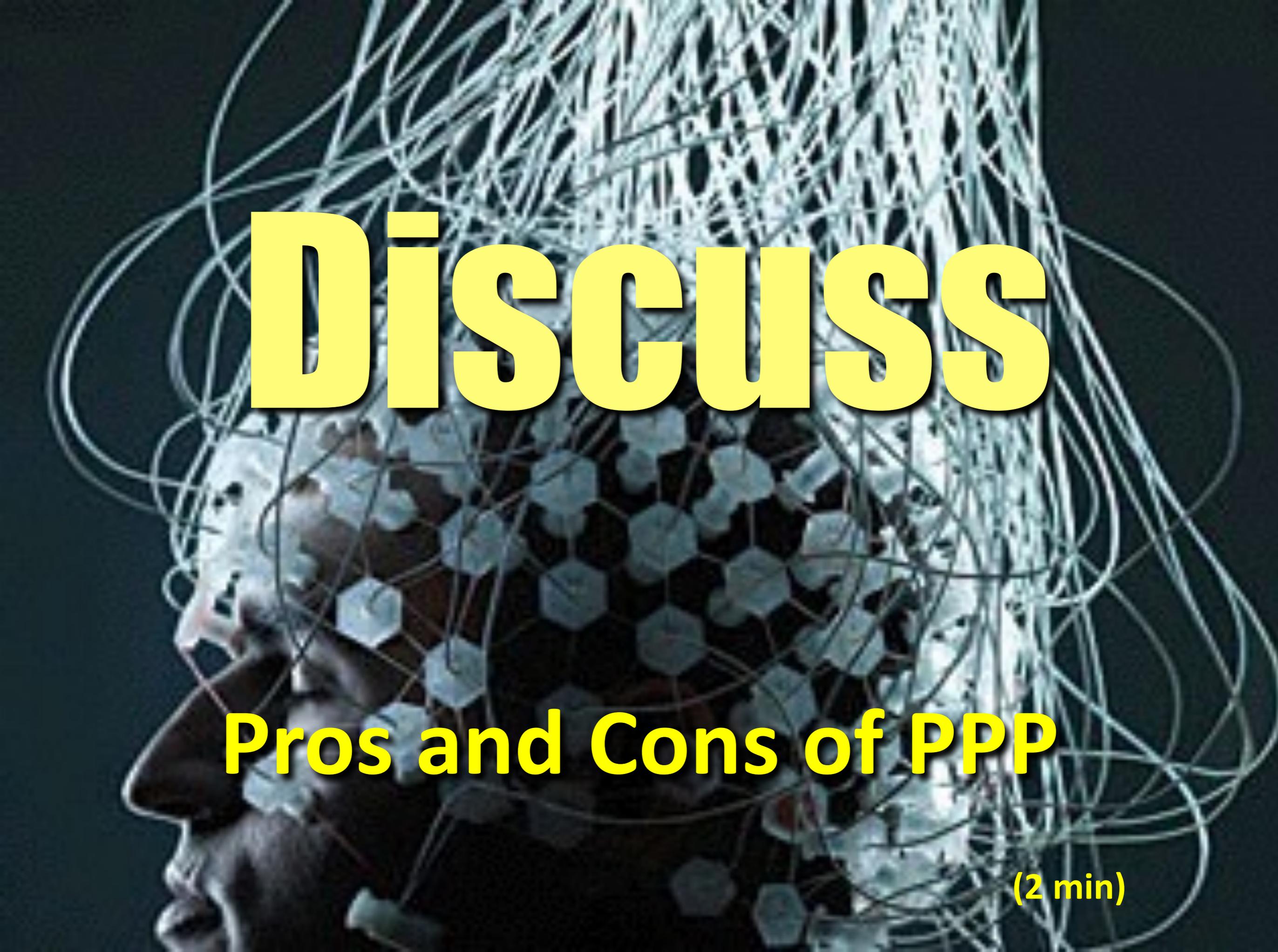
● 疑問詞ではじまる疑問文 ●

疑問詞は文のはじめに置きます。

疑問詞ではじまる疑問文には

Language

Learning



Discuss

Pros and Cons of PPP

(2 min)

Brains Evolved for...?



Daniel Wolpert



JULY 2011

EDINBURGH SCOTLAND

Daniel Wolpert



JULY 2011

EDINBURGH SCOTLAND

Brains Evolved to...



**20
minutes**



**20
minutes**



**20
minutes**

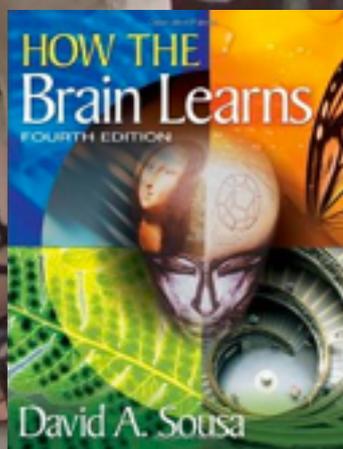


1 minute

+15%



David A. Sousa
How the Brain Learns



A graphic illustration with a blue and black color scheme. In the background, there is a glowing globe with a grid pattern, emitting bright light rays. The foreground features silhouettes of several people in dynamic, energetic poses, suggesting movement and activity. A prominent yellow banner with rounded corners is overlaid diagonally across the lower right portion of the image, containing the text 'Energy breakthrough' in a bold, pink, sans-serif font.

Energy breakthrough

Brains Evolved to...



We move muscles to...

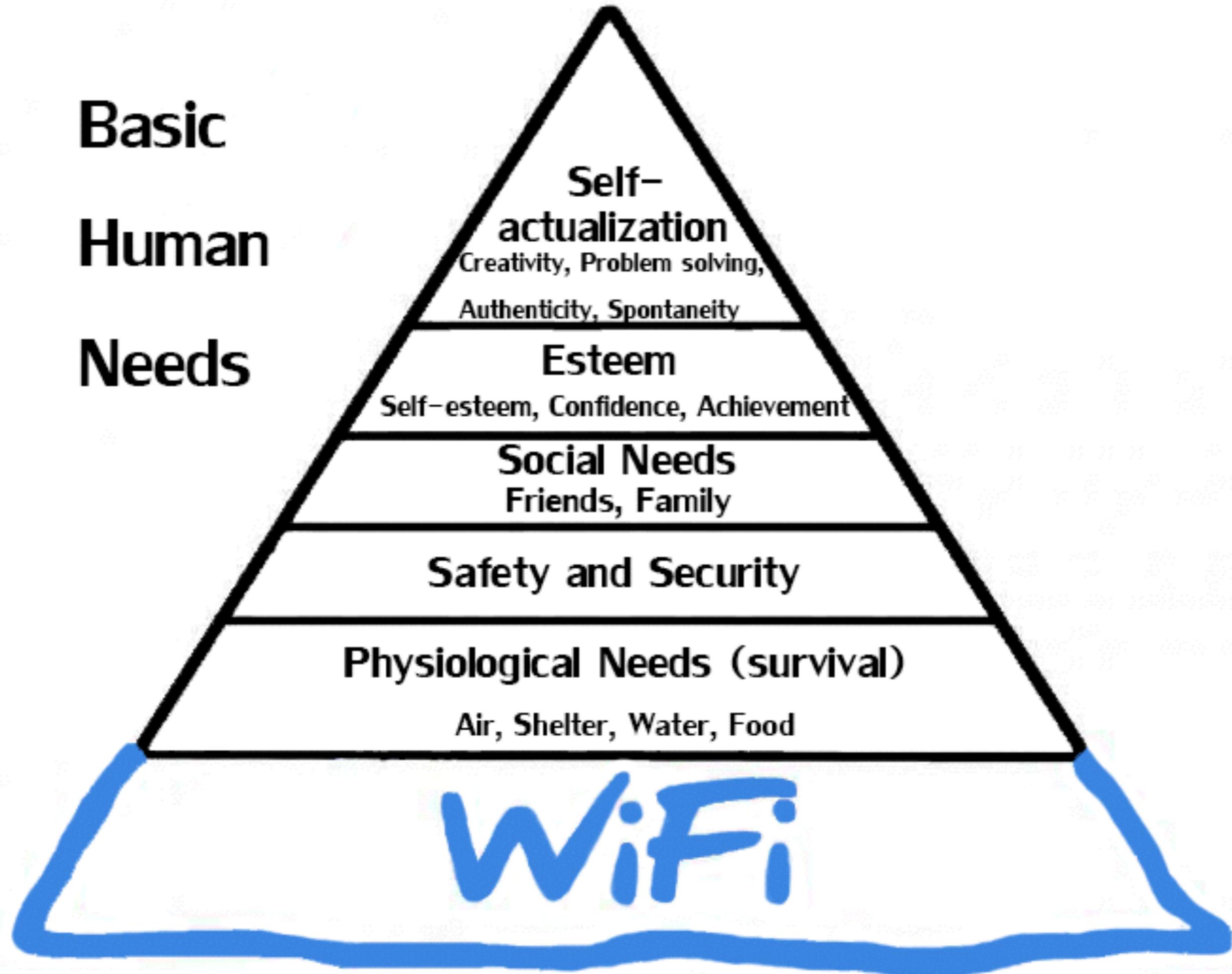


**Solve
Problems**

**Basic
Human
Needs**



**Basic
Human
Needs**



WiFi

Solving Problems

It is very good at...

Predicting

Deciding

Socializing



PPP



A photograph of a classroom with several students sitting at desks, working on papers. The room has large windows in the background. The text 'PPP' is overlaid in large blue letters, and 'is not problem-oriented' is overlaid in black letters below it.

PPP

is not
problem-oriented

Brains Evolved to...

Solve

Problems

NEURON
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NAT NOTESOL

ENHANCING LANGUAGE TEACHING

Asia-Pacific Regional Tax Conference

IFA

SEOUL - REPUBLIC OF KOREA



Brains Evolved to...

Solve

Problems

PPP

**Problem
involved?**

- 1. Vocabulary instruction**
- 2. Grammar instruction**
- 3. Dialog**
- 4. Communicative Task**

PPP

Problem
involved?

1. Vocabulary instruction

No

2. Grammar instruction

3. Dialog

4. Communicative Task

PPP

Problem
involved?

1. Vocabulary instruction

No

2. Grammar instruction

No

3. Dialog

4. Communicative Task

PPP

Problem
involved?

1. Vocabulary instruction

No

2. Grammar instruction

No

3. Dialog

No

4. Communicative Task

PPP

Problem
involved?

1. Vocabulary instruction

No

2. Grammar instruction

No

3. Dialog

No

4. Communicative Task

Yes!

PPP

Problem
involved?

1. Vocabulary instruction

No

2. Grammar instruction

No

3. Dialog

No

4. Communicative Task

Yes!

Teachable Moment

PPP

Problem
involved?

1

ction

No

Not brain
compatible

No

No

4. Co

Yes!

Teachable Moment

Discuss

PPP

1. Vocabulary instruction
2. Grammar instruction
3. Dialog
4. Communicative Task

Make it problem-solving oriented!?

(2 min, standing)

PPP Changes

PPP Changes

1. personalization

PPP Changes

- 1. personalization**
- 2. change the order**

PPP Changes

- 1. personalization**
- 2. change the order**
- 3. combine parts**

PPP Changes

- 1. personalization**
- 2. change the order**
- 3. combine parts**
- 4. *“It’ll be on the test!”***

Lecture on

RAS & Emotion







RAS

reticular activating system

- 1) personal relevance
- 2) recent thinking
- 3) Novelty



RAS

reticular activating system

- 1) personal relevance
- 2) recent thinking
- 3) Novelty



RAS

reticular activating system

- 1) personal relevance
- 2) recent thinking
- 3) Novelty



RAS

reticular activating system

- 1) personal relevance
- 2) recent thinking
- 3) Novelty



Novelty



Novelty



Novelty



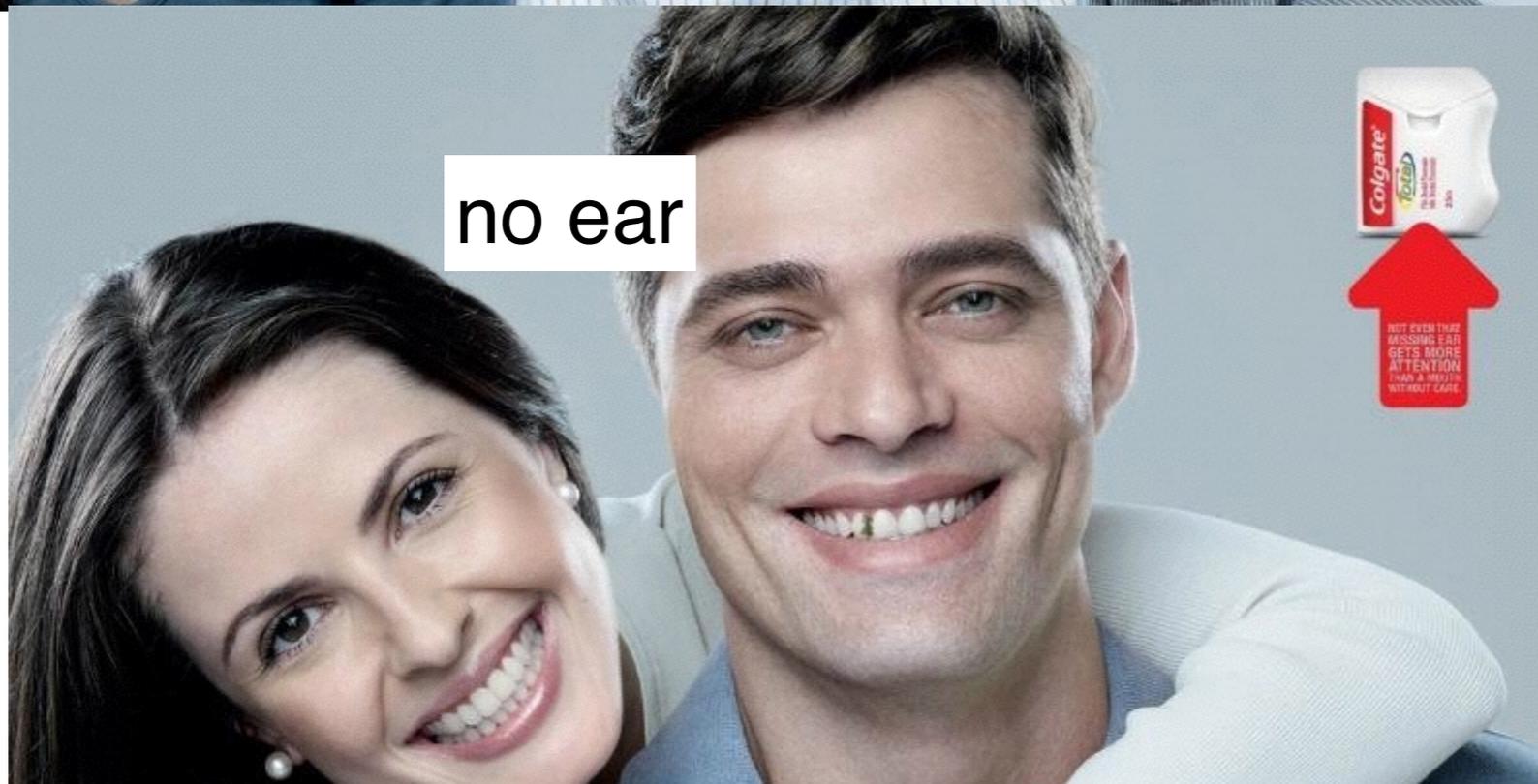
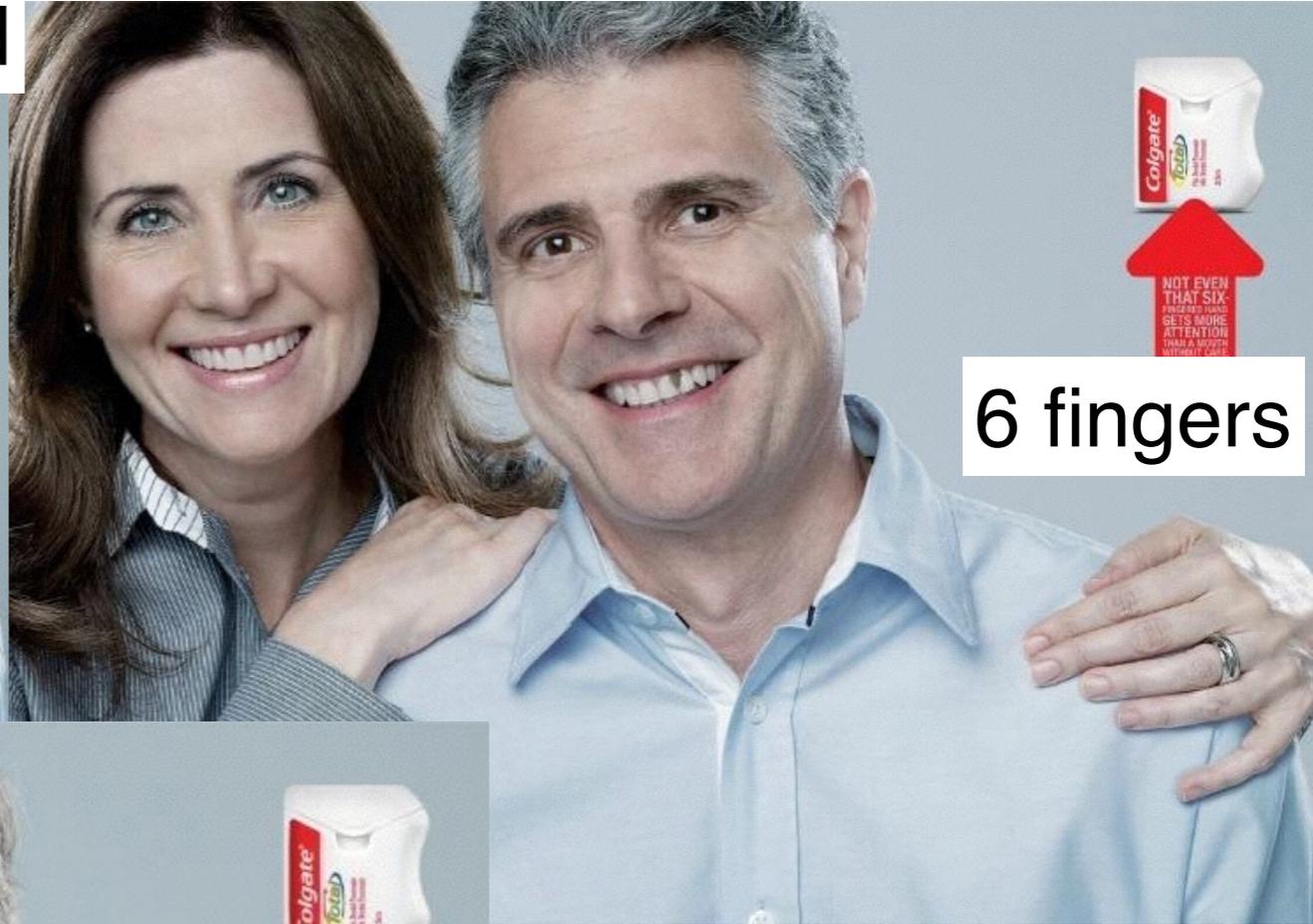
Novelty

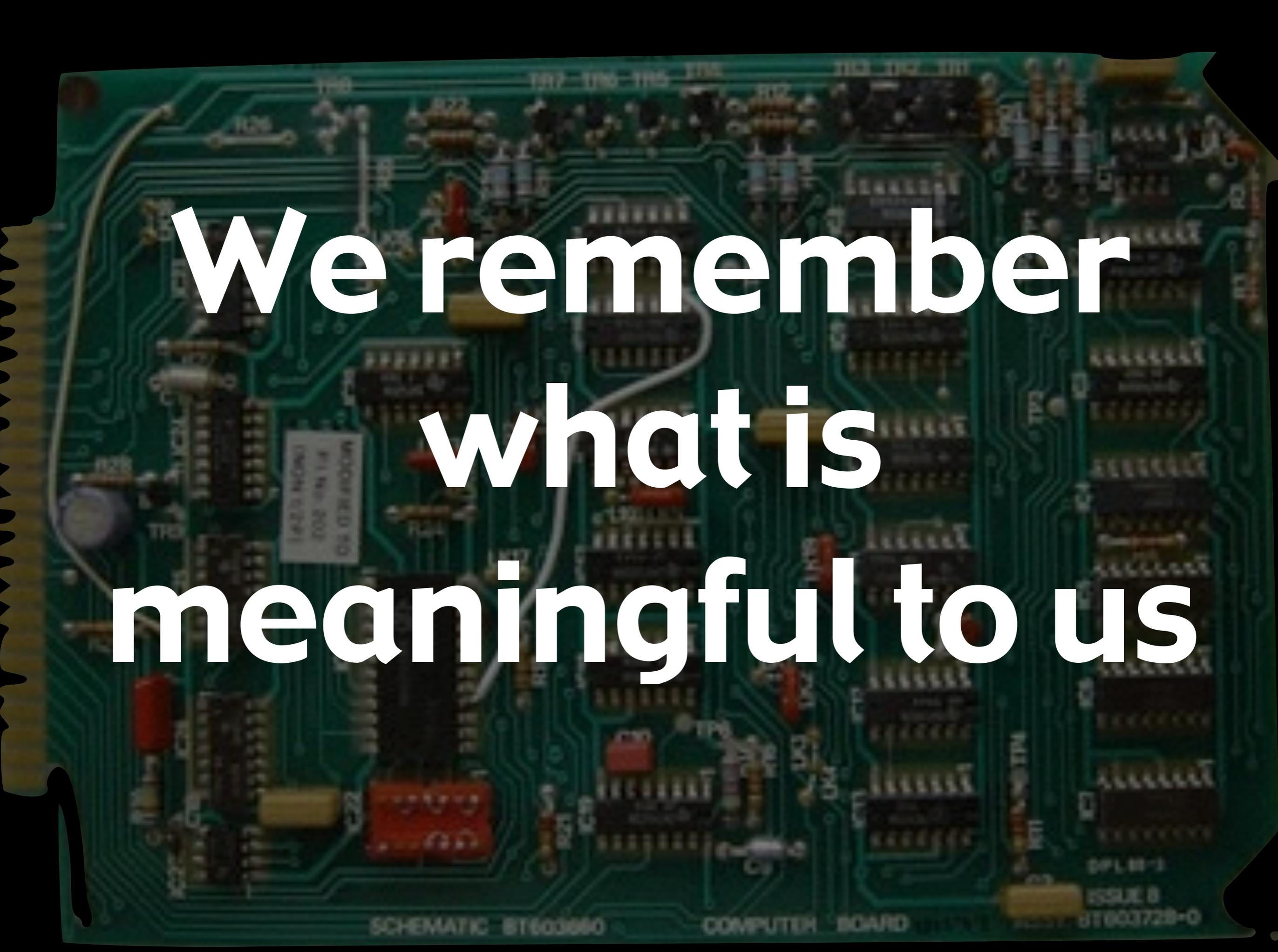
**Did you notice
anything novel?**

Novelty



Novelty





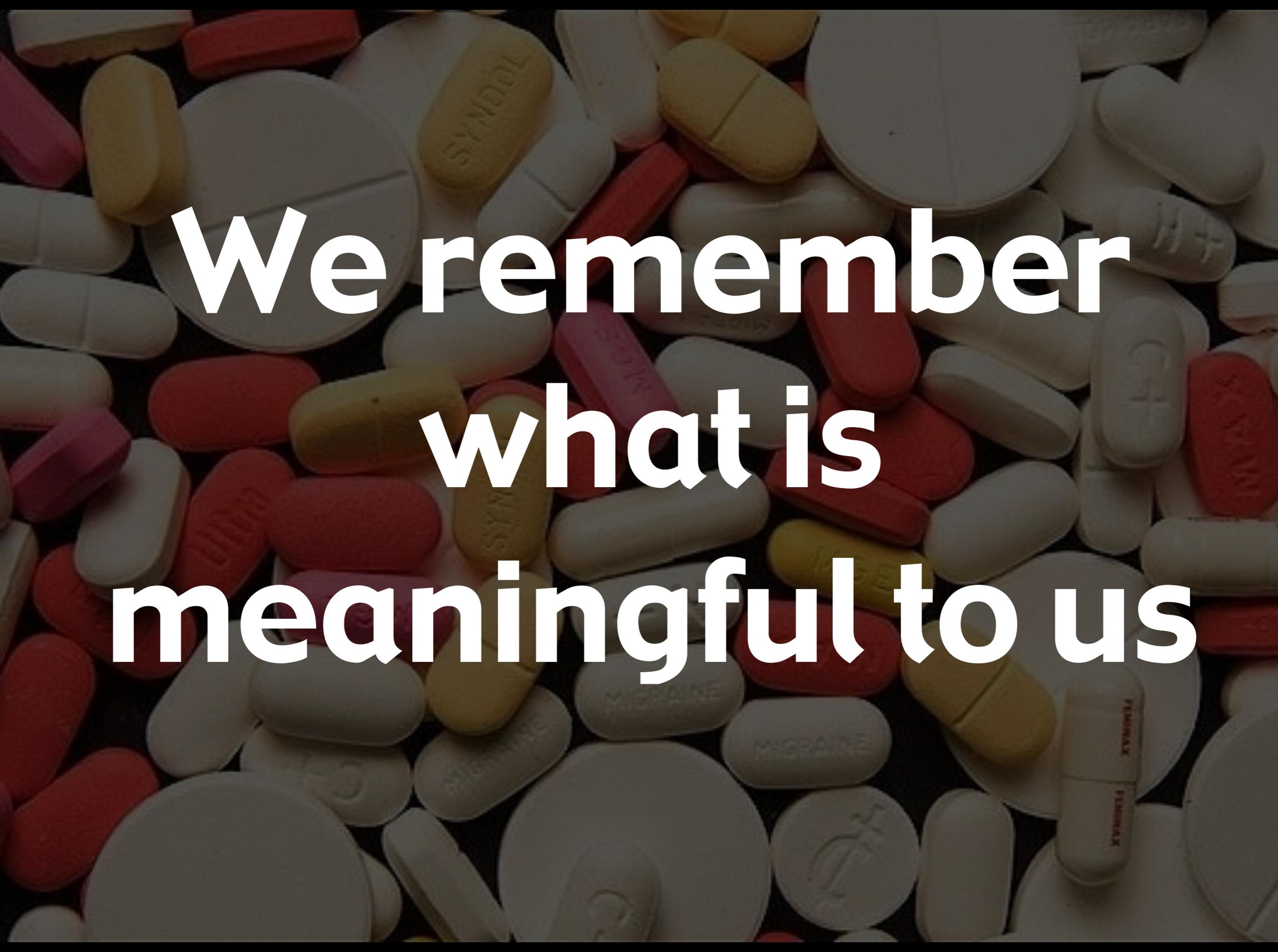
**We remember
what is
meaningful to us**

SCHMATIC BT603660

COMPUTER BOARD

DPL 88-3
ISSUE B
BT603728-0

**We remember
what is
meaningful to us**



**We remember
what is
meaningful to us**

RAS

reticular activating system

Relevance for teachers?

- 1) personal relevance
- 2) recent thinking
- 3) Novelty



RAS

reticular activating system

Relevance for teachers?

- 1) personal relevance
- 2) recent thinking
- 3) Novelty



Discuss

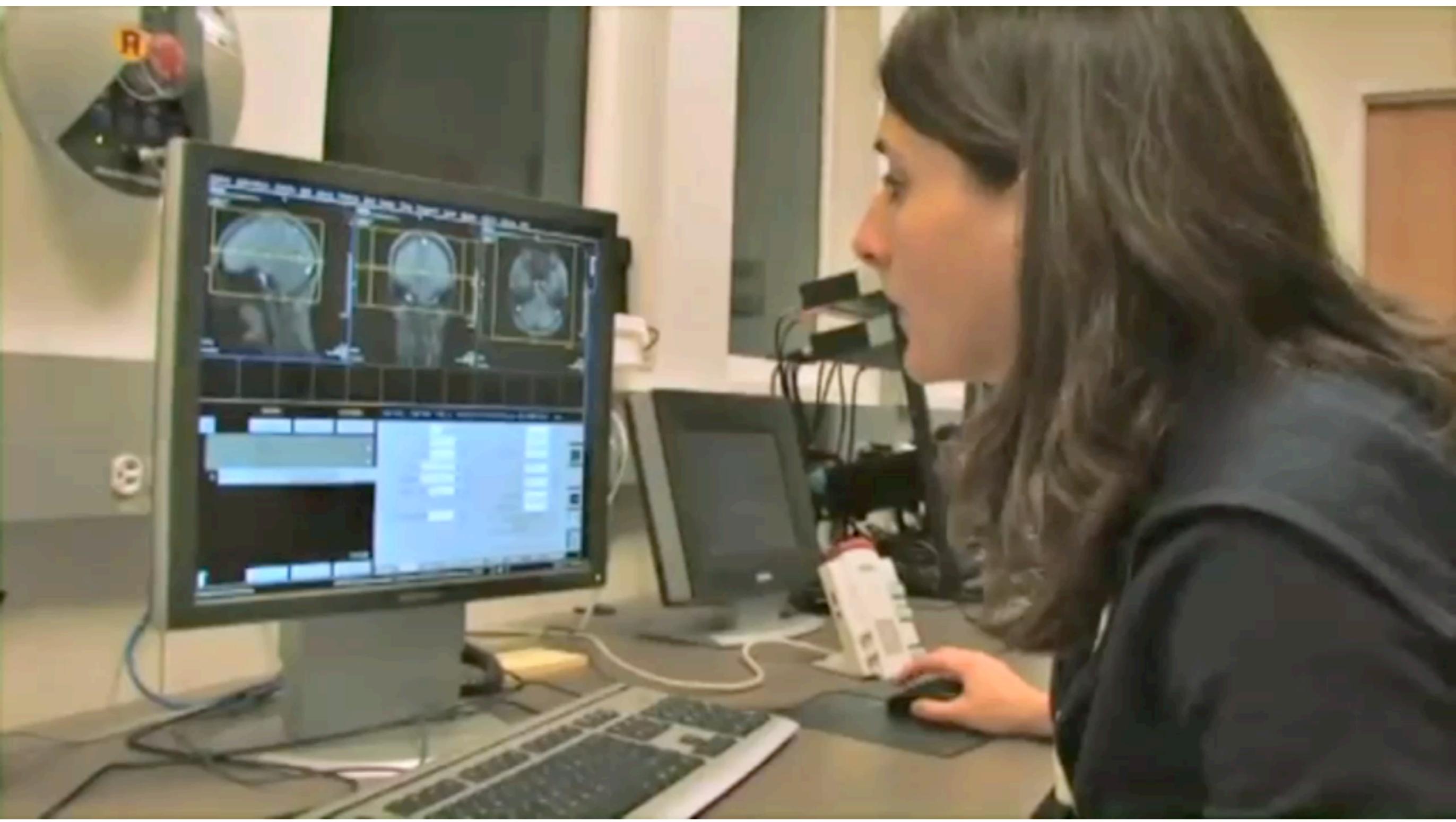
RAS filters in:

- 1) personal relevance
- 2) recent thinking
- 3) novelty

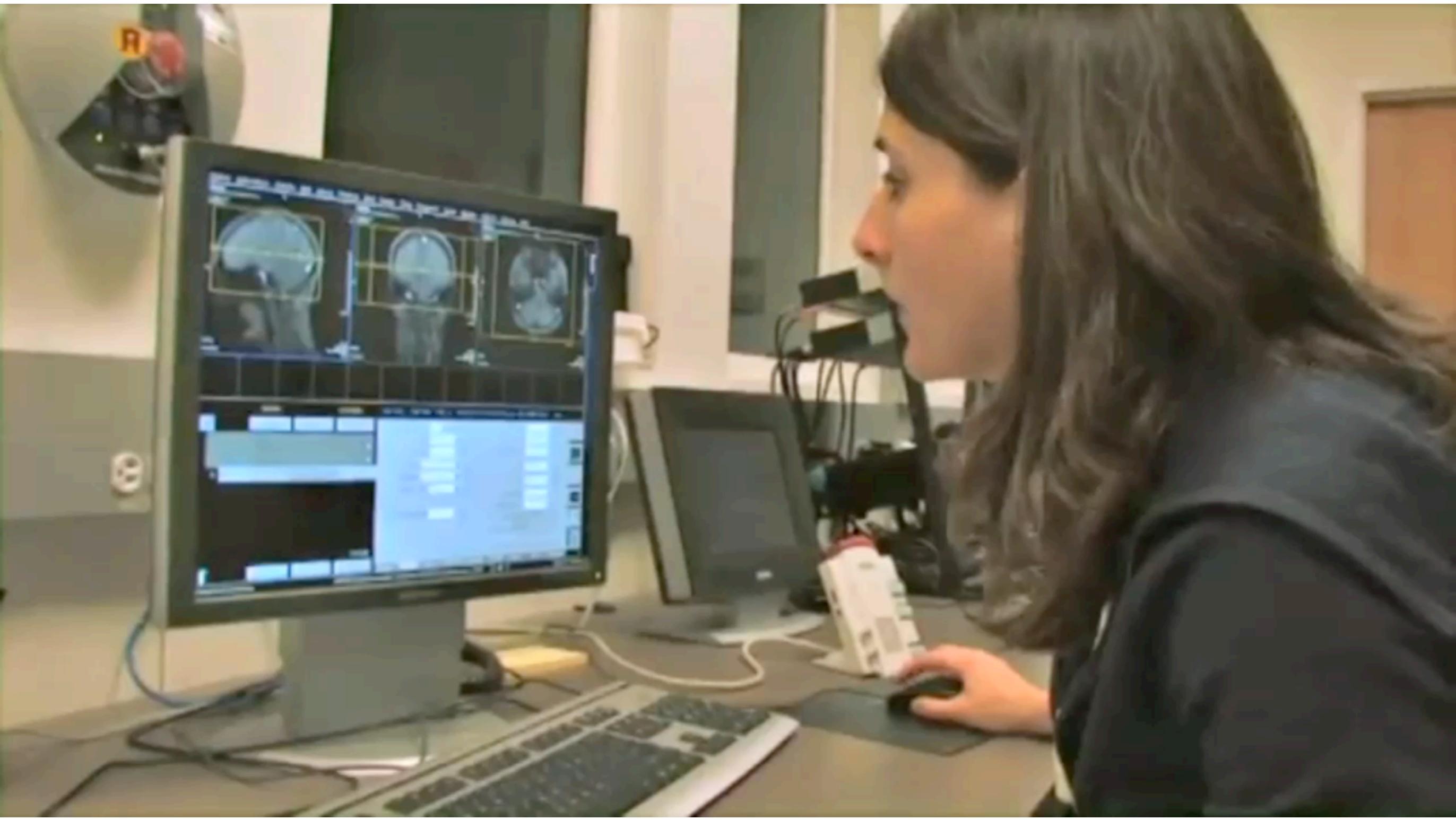
-Relevance for teachers?

(2 min, standing)

Learning requires emotion



Learning requires emotion



No emotion, no learning



Damasio



Immordino-Yang

No emotion, no learning

“Emotion...heightens one’s propensity to engage with the material in readiness for learning.”



Damasio



Immordino-Yang

Emotions are not the same as feelings



Damasio



Immordino-Yang

Emotions are not the same as feelings

Feelings are love, hate, fear, disgust, thirst, etc,



Damasio



Immordino-Yang

Emotions are not the same as feelings

Feelings are love, hate, fear, disgust, thirst, etc,
-our interpretations of emotions



Damasio



Immordino-Yang

Emotions are not the same as feelings



Damasio



Immordino-Yang

Emotions are not the same as feelings

Emotions are neural coding attached to memories



Damasio



Immordino-Yang

Emotions are not the same as feelings

Emotions are neural coding attached to memories

Every memory has an emotional component.



Damasio



Immordino-Yang

Emotions...



Damasio



Immordino-Yang

Emotions...

-help us decide



Damasio



Immordino-Yang

Emotions...

- help us decide
- steer us through life



Damasio



Immordino-Yang

Emotions in deciding

Emotions in deciding



Emotions in deciding



Emotions in deciding



negative or no valence



positive valence

Emotions in deciding

STAR TREK



**How do we
add
emotion?**

**Make it
personally
relevant!**

Challenge

Play the Truth-Lie Game. Make a group and tell each other interesting stories. Some stories will be true and others will be lies.

A Write. Think how you would answer these two questions. Write one true story and one lie. Don't tell anyone which story is true.

Example: Have you eaten anything strange?
Yes, I have. One day, I was really hungry in class so I put an eraser in my mouth. Then the teacher asked me a question. I swallowed it by mistake.

Critical Thinking

Think about how to spot a lie. What do people do or say when they tell a lie? List three things.

1 Have you eaten anything strange?
Yes, I have ...

2 Have you ever seen a crime?
Yes, I have ...



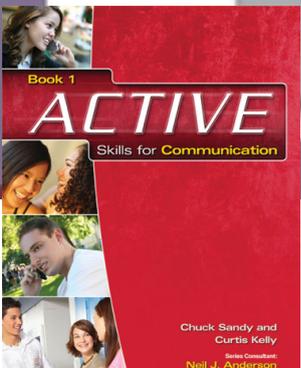
B Play the game. Get into groups of four students. For each question, follow these instructions.



Your Classmates' Names	1. Have you ever eaten anything strange?	2. Have you ever seen a crime?	3. Have you ever lost anything valuable?	4. Have you ever had an unusual friend?	5. Have you ever been really scared?
TOTAL:					

Reflection Time

Write useful words and ideas you learned in this unit.



Challenge

Play the Truth-Lie Game. Make a group and tell each other interesting stories. Some stories will be true and others will be lies.

Have you ever kissed someone?

Two sheets of lined paper for writing answers.



B Play the game. Get into groups of four students. For each question, follow these instructions.

1. Ask each

Have you eaten strange?

2. Storyteller: say "yes" and tell a true story or a lie.

Yes, I have. I ate an eraser once ...

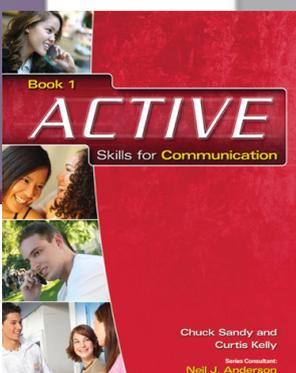
3. Listeners: push the Truth or Lie button.

4. Listeners: get one point for each correct guess. Write how many points you got.

Your Classmates' Names	1. Have you ever eaten anything strange?	2. Have you ever seen a crime?	3. Have you ever lost anything valuable?	4. Have you ever had an unusual friend?	5. Have you ever been really scared?
					TOTAL:

Reflection Time

Write useful words and ideas you learned in this unit.



Low relevance

High relevance

Low relevance

High relevance

Low relevance

High relevance

Read about British Christmas
customs

Low relevance

Read about British Christmas customs

High relevance

Read this touching story about a little girl and gold wrapping paper

Low relevance

Read about British Christmas customs

Write these food words

High relevance

Read this touching story about a little girl and gold wrapping paper

Low relevance

Read about British Christmas customs

Write these food words

High relevance

Read this touching story about a little girl and gold wrapping paper

Write a class party dinner plan

Low relevance

Read about British Christmas customs

Write these food words

Write *wh* questions about this picture

High relevance

Read this touching story about a little girl and gold wrapping paper

Write a class party dinner plan

Low relevance

Read about British Christmas customs

Write these food words

Write *wh* questions about this picture

High relevance

Read this touching story about a little girl and gold wrapping paper

Write a class party dinner plan

Your partner will show you a favorite photo. Ask *wh* questions

Low relevance

Read about British Christmas customs

Write these food words

Write *wh* questions about this picture

Write instructions for using a photocopier machine

High relevance

Read this touching story about a little girl and gold wrapping paper

Write a class party dinner plan

Your partner will show you a favorite photo. Ask *wh* questions

Low relevance

Read about British Christmas customs

Write these food words

Write *wh* questions about this picture

Write instructions for using a photocopier machine

High relevance

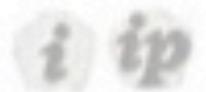
Read this touching story about a little girl and gold wrapping paper

Write a class party dinner plan

Your partner will show you a favorite photo. Ask *wh* questions

Invent a crazy machine and write instructions for it

MOVING ON



Make It Brief (Contractions)

Shahrul is telling his friends about his cousin, Lisa.



Lisa lives in Ipoh.
She's my cousin.
She's a very cheerful person.
She'll be visiting me during the holidays.

CLIP NOTES

A contraction is a short form of a word. It is often used in informal situations.

I am	=	I'm
We are	=	We're
You are	=	You're
I will	=	I'll
They have	=	They've
She has	=	She's

language analysis

TASK 1

Read these sentences below. What are the contractions used in these sentences?

We're classmates.
We're in Form 2 Biru.
We've been classmates since Form 1.
We'll be in Form 3 next year.



MOVING ON



Make It Brief (Contractions) MyCD

Shahrul is telling his friends about his cousin, Lisa.



Lisa lives in Ipoh.
She's my cousin.
She's a very cheerful person.
She'll be visiting me during the holidays.

CLIP NOTES

A contraction is a short form of a word. It is often used in informal sentences and questions.

Examples:

He's (He is)	my friend.
It is	= It's
I am	= I'm
We are	= We're
You are	= You're
I will	= I'll
They have	= They've
She has	= She's

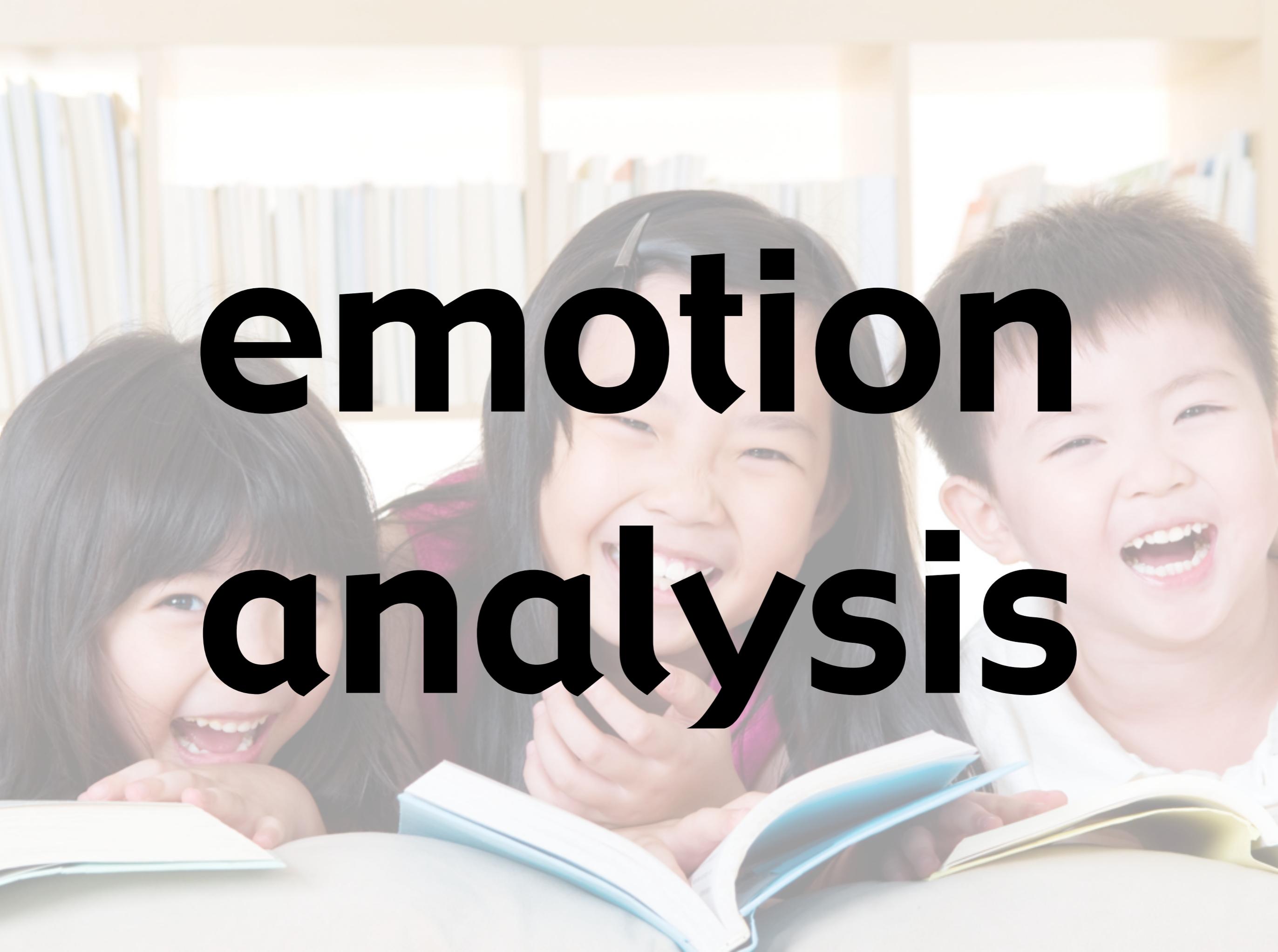
task analysis

TASK 1

Read these sentences below. What are the contractions used in these sentences?

We're classmates.
We're in Form 2 Biru.
We've been classmates since Form 1.
We'll be in Form 3 next year.



A photograph of three young children, two girls and one boy, sitting at a table in a library or bookstore. They are all smiling broadly and looking at open books in front of them. The background shows bookshelves filled with books. The text "emotion analysis" is overlaid in large, bold, black letters across the center of the image.

emotion analysis

CommuniCard (If you have anything you would like to say to me, write it here)

I live in Hyogo.

CommuniCard (If you have anything you would like to say to me, write it here)

I went to Umeda after class to dinner with my friends.

CommuniCard (If you have anything you would like to say to me, write it here)

The video was really touching and interesting. I think I've seen one of the videos from this series before

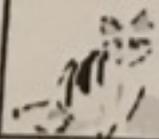


name: HSIEH SHINNA

CommuniCard (If you have anything you would like to say to me, write it here)

Stories in the textbook are very interesting!!!

I want to read more!!



name: Tateki Yonemura

CommuniCard (If you have anything you would like to say to me, write it here)

In the ^{early} morning, I had to do my homeworks, so today, I'm very sleepy.



name: Shiori Nakasha

CommuniCard (If you have anything you would like to say to me, write it here)

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CommuniCard (If you have anything you would like to say to me, write it here)

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name: HSIEH SHINNA

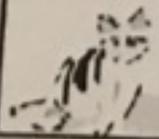
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name: Shiori Nakasha

CommuniCard (If you have anything you would like to say to me, write it here)

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of the videos from this series before



name: HSIEH SHINNA

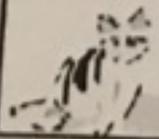
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name: Tateki Yonemura

CommuniCard (If you have anything you would like to say to me, write it here)

In the ^{early} morning, I had to do my homeworks, so today, I'm very sleepy.



name: Shiori Nakasha

Emotion in Math

Emotion in Math

A photograph of three young children sitting at a table in a library, each reading an open book. They are all smiling broadly, showing their teeth. The child on the left is a girl with dark hair, the middle one is a girl with long dark hair, and the one on the right is a boy with short dark hair. The background shows bookshelves filled with books, slightly out of focus. The overall atmosphere is bright and positive.

emotion

drives

learning

Vocab

Teaching

Vocabulary

Food Words:

Carrots

Tomatoes

Potatoes

Beans

Lettuce

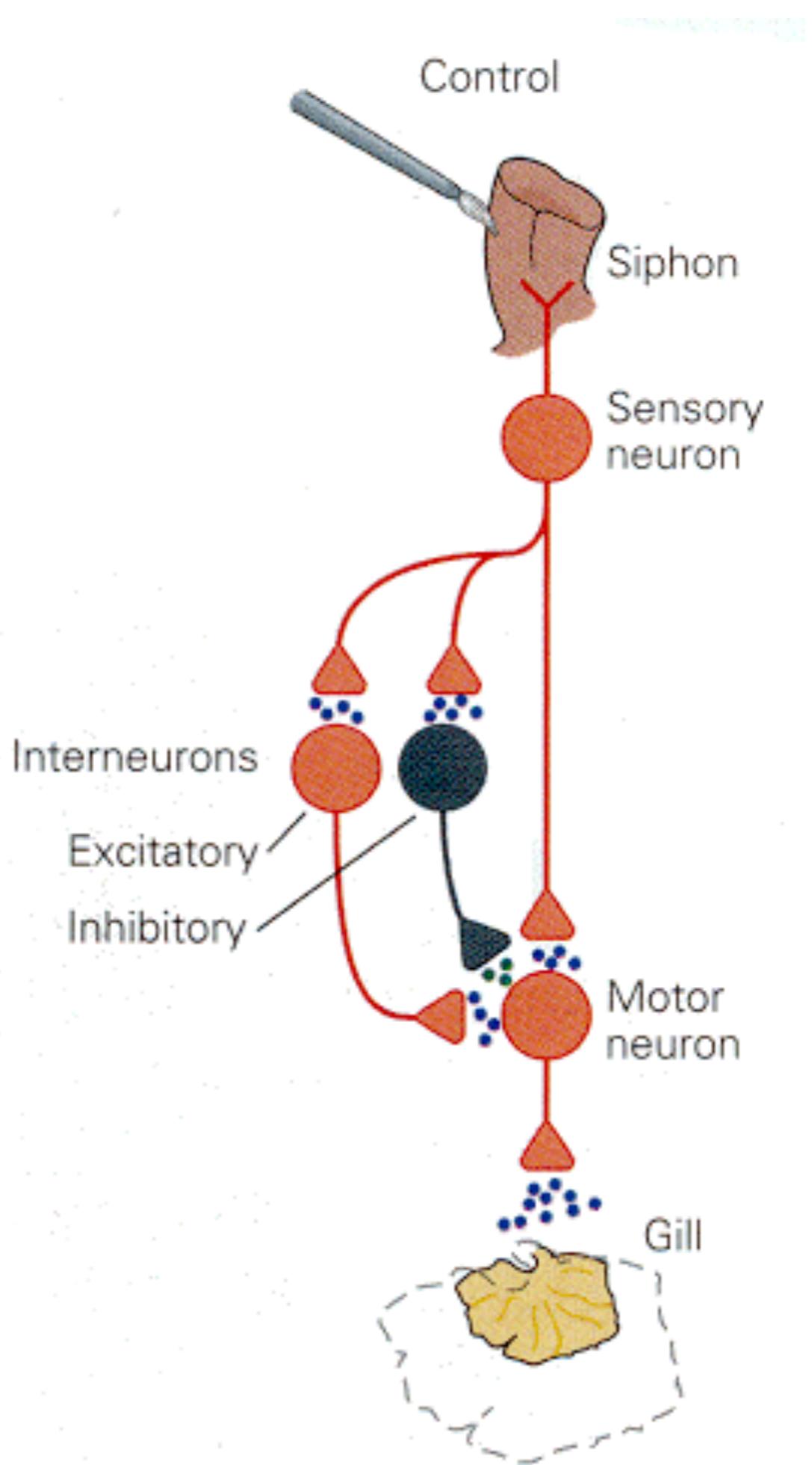
Green Peppers

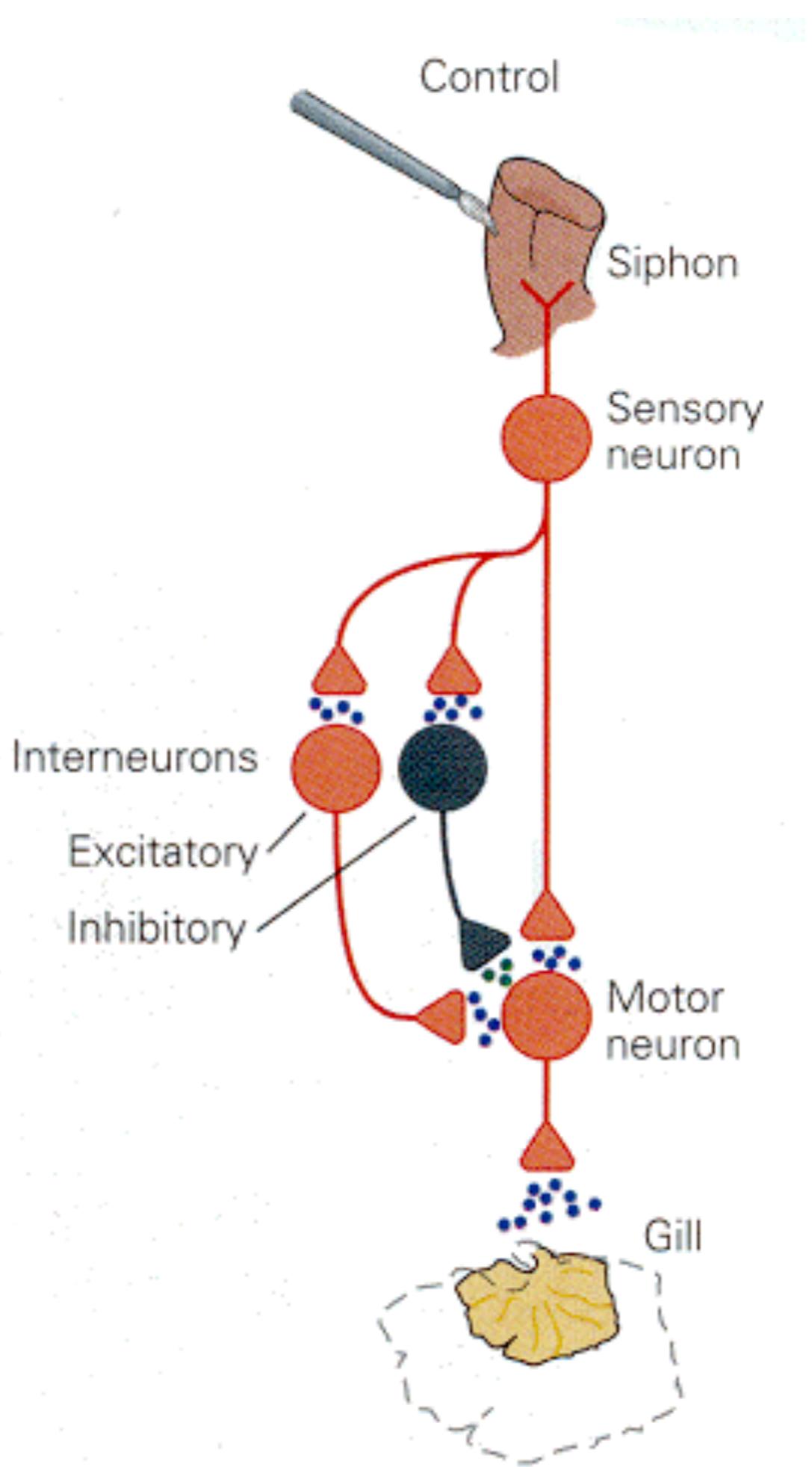
What happens when you teach too many words?

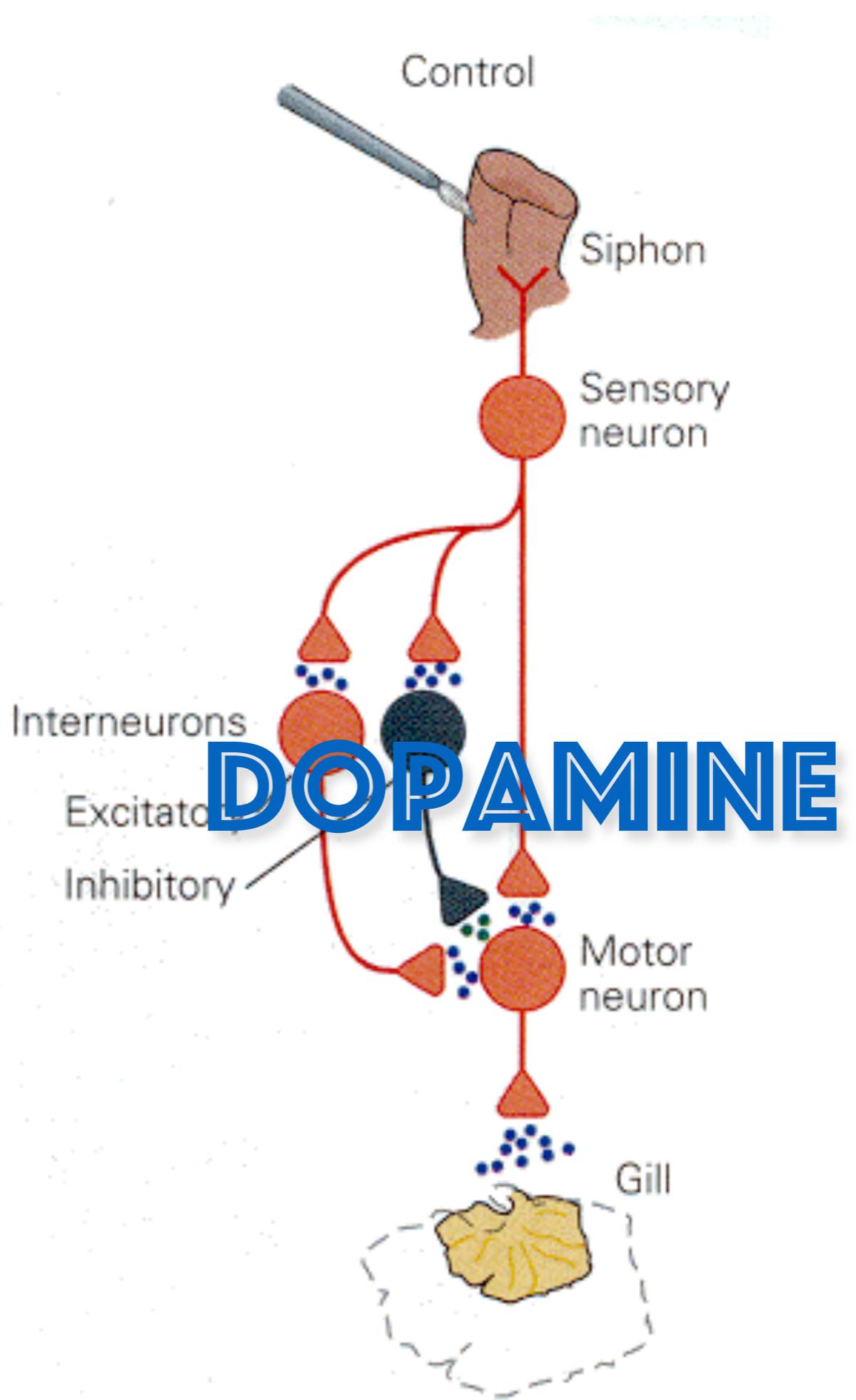
What happens when you teach too many words?



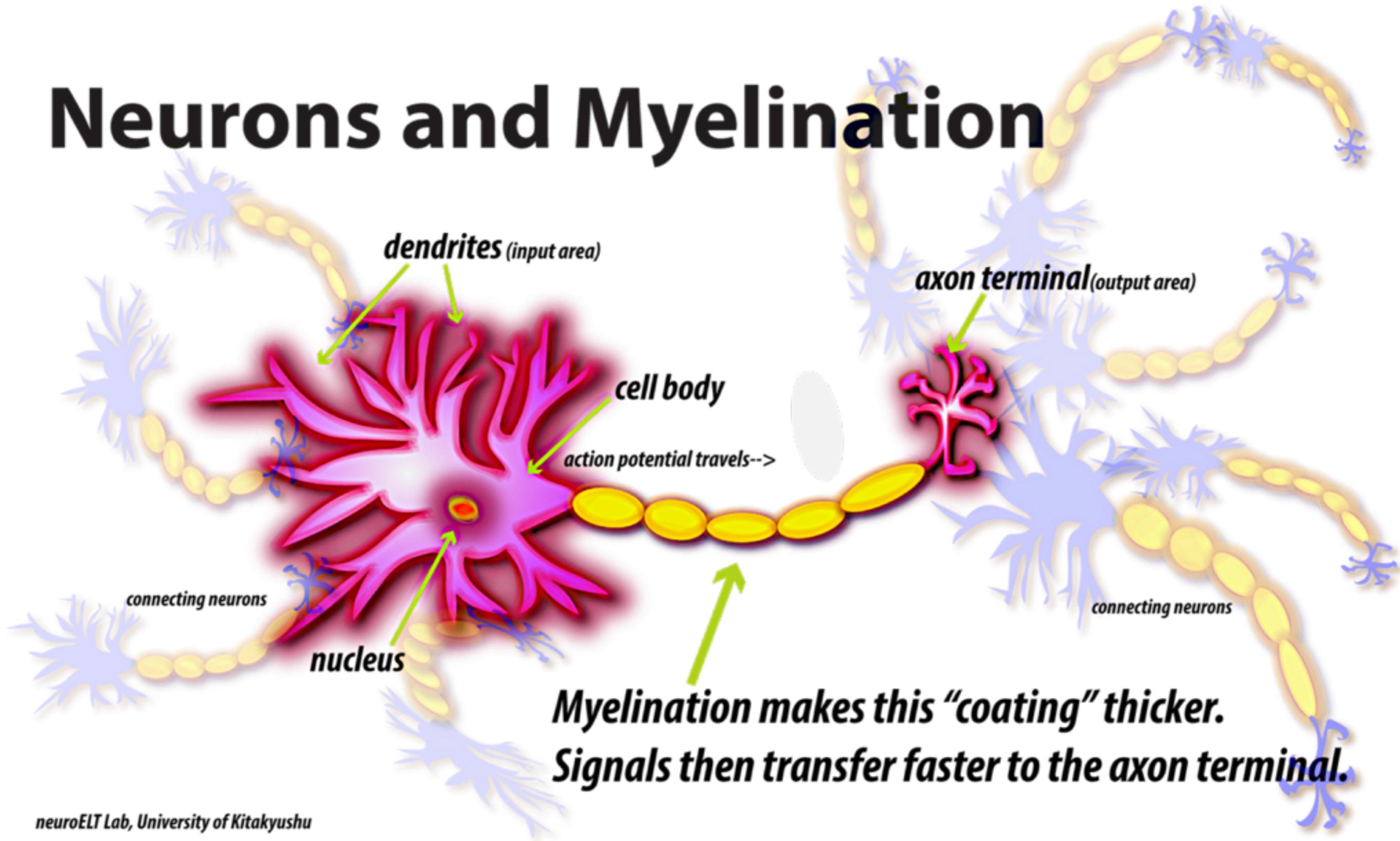
**Lecture on
Hebbian Neuroplasticity
& Embodied sim**







Neurons and Myelination

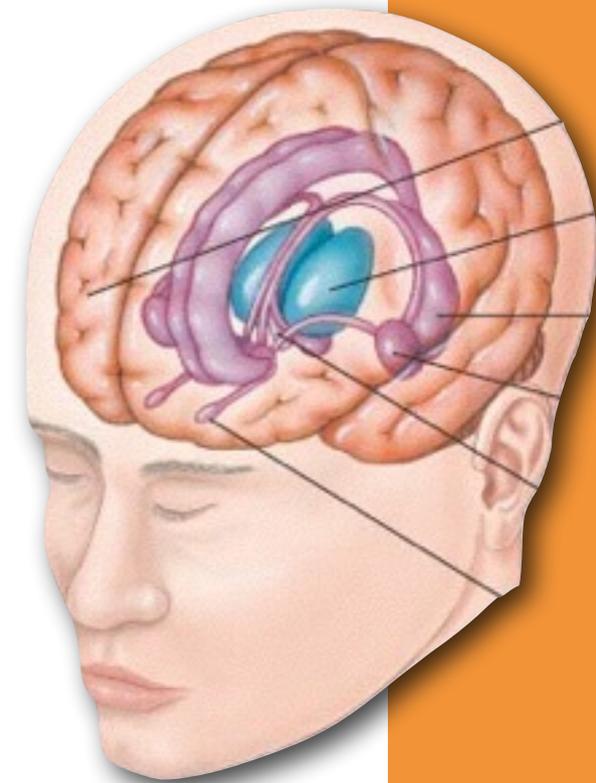
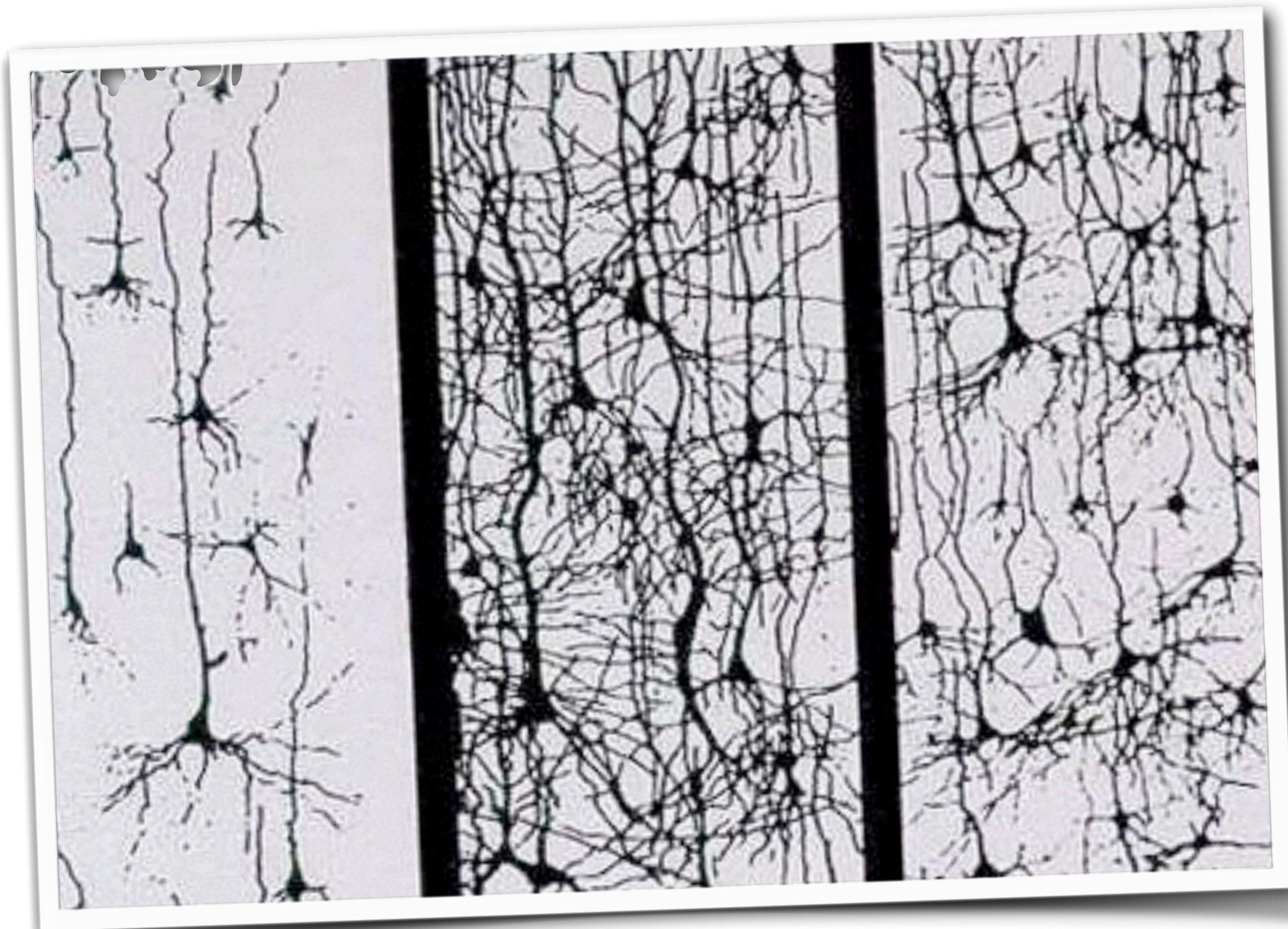


Connecting

A close-up, slightly blurred photograph of a person's face, showing their eyes and nose, set against a blue background. The person appears to be looking towards the camera with a neutral expression. The lighting is soft, and the overall tone is calm and focused.

Connecting

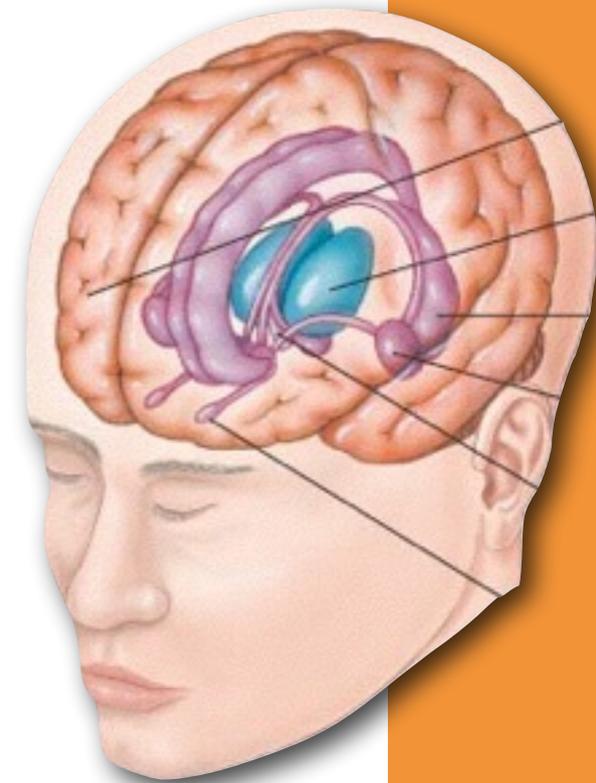
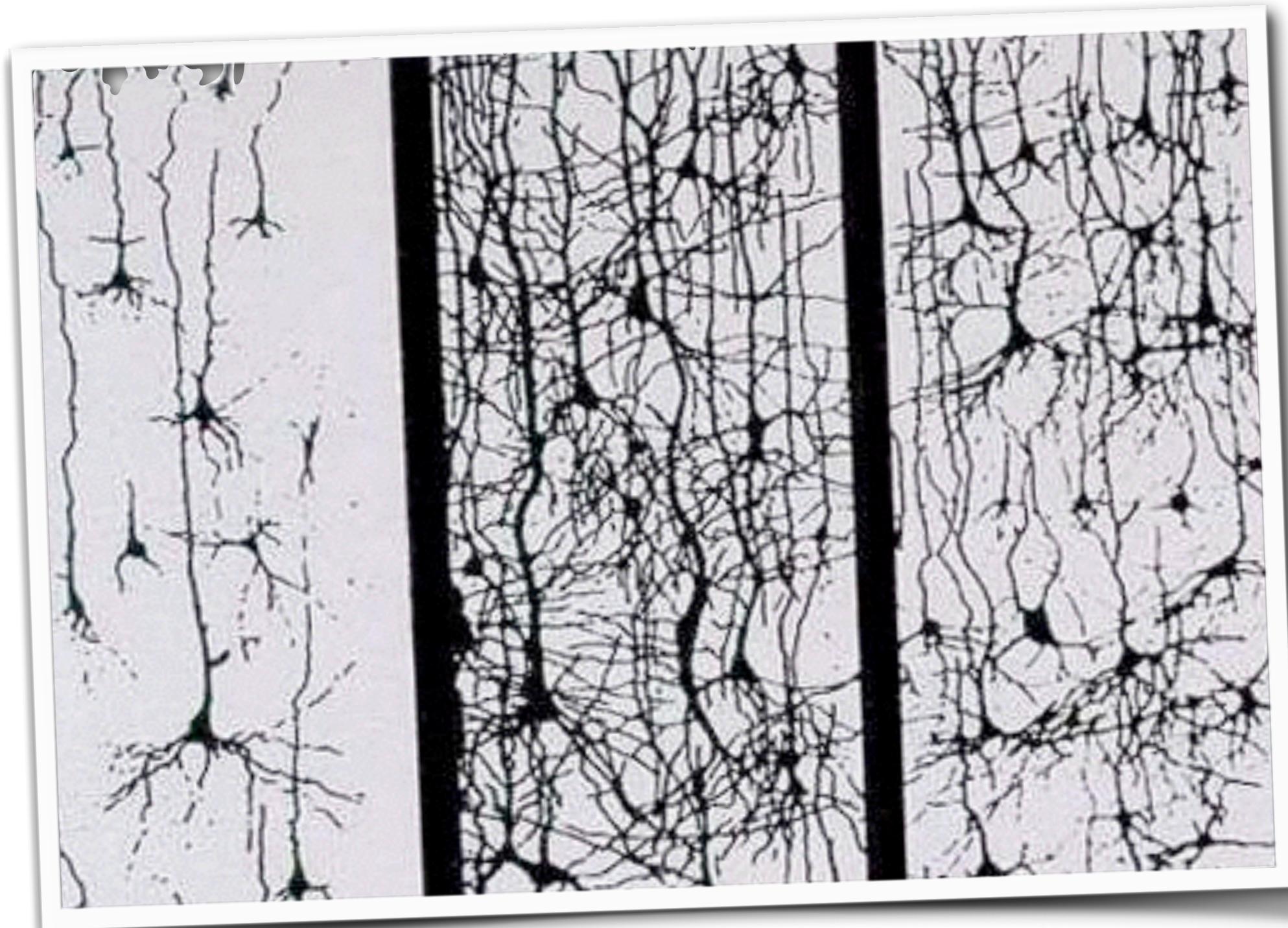
A close-up, slightly blurred photograph of a person's face, showing their eyes and nose, set against a blue background. The person appears to be looking towards the camera with a neutral expression. The lighting is soft, and the overall tone is calm and focused.



Q. What do you notice?

Public Library Association

Birth - 6m - JHS



Q. What do you notice?

Public Library Association

Pruning



Pruning



Spaced Repetition

One Hour Lesson

Spaced Repetition

30 min

30 min

Spaced Repetition

30 min

30 min

100% greater retention

Hebbian Neuroplasticity

- 1) The brain is hardwired.
- 2) Processing is done in fixed areas.

Hebbian Neuroplasticity

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Hebbian Neuroplasticity

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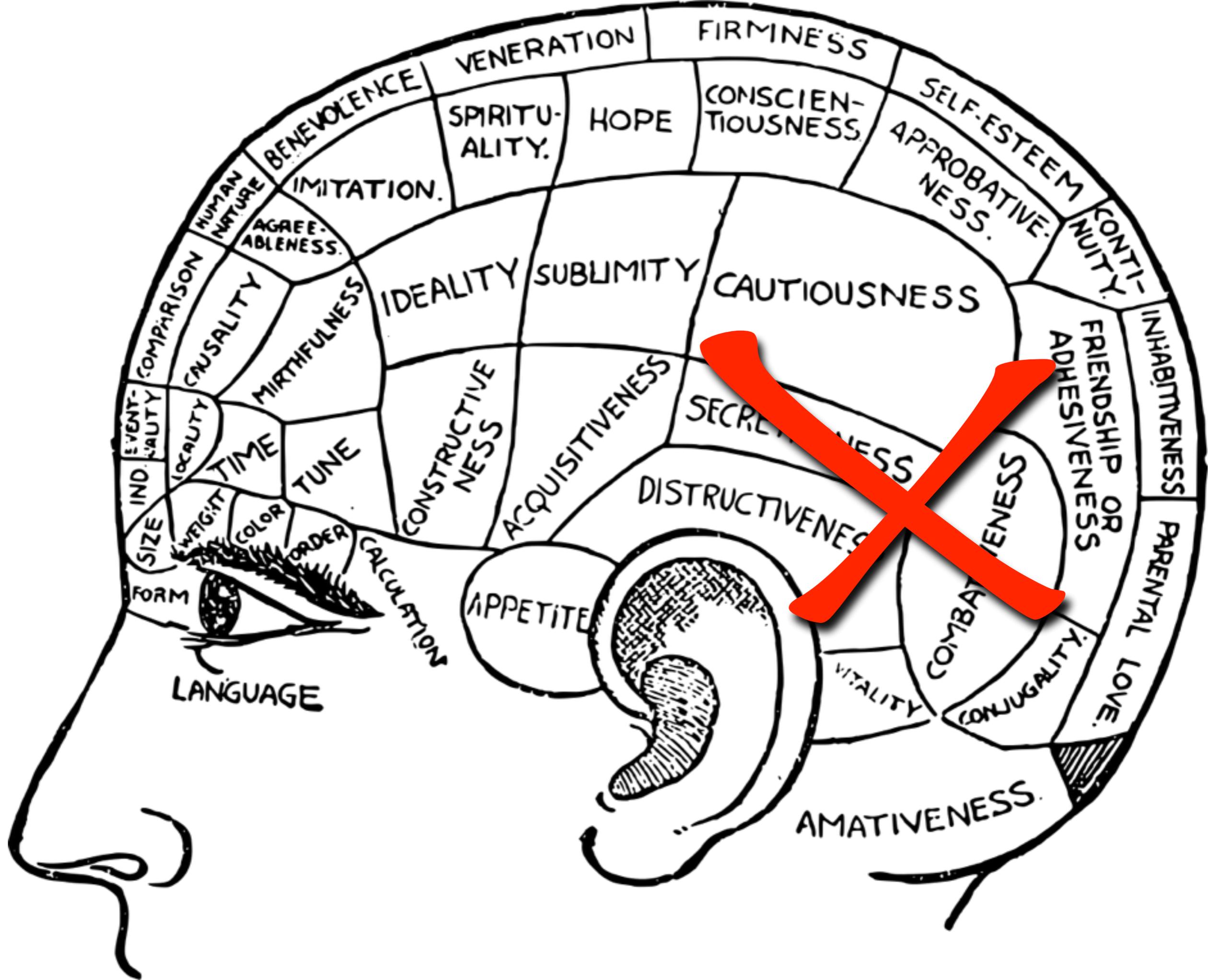


Hebbian Neuroplasticity

- 1) The brain is hardwired.
- 2) Processing is done in fixed areas.



***“everything I learned
during my PhD...”***



We will

Discuss

Vocabulary teaching:

Better approach than “repeating”

Adding Emotion to Vocabulary

accomplish

accurate

accuse

achievement

acid

Adding Emotion to Vocabulary

— quick and dirty trick!

accomplish

accurate

accuse

achievement

acid

Adding Emotion to Vocabulary

— quick and dirty trick!

accomplish

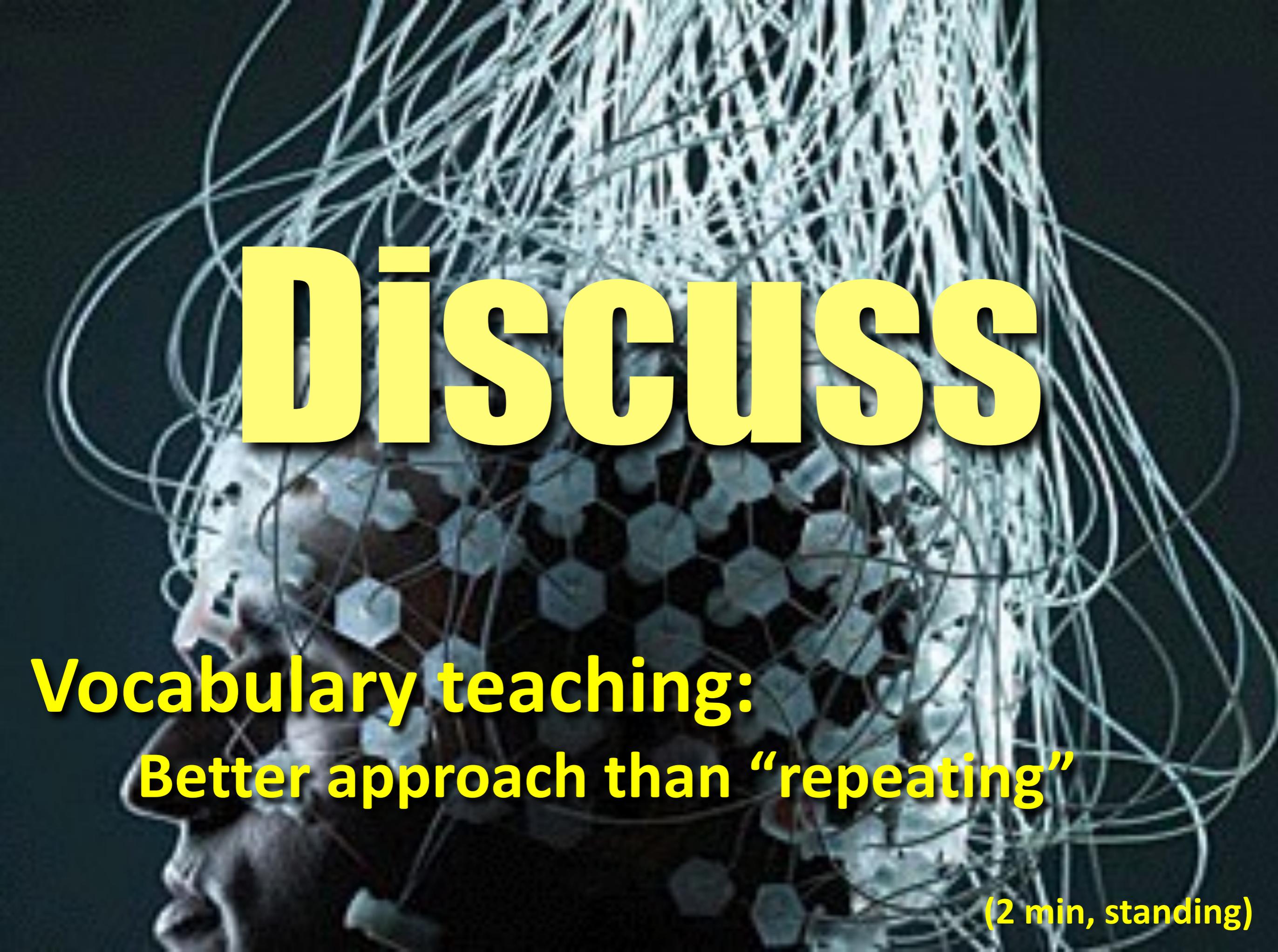
accurate

accuse

achievement

acid

Just add (+) or (-) signs!



Discuss

Vocabulary teaching:

Better approach than “repeating”

(2 min, standing)

Summary of



Summary of

- **The brain is a problem-solver; PPP isn't natural**

Summary of

- **The brain is a problem-solver; PPP isn't natural**
- **The brain needs blood flow**

Summary of

- **The brain is a problem-solver; PPP isn't natural**
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- **Attention = novelty / personal relevance**

Summary of

- **The brain is a problem-solver; PPP isn't natural**
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- **Attention = novelty / personal relevance**
- **No emotion, no learning**

Summary of

Key points

- **The brain is a problem-solver; PPP isn't natural**
- **The brain needs blood flow**
- **Attention = novelty / personal relevance**
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What Neuroscience Tells Us about Language Learning

Curtis Kelly & Robert Murphy

FAB-EFL.COM



What Neuroscience Tells Us about Language Teaching

Robert Murphy & Curtis Kelly



Summary of



Summary of

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Summary of

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Summary of

Key points

- **The brain is a problem-solver; PPP isn't natural**
- **The brain needs blood flow**
- **Attention = novelty / personal relevance**
- **No emotion, no learning**



Grammar Teaching

Grammar

Does John like carrots?

**Yes. John
likes
carrots.**

**No. John does
not like carrots.**

Noticing

Noticing is basically the idea that if learners pay attention to the form and meaning of certain language structures in input, this will contribute to the internalization of the rule (Batstone, 1996).



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Instructing: Explaining and drawing attention to a particular form



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Modeling: Reading or listening to a text that has the target form



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Manipulating: Underlining or filling in the target form



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Instructing: Explaining and drawing attention to a particular form

Modeling: Reading or listening to a text that has the target form

Manipulating: Underlining or filling in the target form

Comparing: Mixing target form with related forms



Noticing

Listening for kids

I see 1 rabbit and 2 birds.

I see 2 cats and 1 dog.

I see 3 horses, 4 cows, 5 pigs, and 1 chicken.



Noticing

Find the present perfect verbs below.

I have been to a few countries in Asian.
My parents took me to Thailand and
Malaysia when I was a child, and I have
lived in Korea. I went to Japan last year,
but I have never been to Taiwan.



Noticing

Find the present perfect verbs below.

I **have been** to a few countries in Asian. My parents took me to Thailand and Malaysia when I was a child, and I **have lived** in Korea. I went to Japan last year, but I **have never been** to Taiwan.





Make

Grammar noticing exercise

(3 min)

Make

Instructing: Explaining and drawing attention to a particular form

Modeling: Reading or listening to a text that has the target form

Manipulating: Underlining or filling in the target form

Comparing: Mixing target form with related forms

Grammar noticing exercise

(3 min)

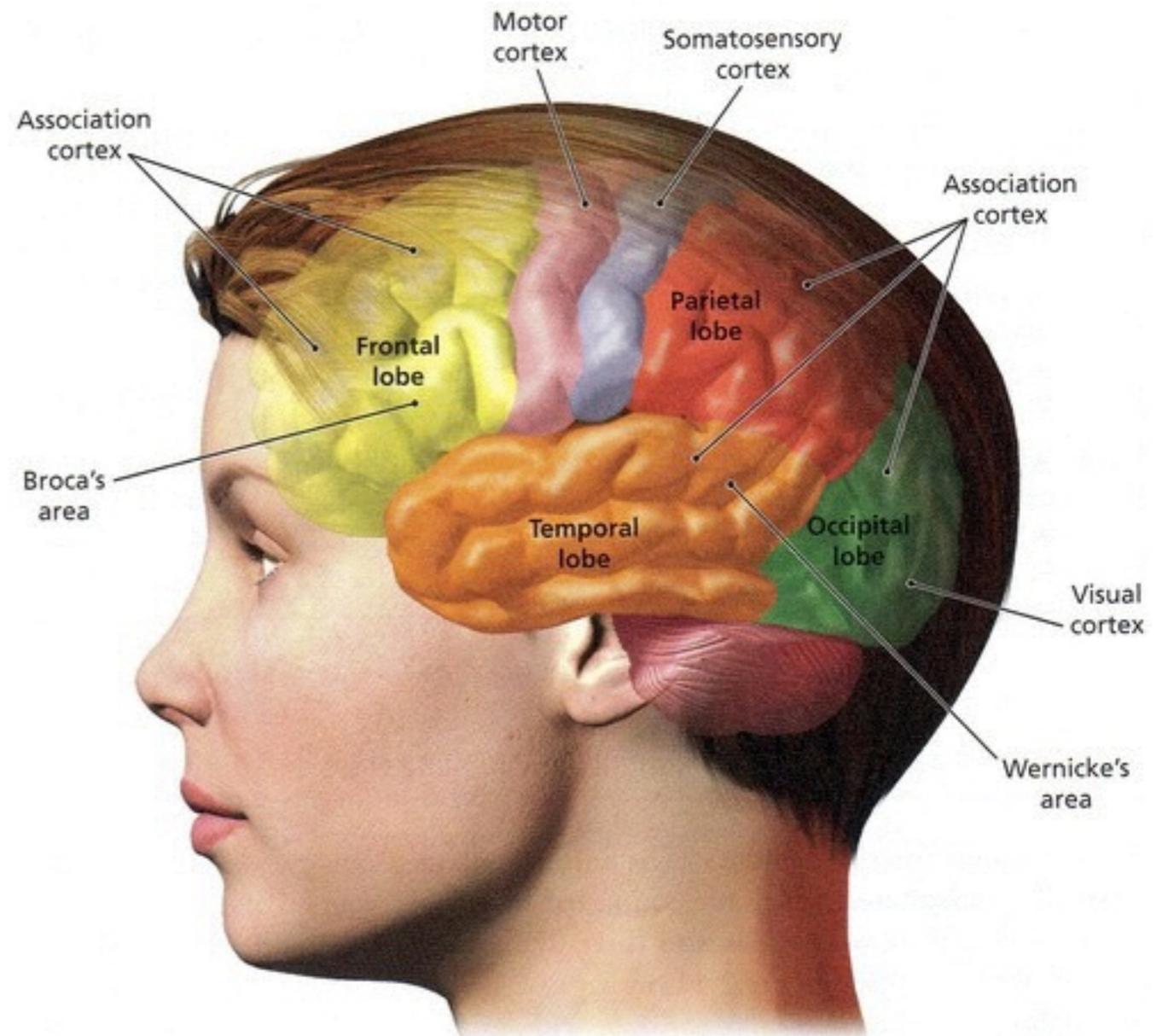
Lecture on Predicting





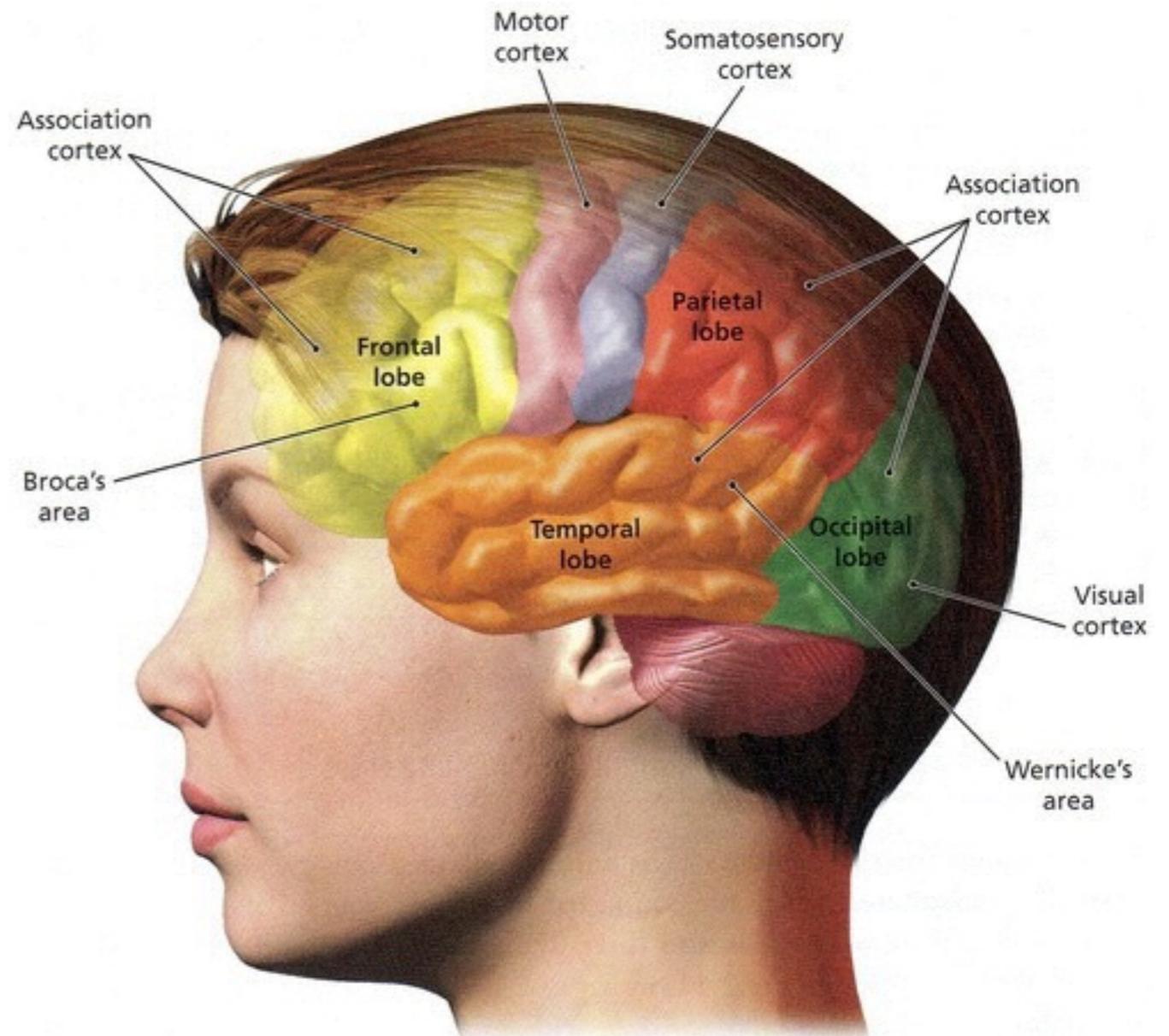
**How does the
brain figure out
the world?**

Processing



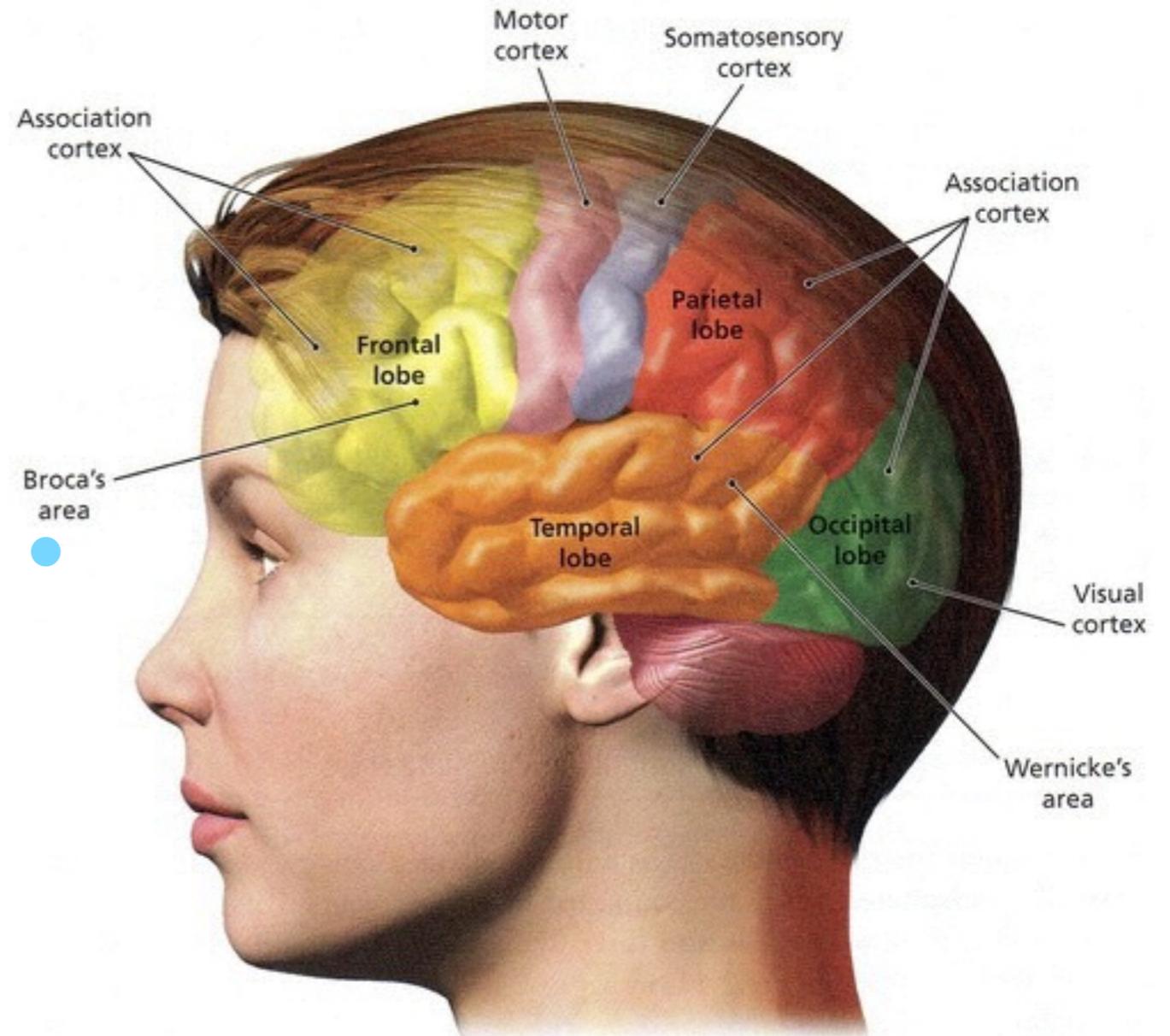
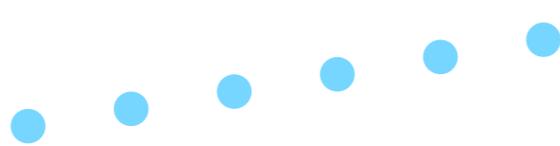
Processing

I. Sensory Input



Processing

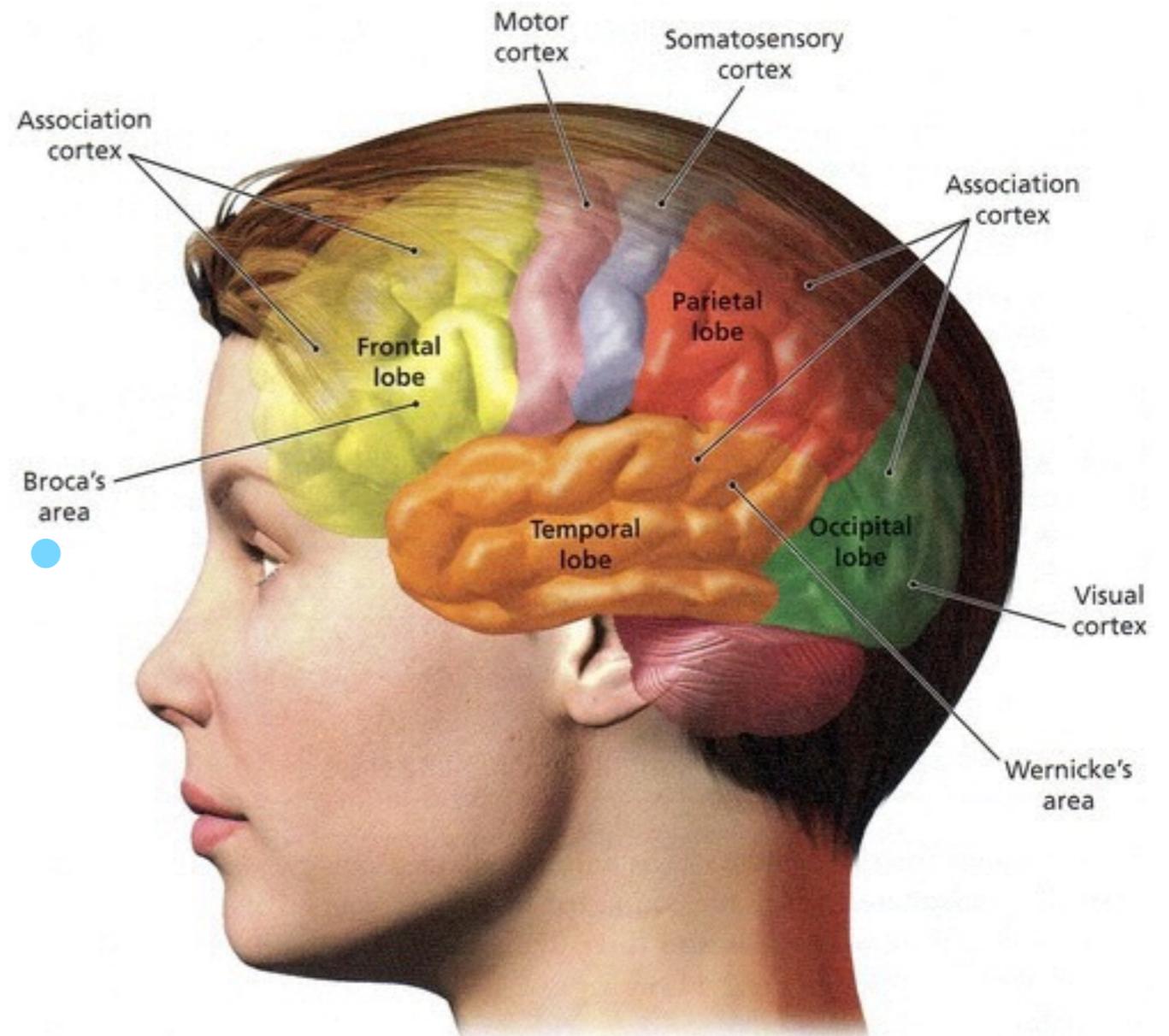
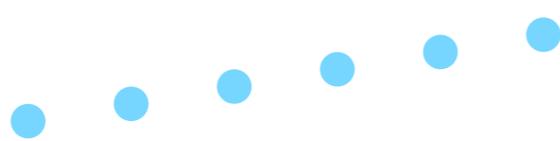
I. Sensory Input



Processing

1. Sensory Input

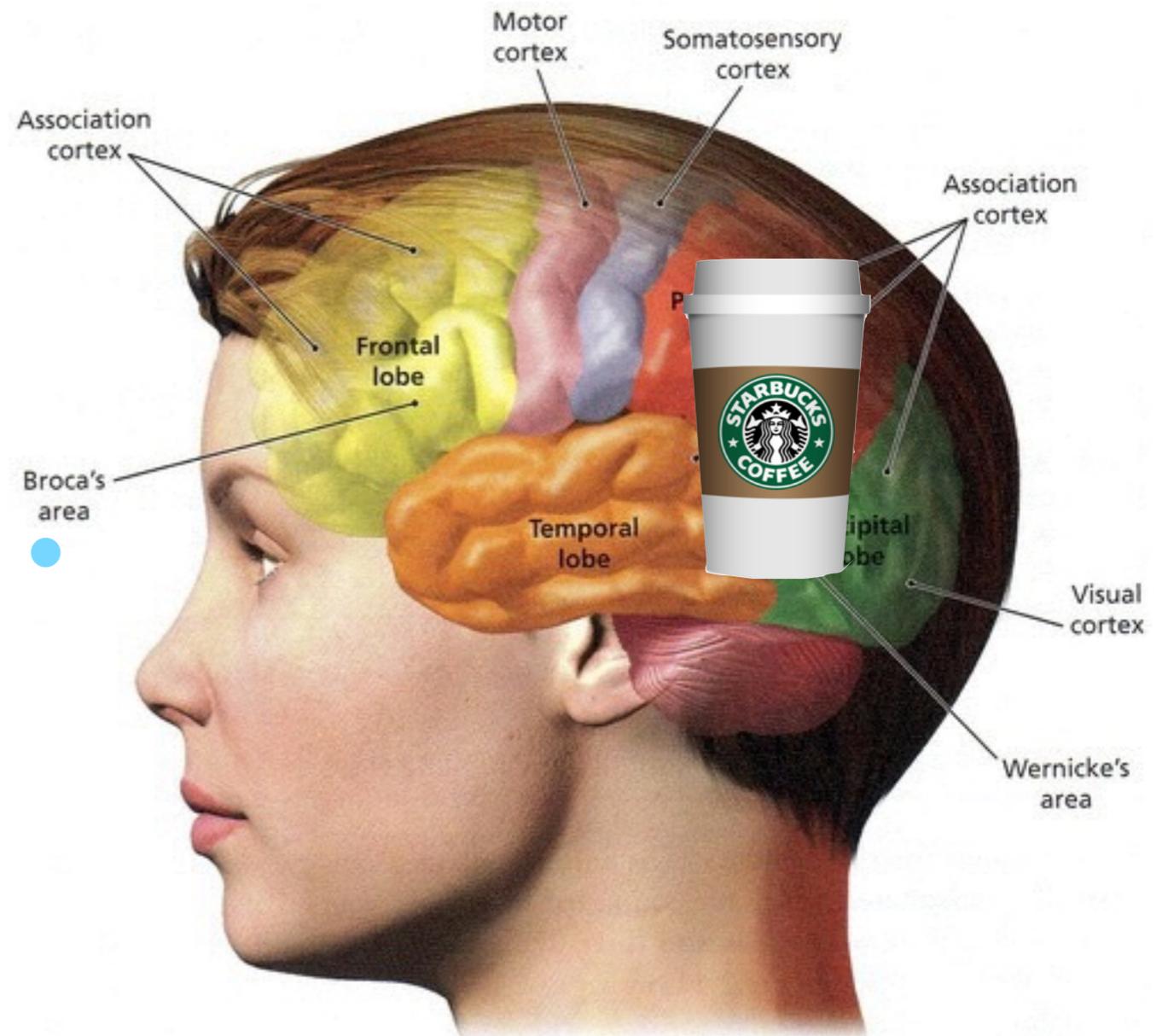
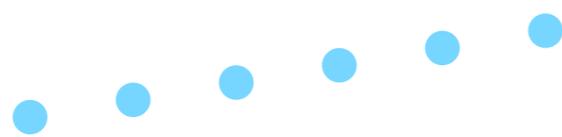
2. Identification



Processing

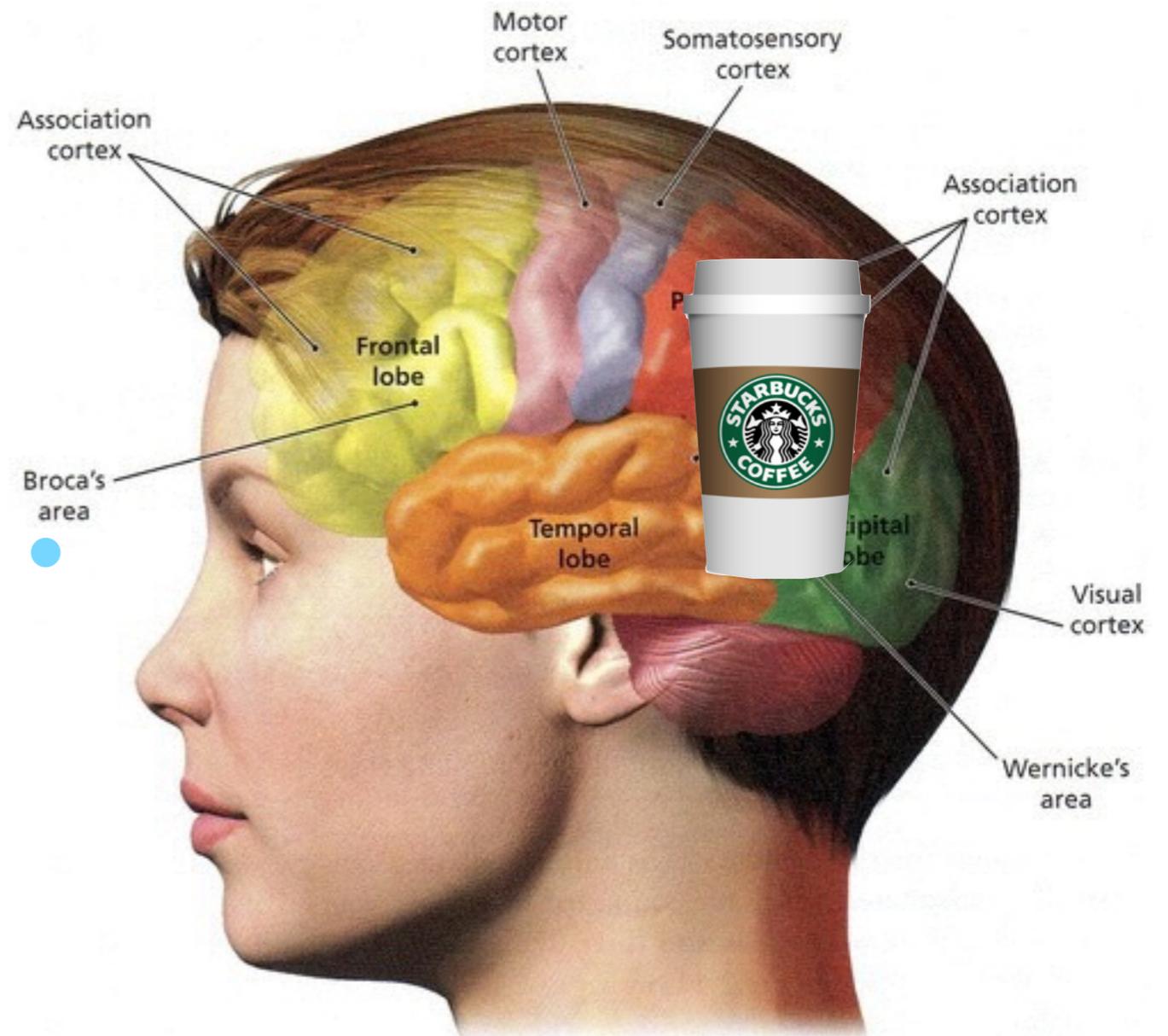
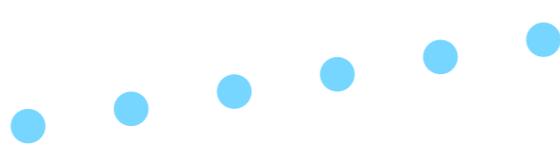
1. Sensory Input

2. Identification



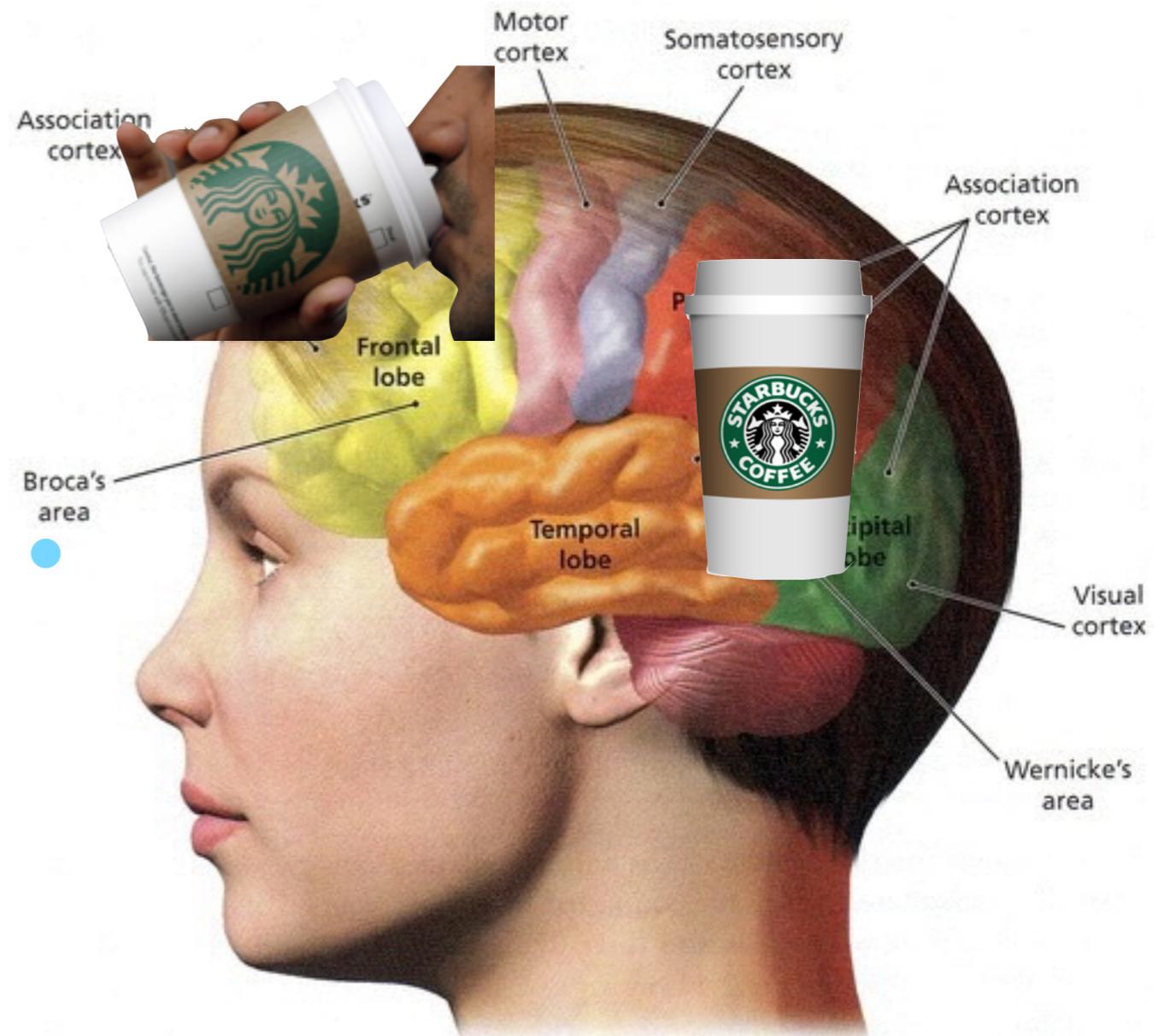
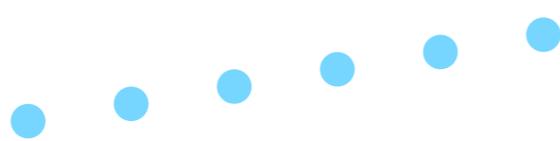
Processing

1. Sensory Input
2. Identification
3. Decision



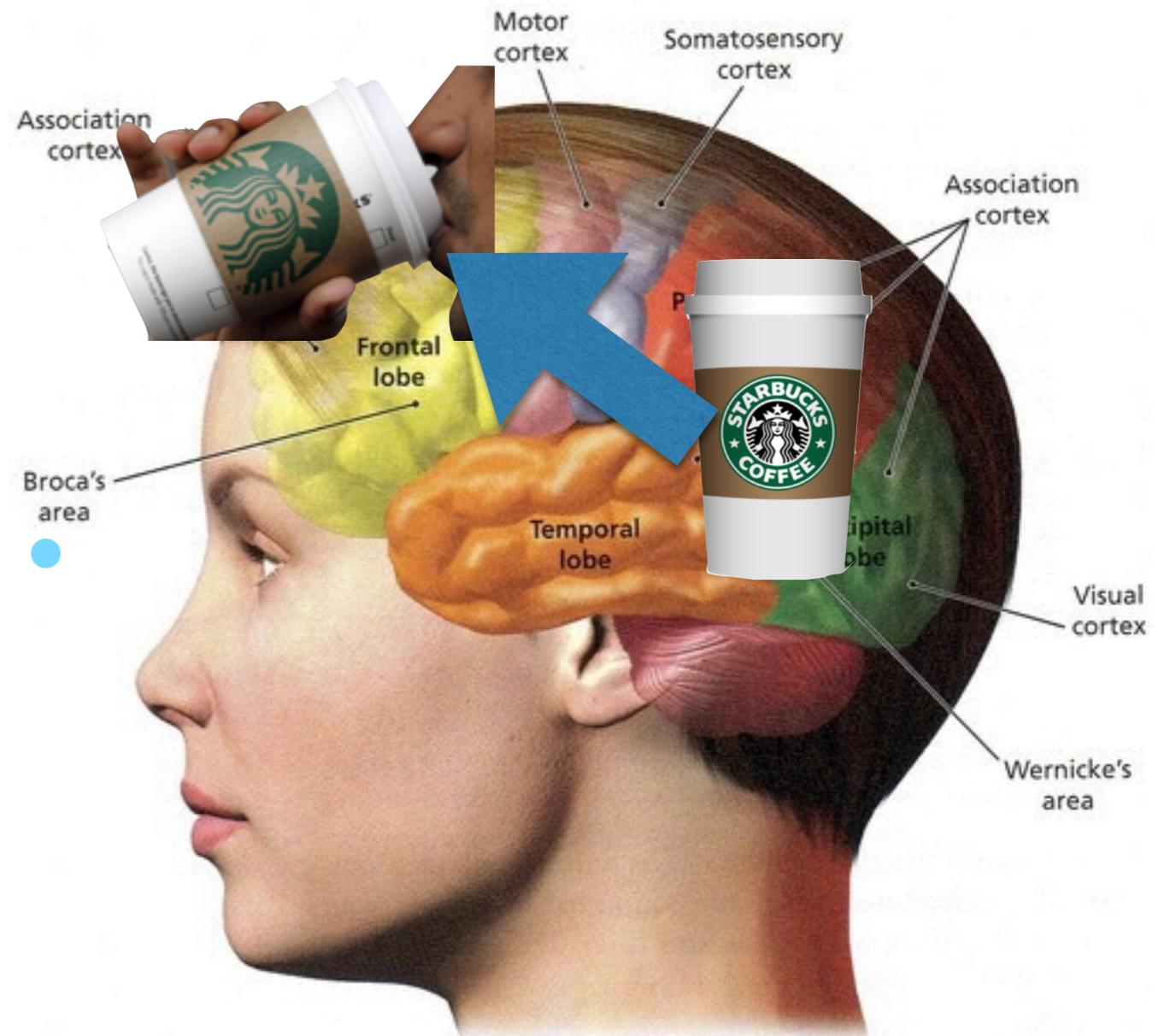
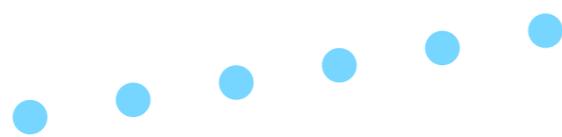
Processing

1. Sensory Input
2. Identification
3. Decision



Processing

1. Sensory Input
2. Identification
3. Decision

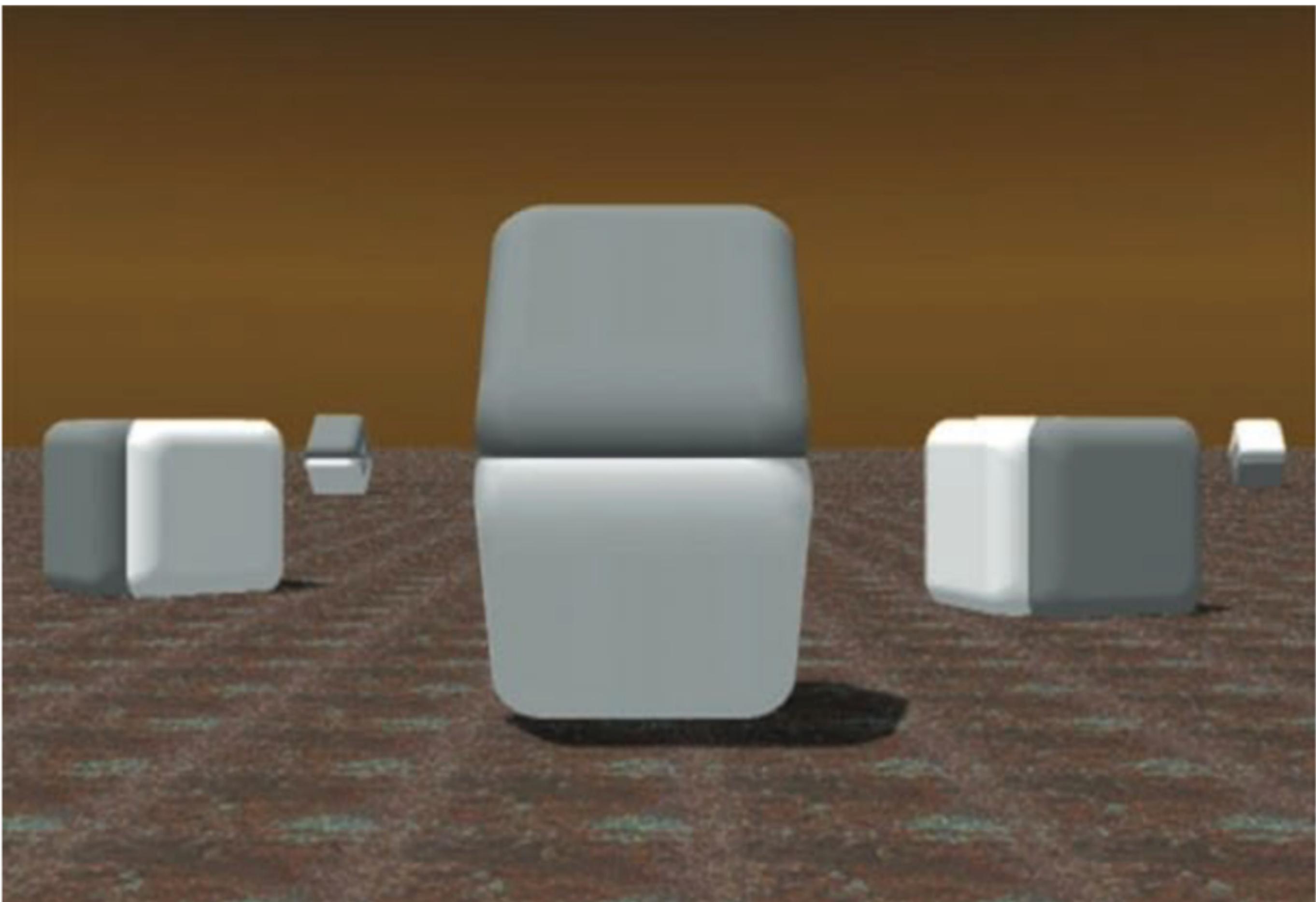


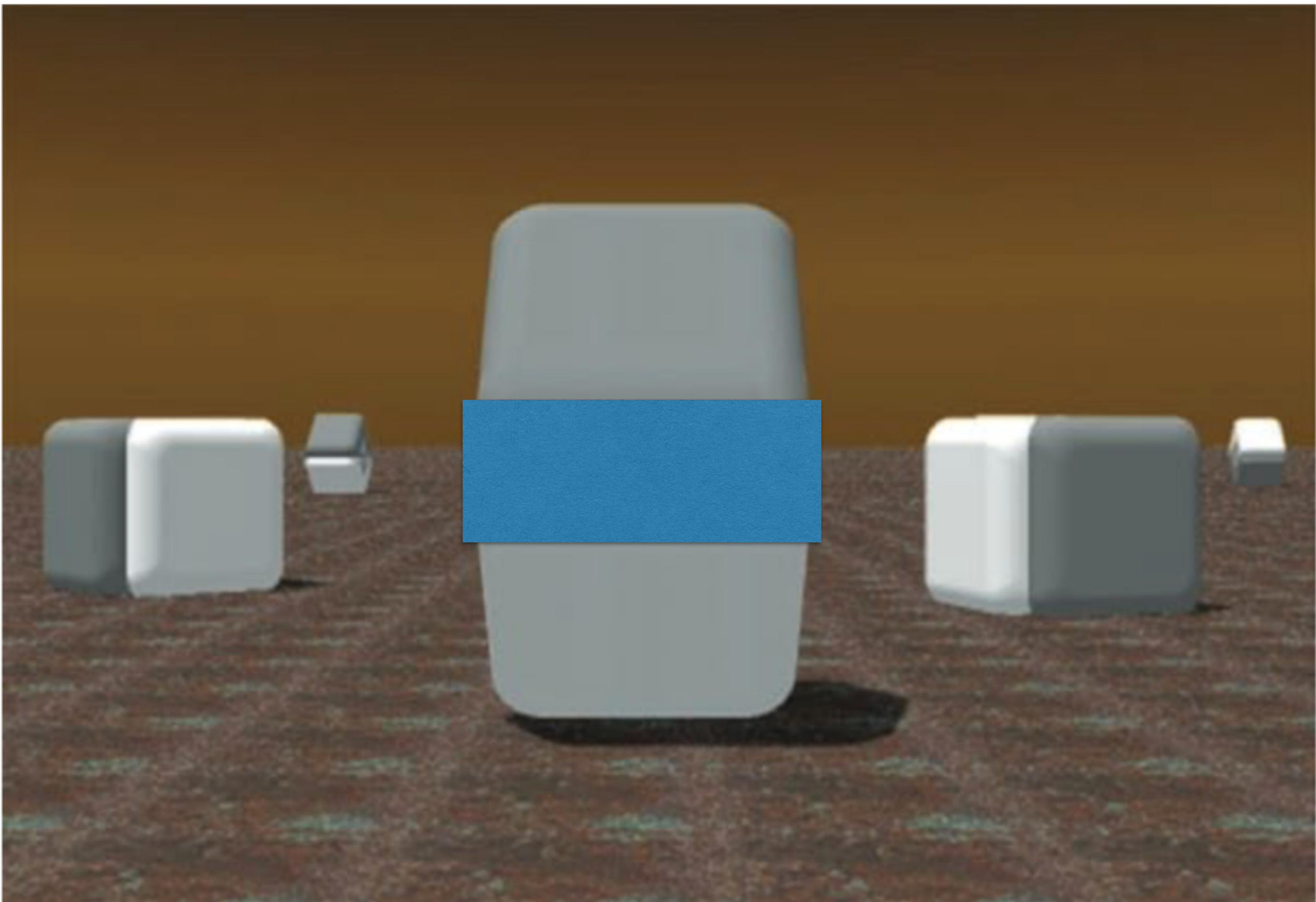
Listen

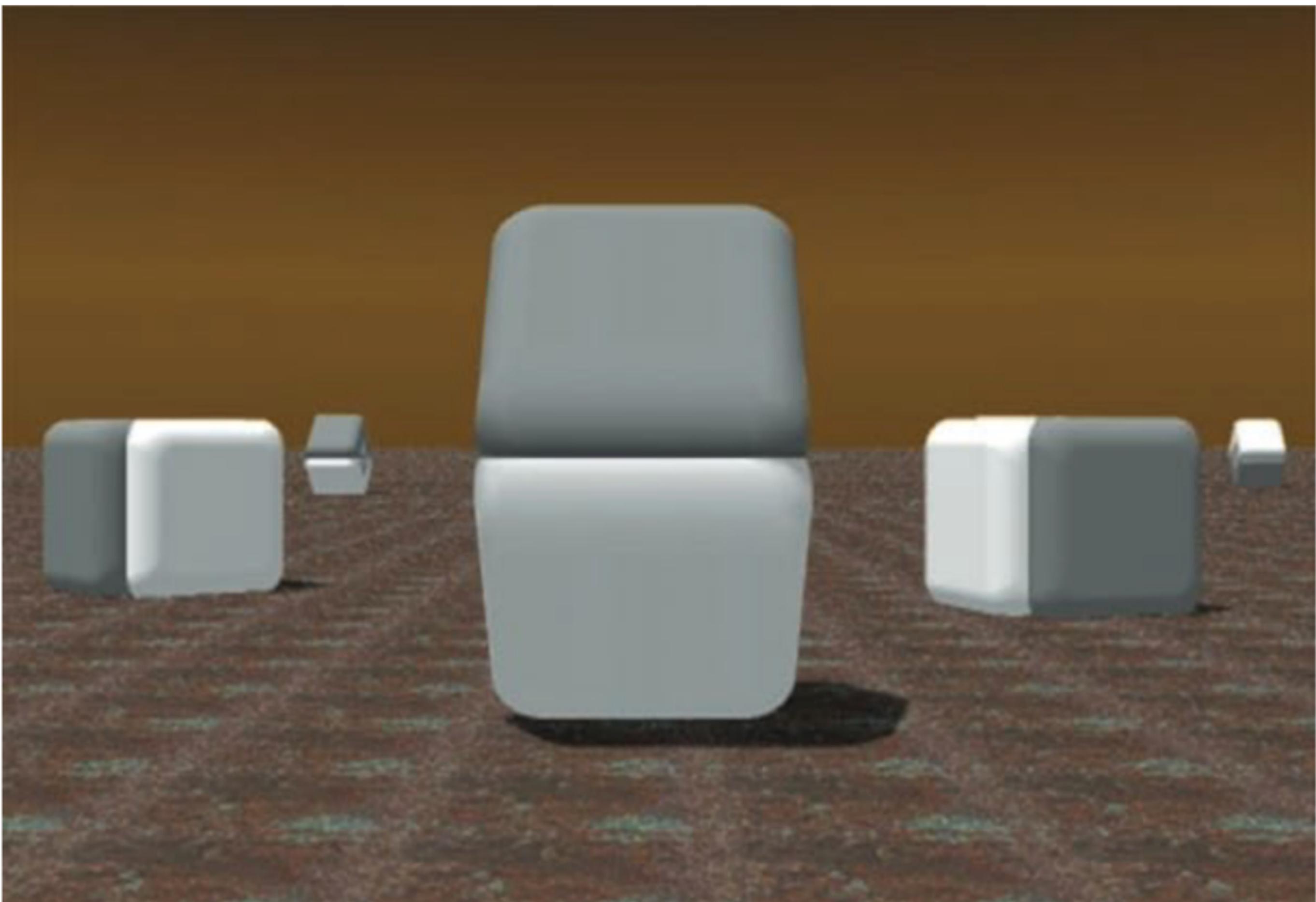
Listen

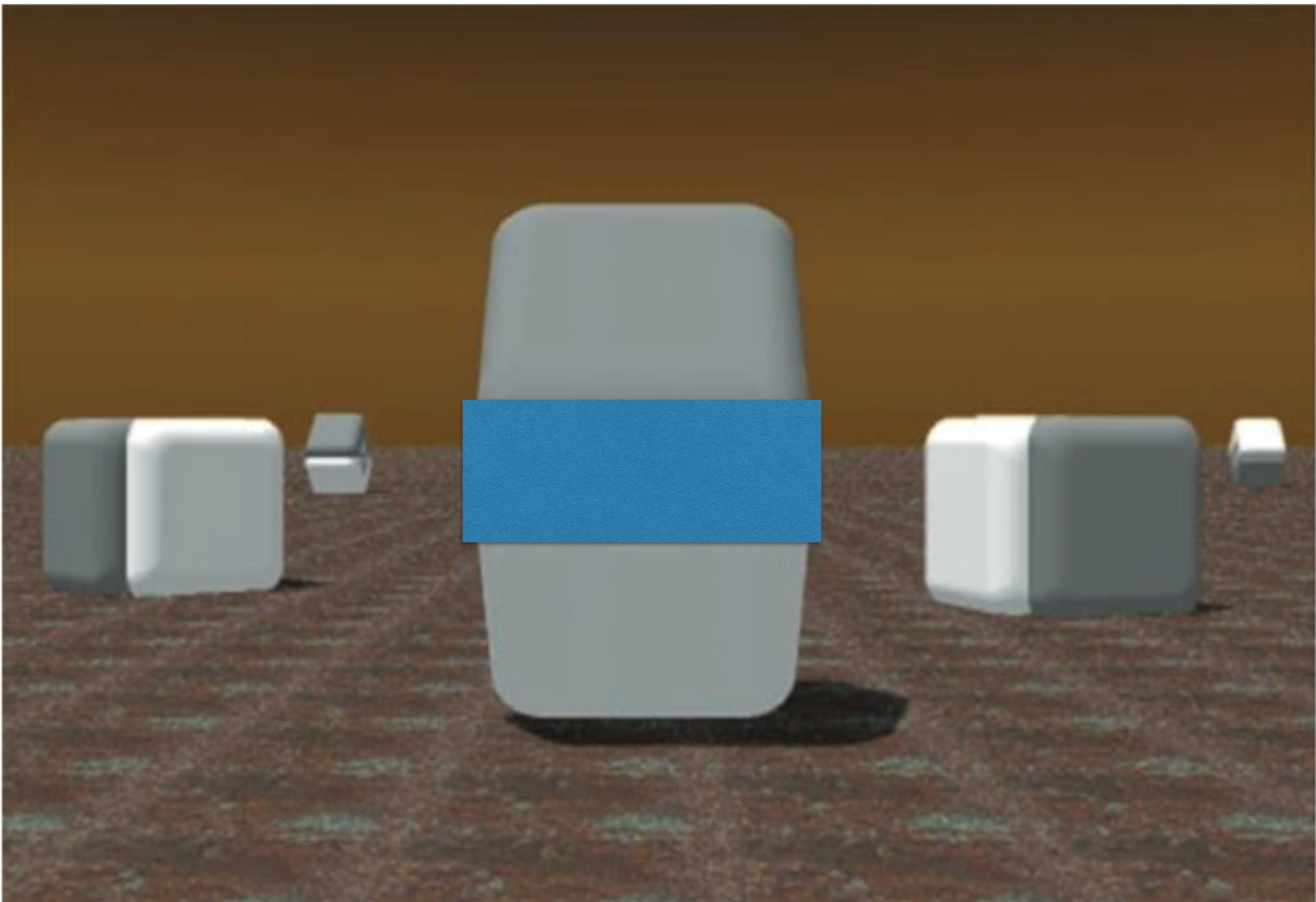
Listen

Listen

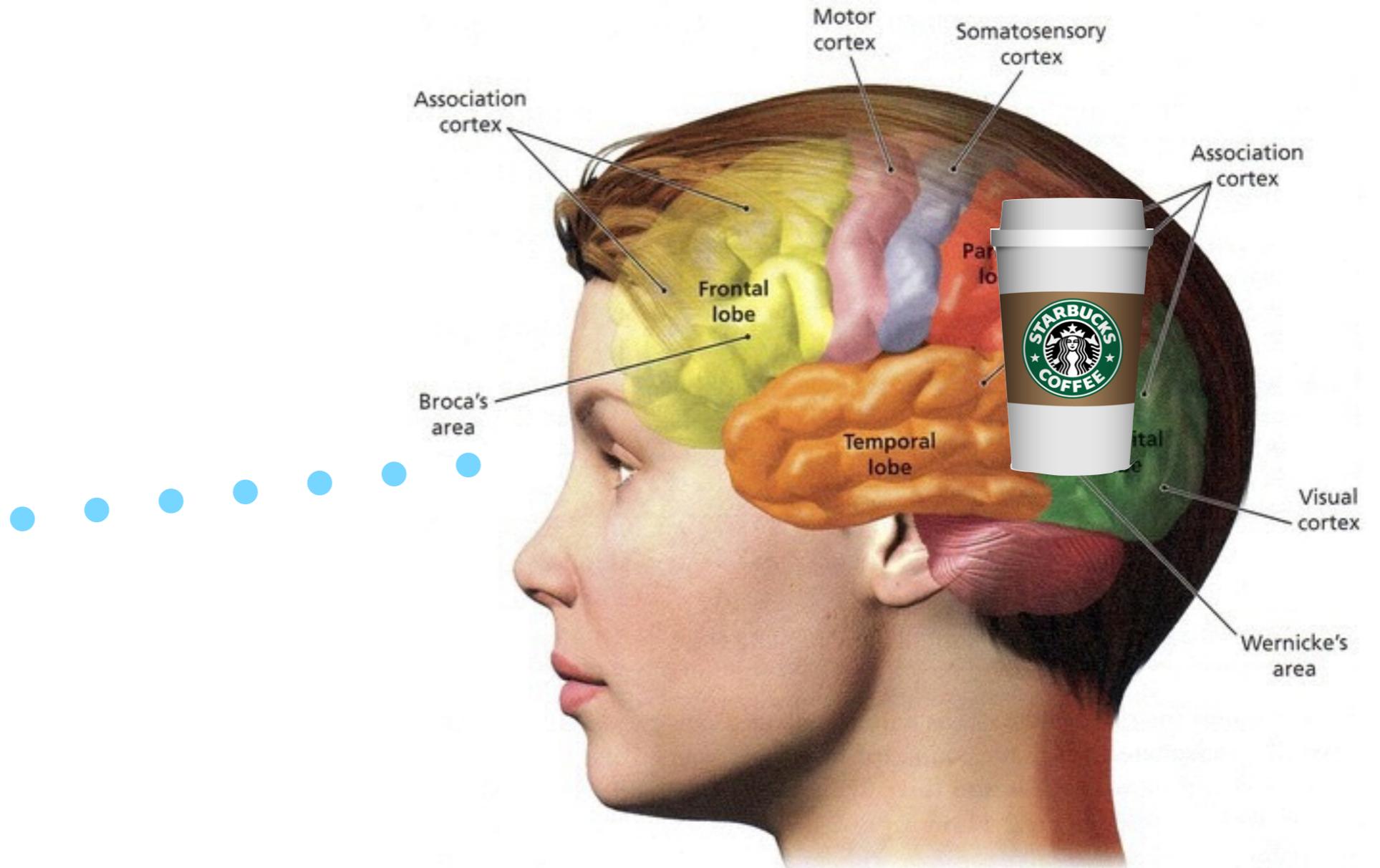




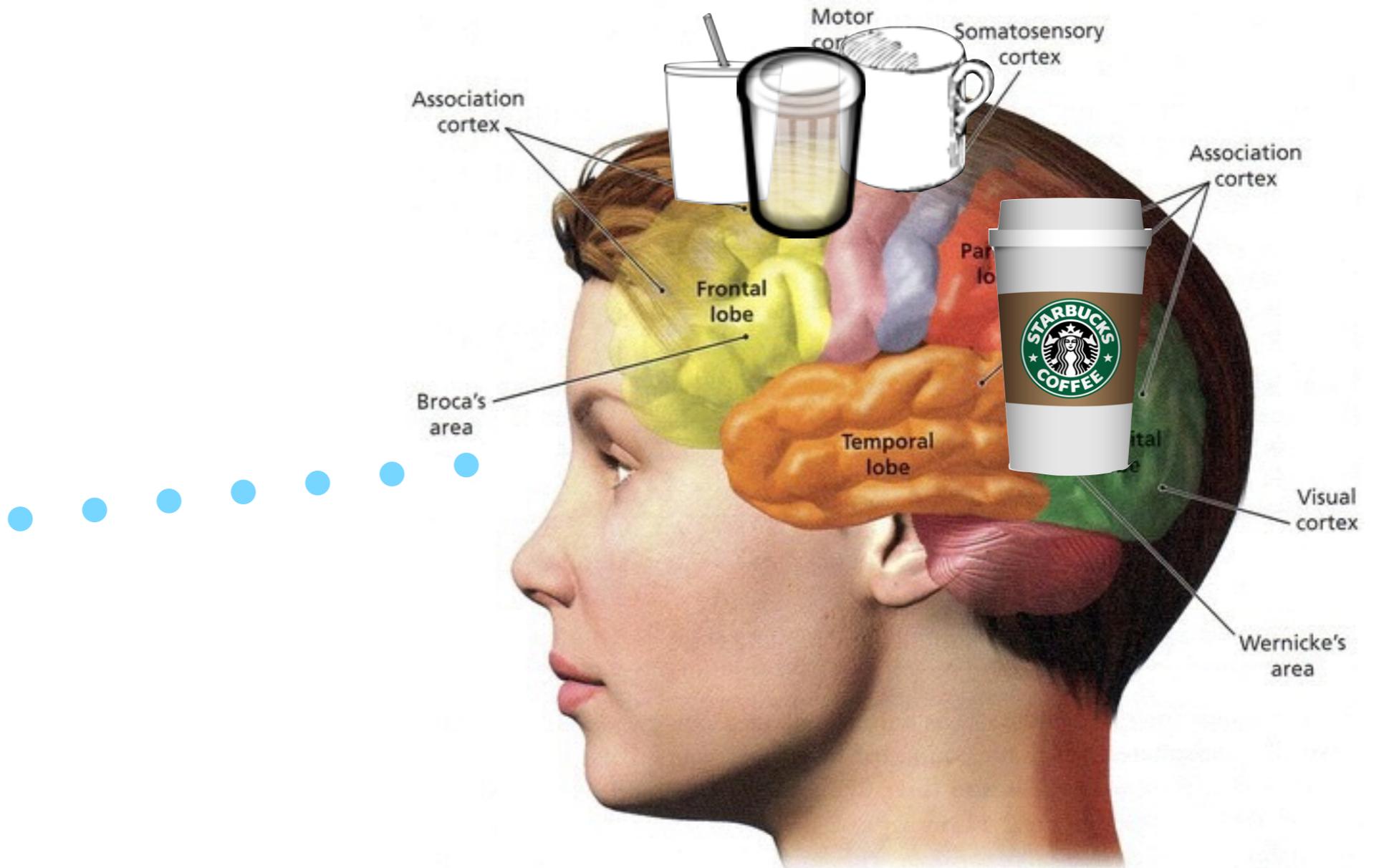




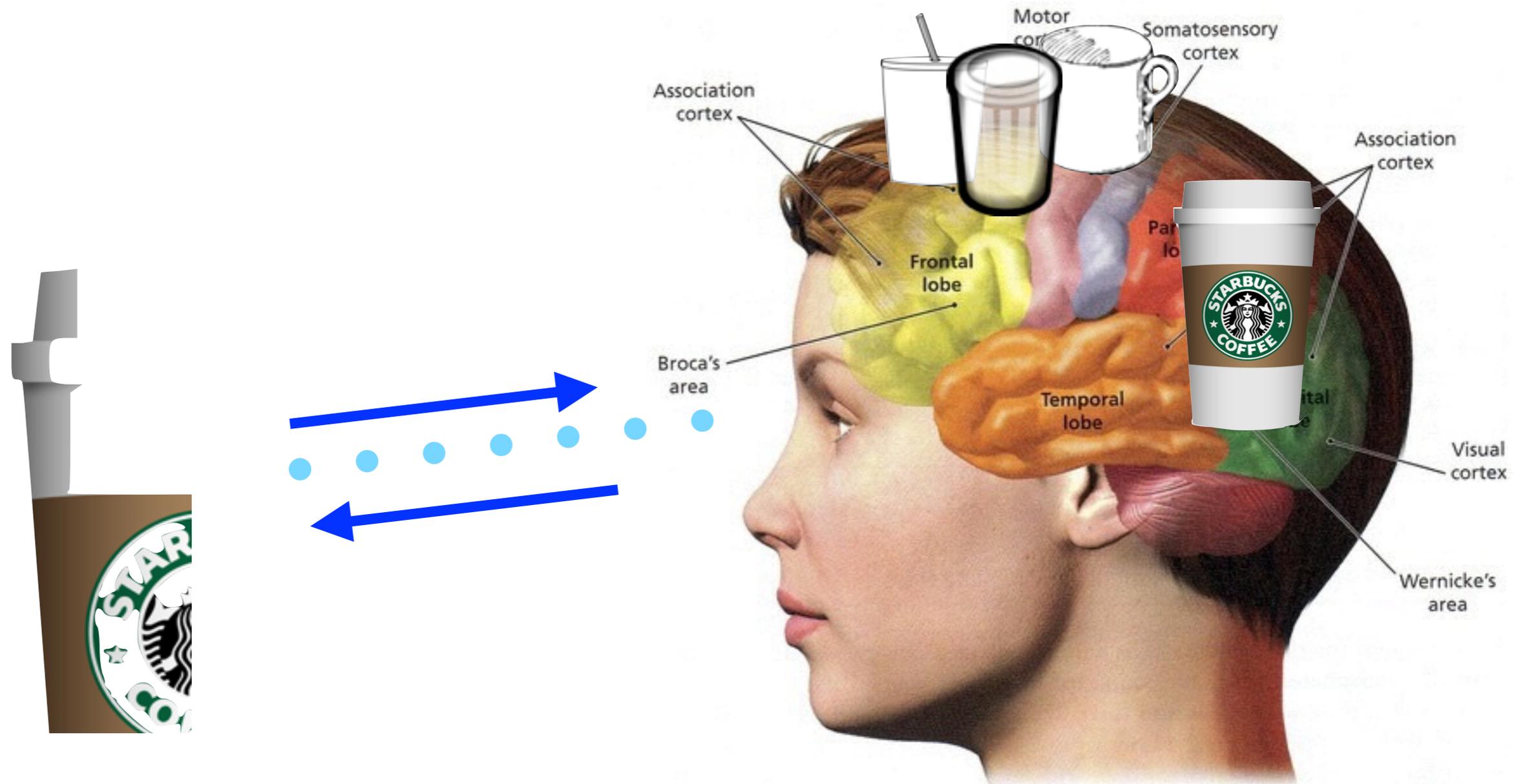
Processing



Processing

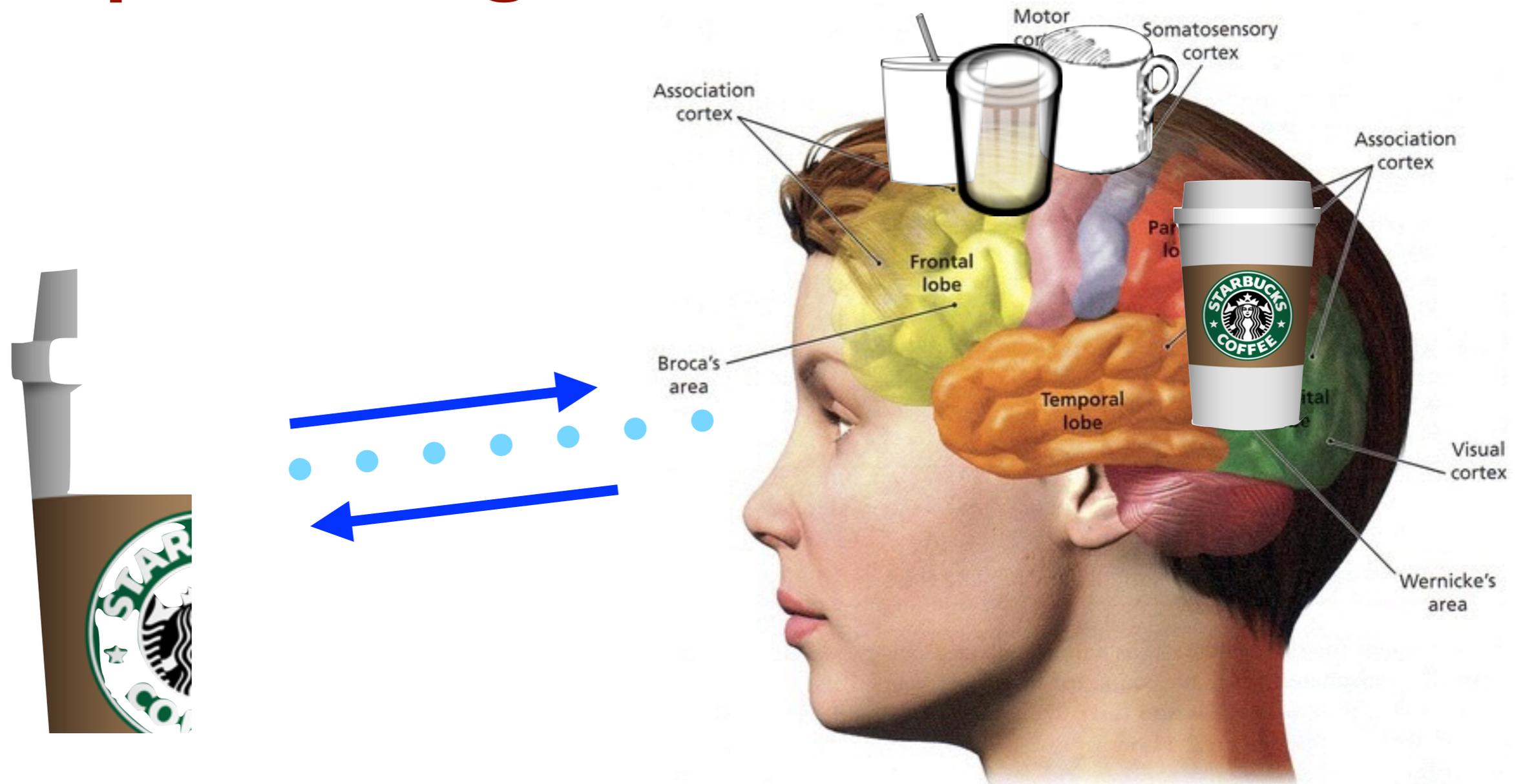


Processing



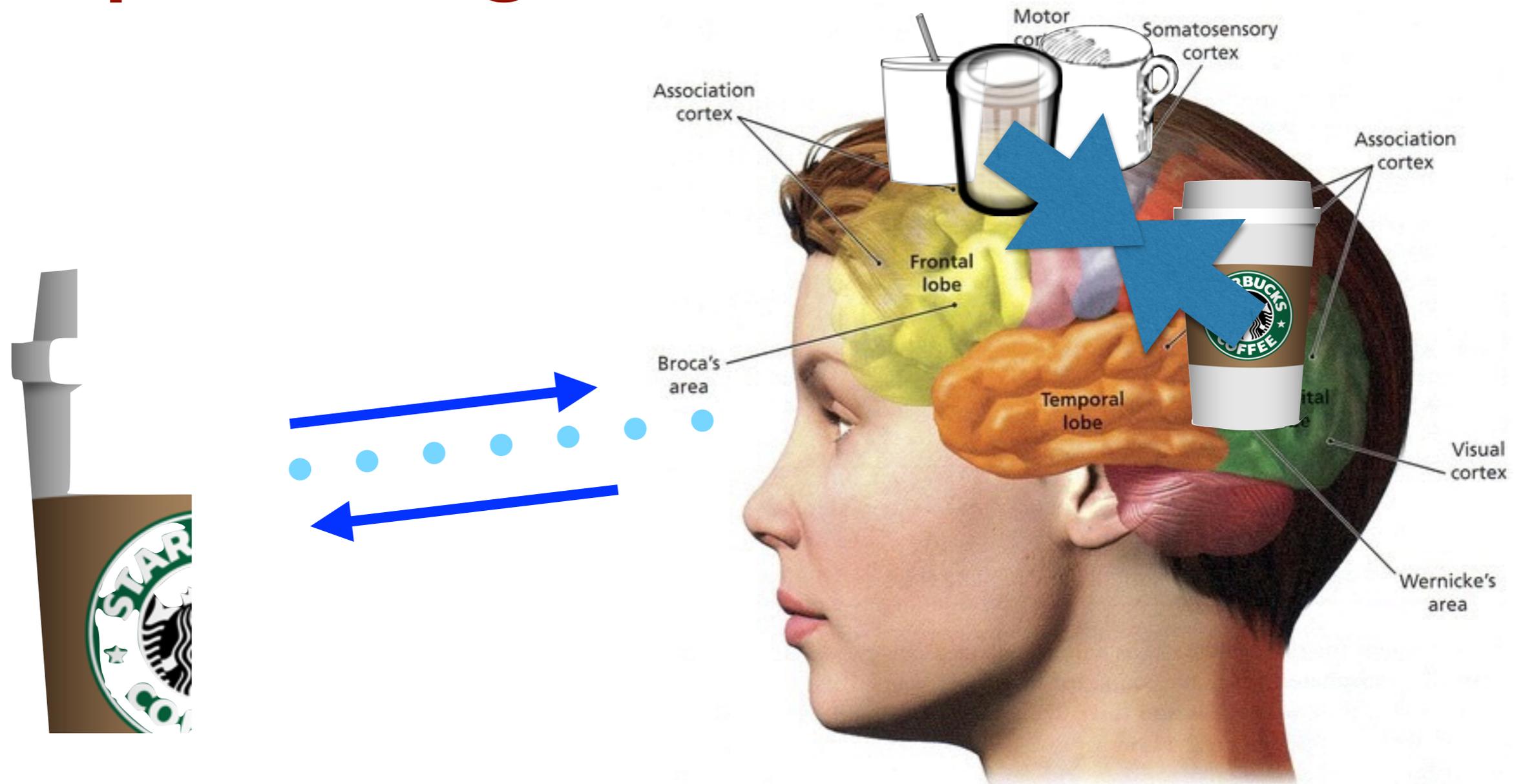
Processing

Simultaneous input
and predicting



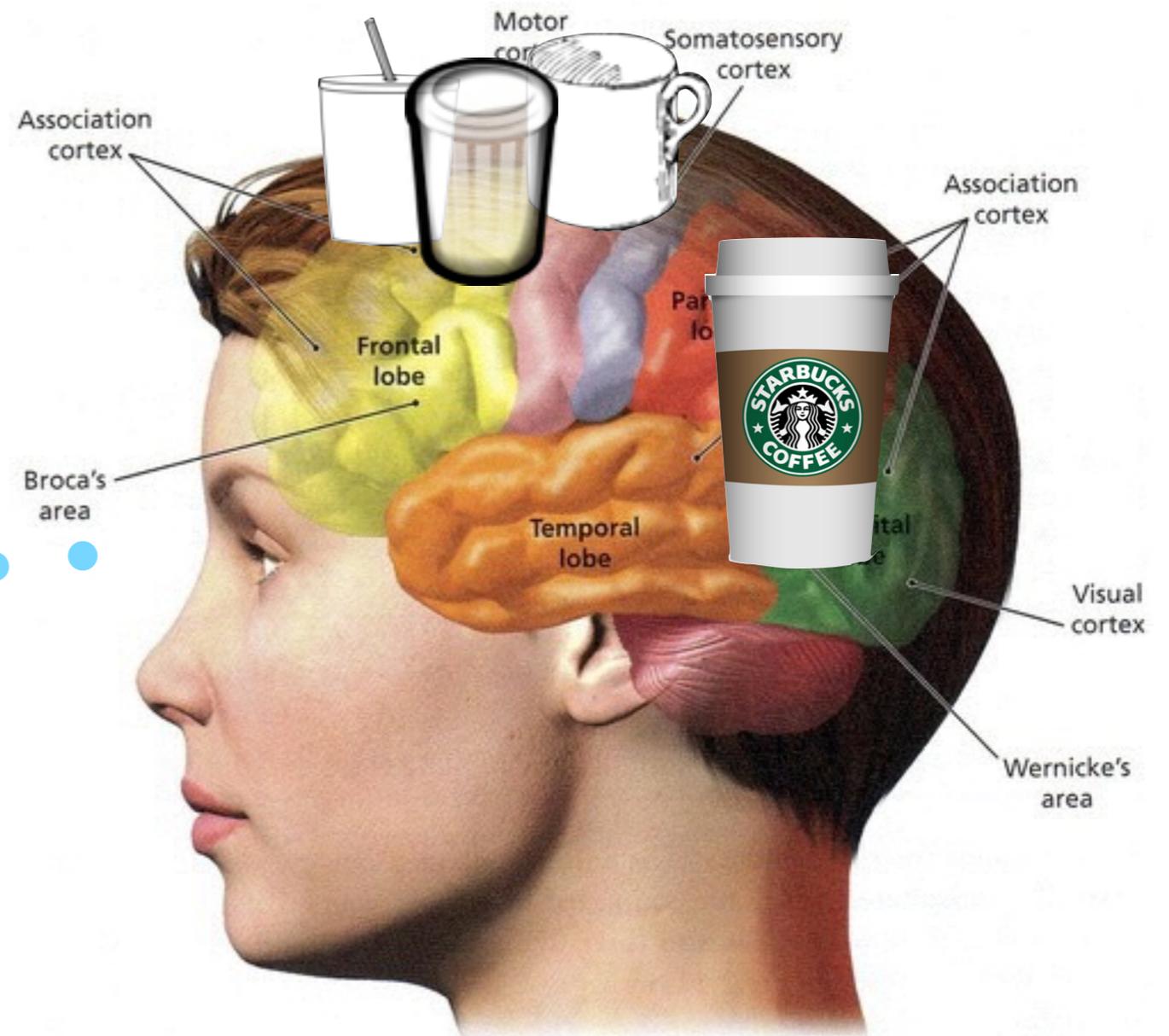
Processing

Simultaneous input
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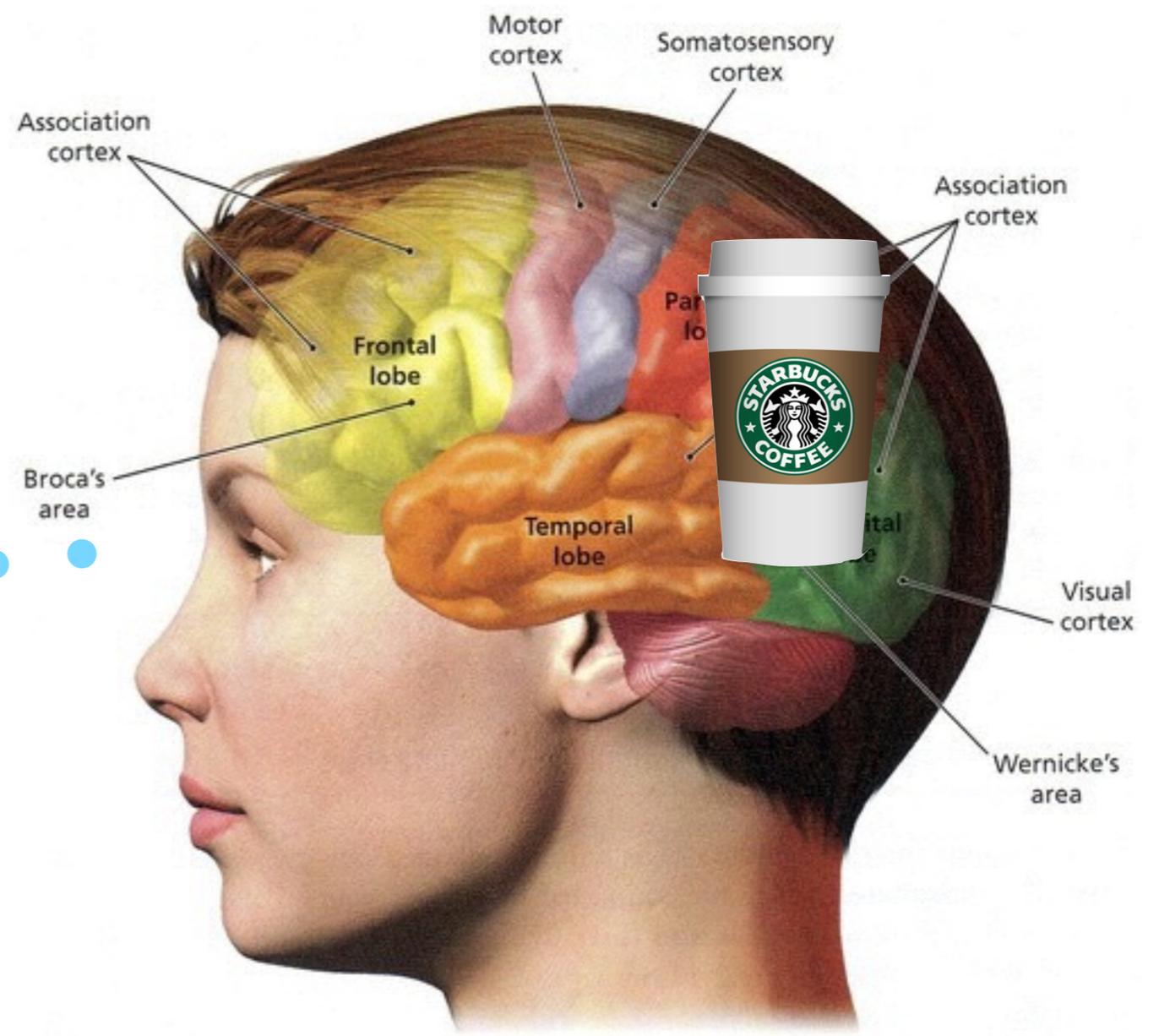
Predictive Processing

Representations with affordances



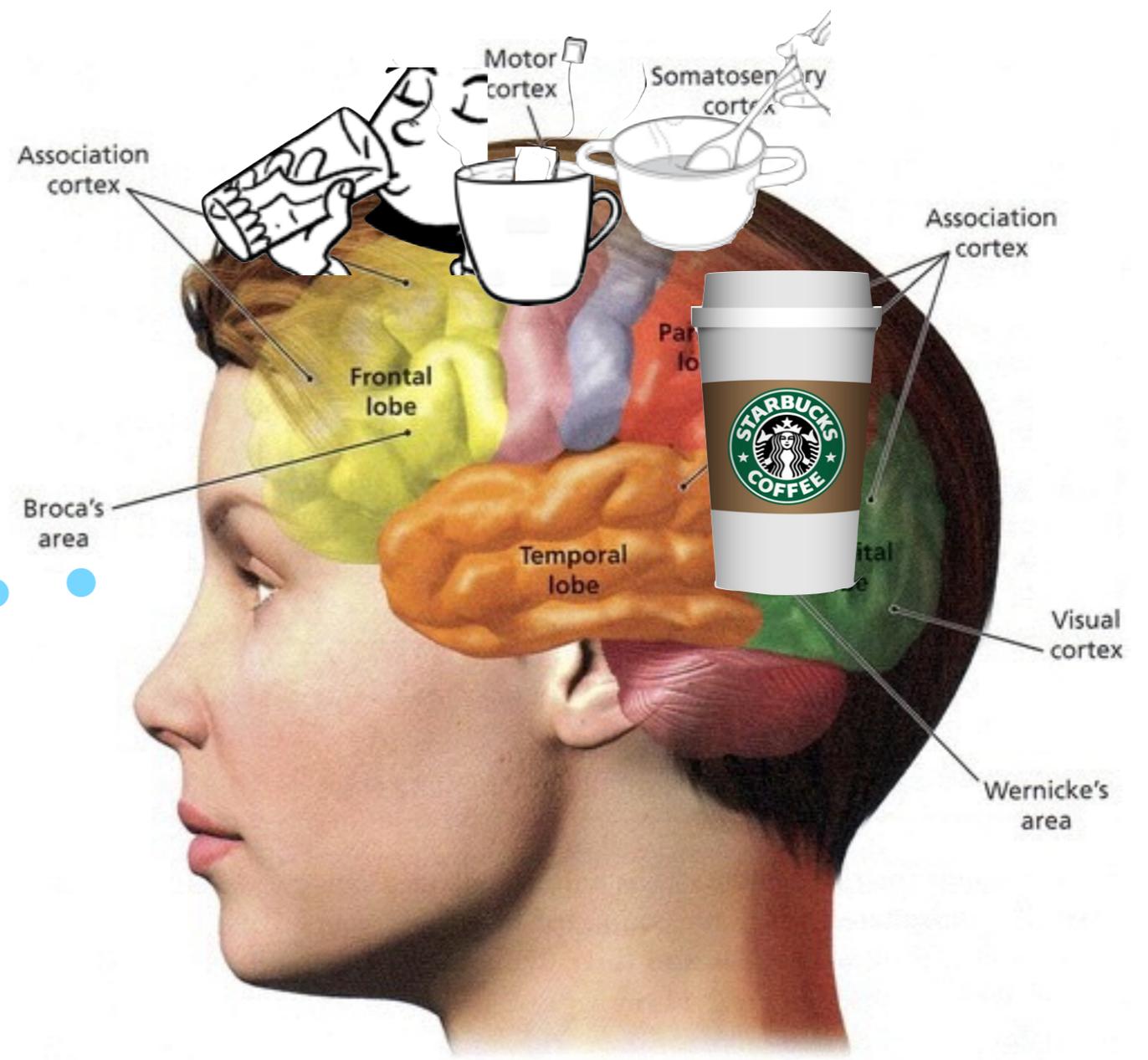
Predictive Processing

Representations with affordances



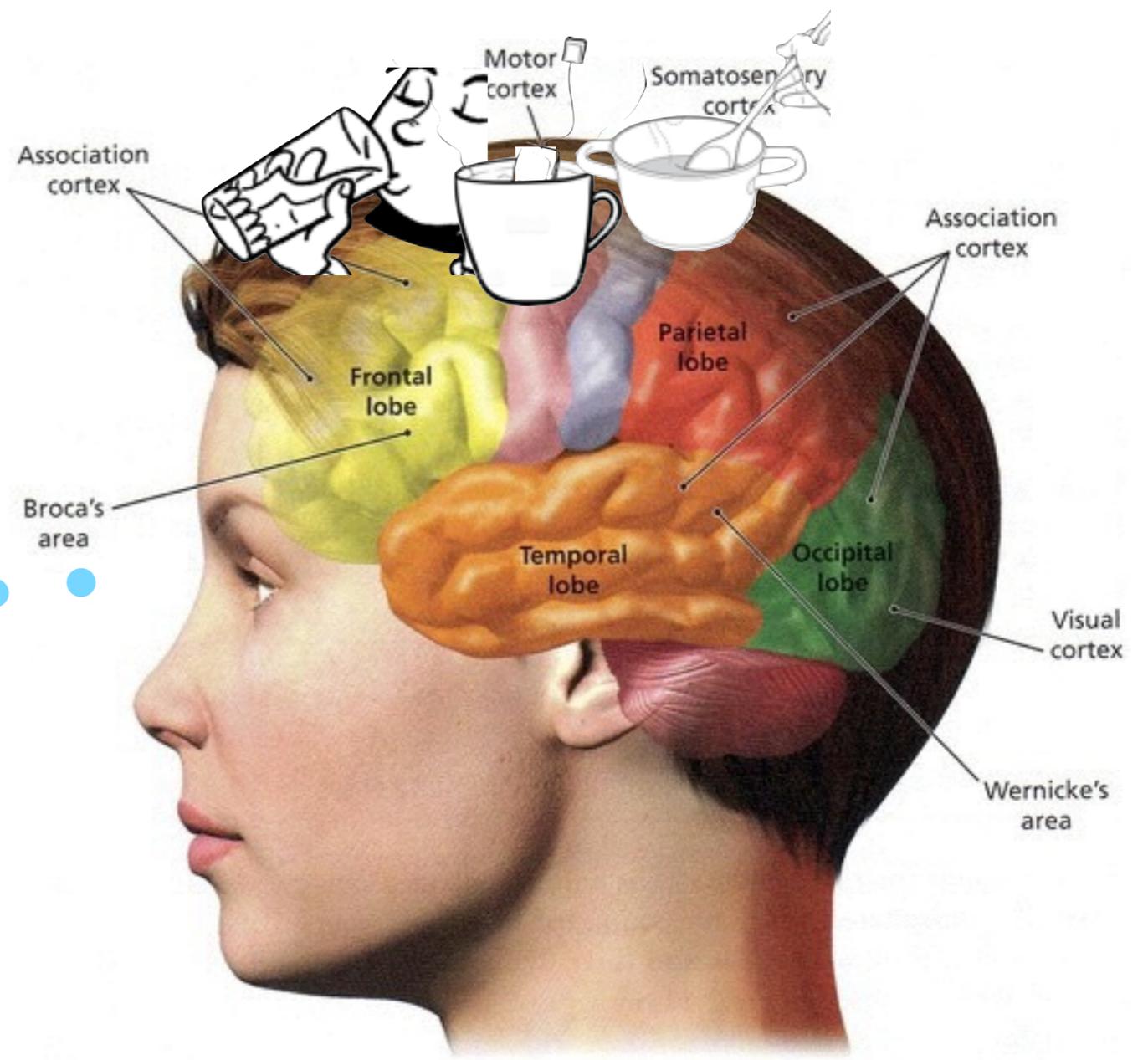
Predictive Processing

Representations with affordances



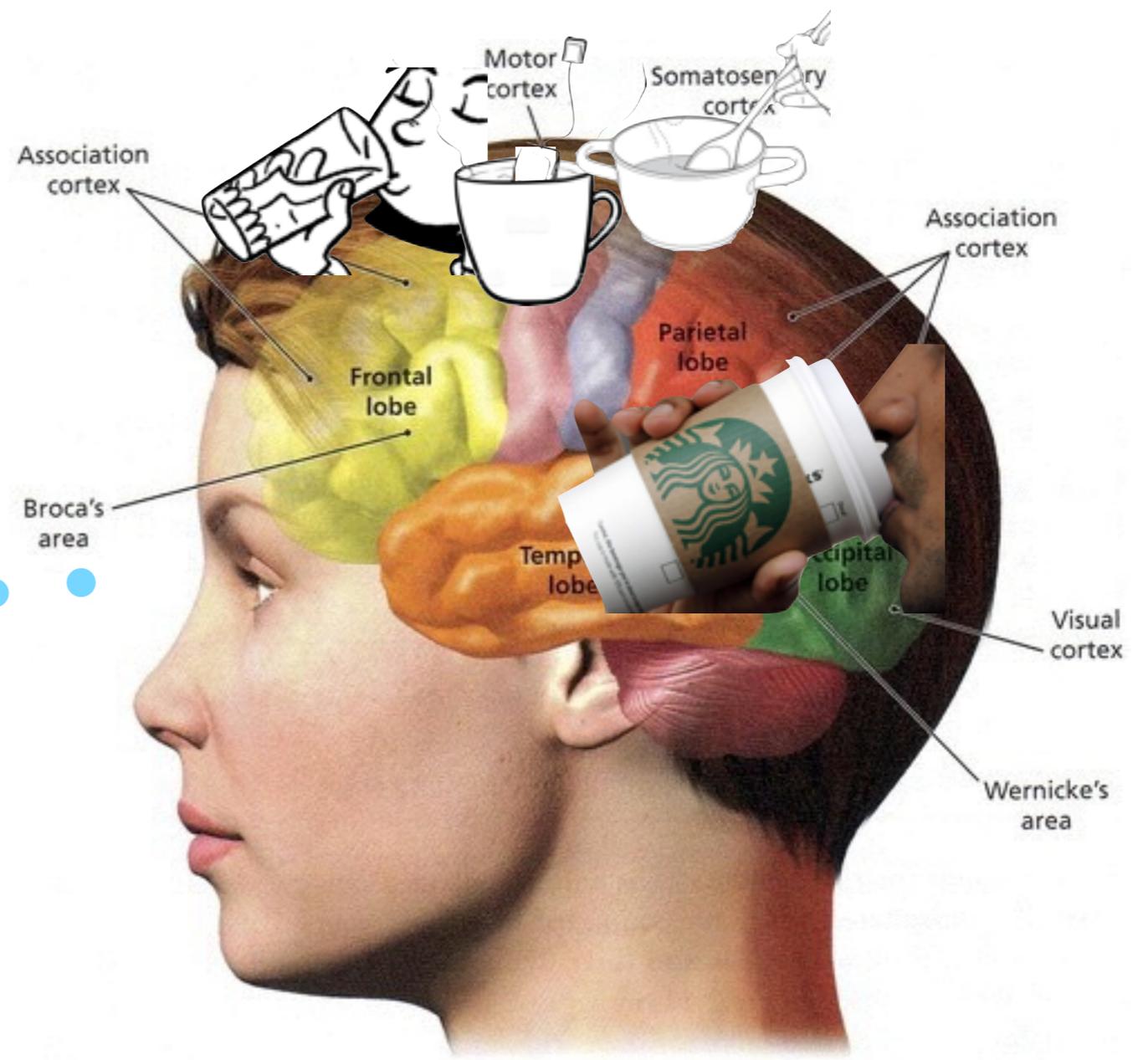
Predictive Processing

Representations with affordances



Predictive Processing

Representations with affordances



Predictive Processing

**Representations
with affordances**



Predictive Processing

**Representations
with affordances**

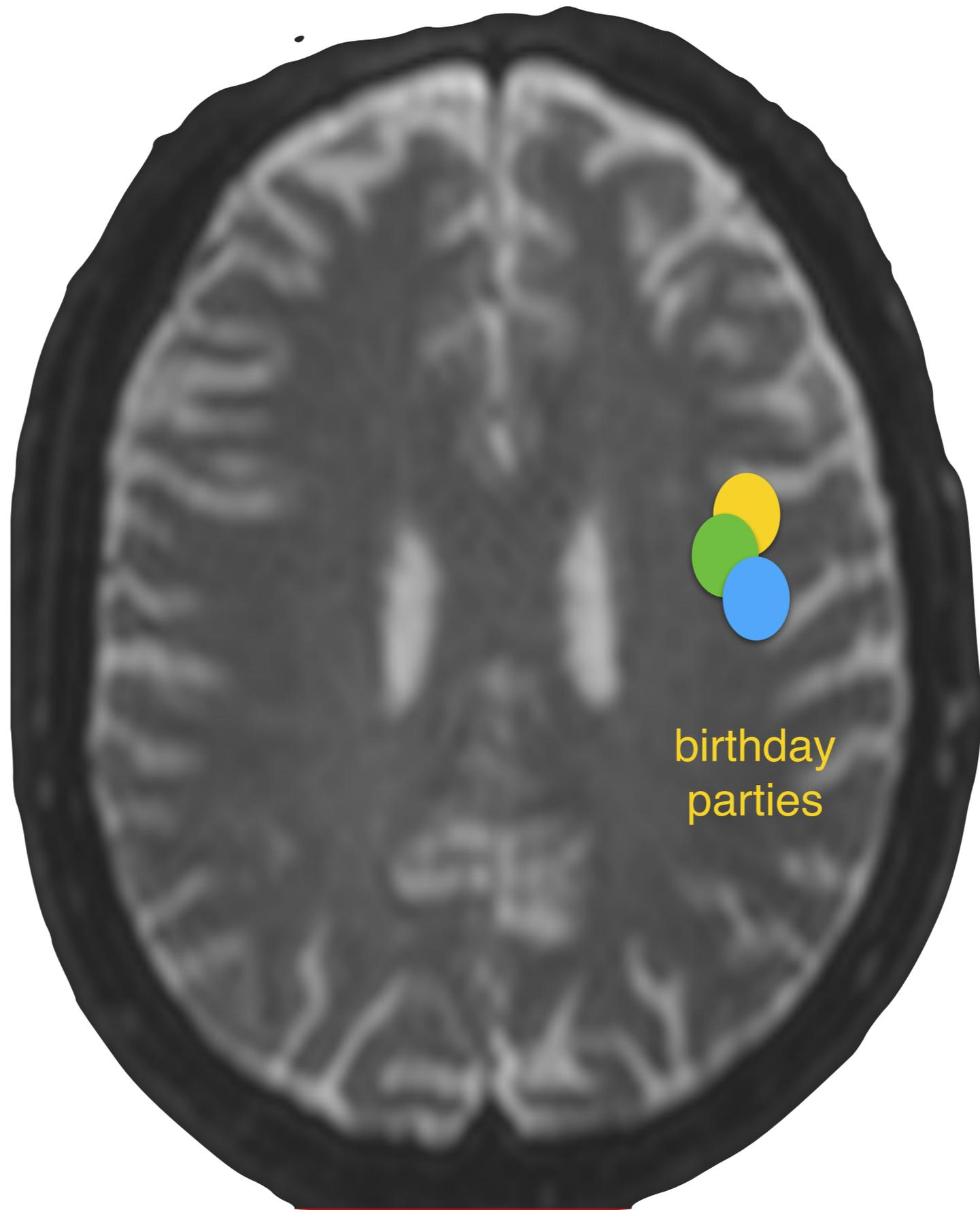


Predictive Processing

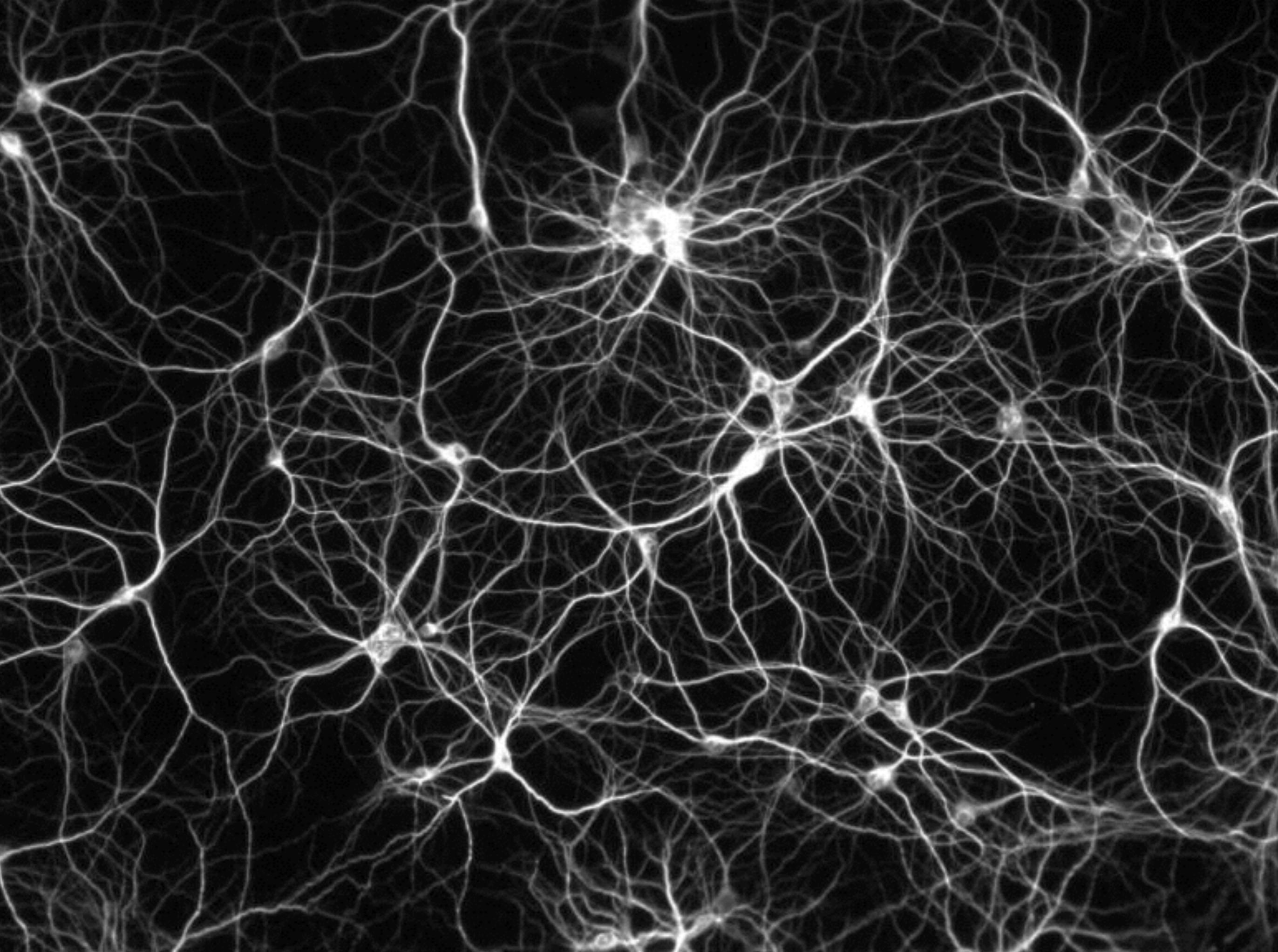
**Representations
with affordances**

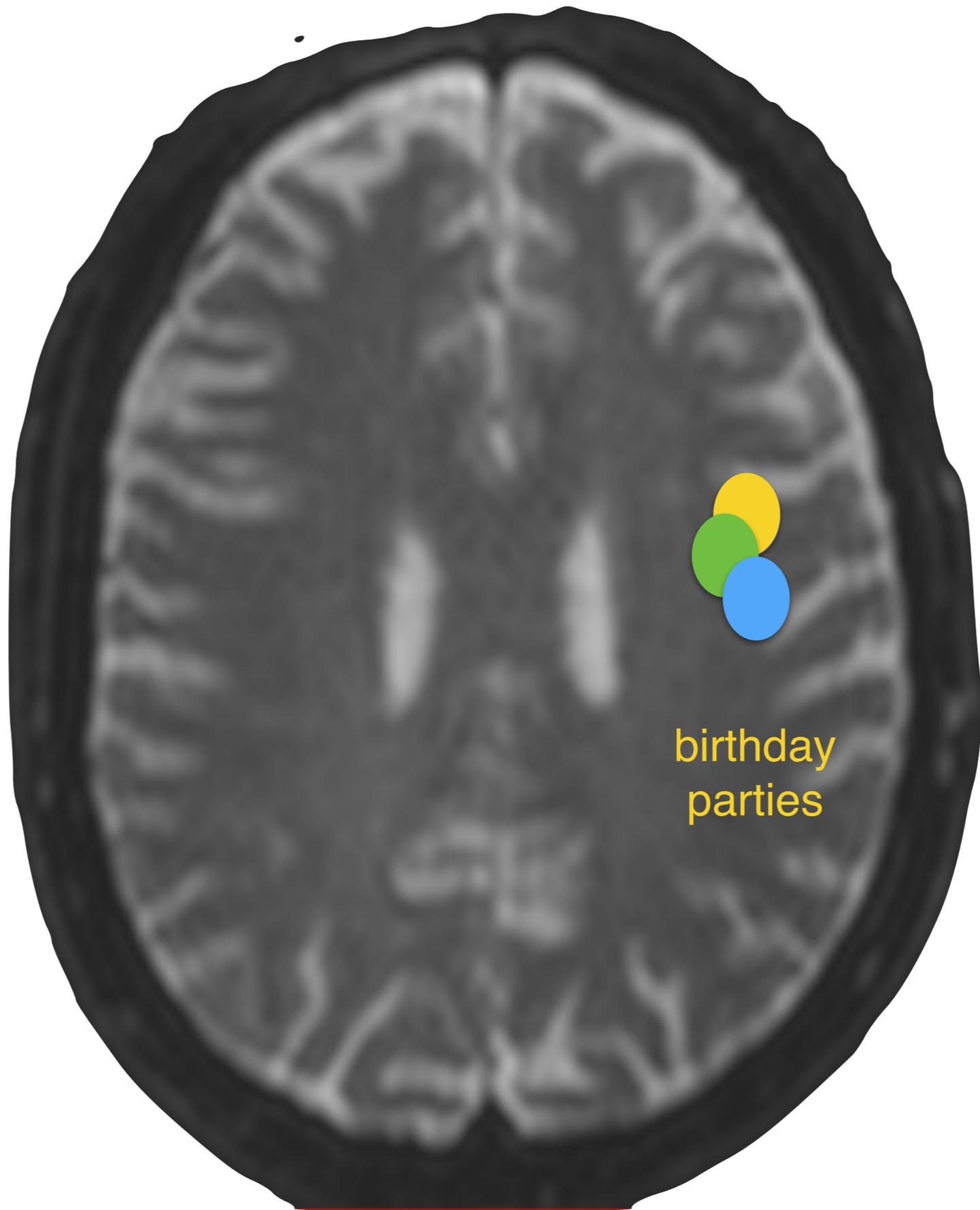


**Birthday
Parties!**



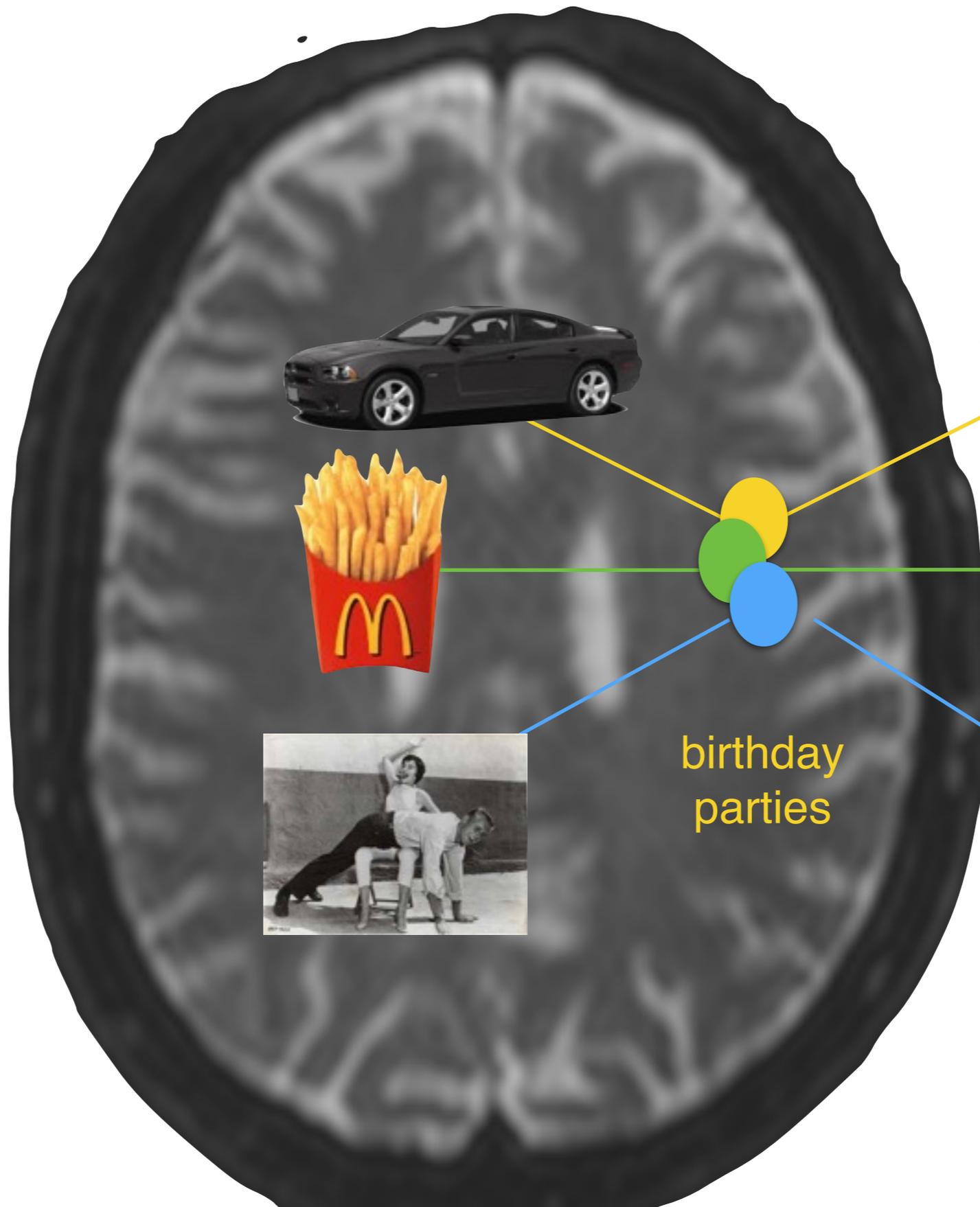
birthday
parties





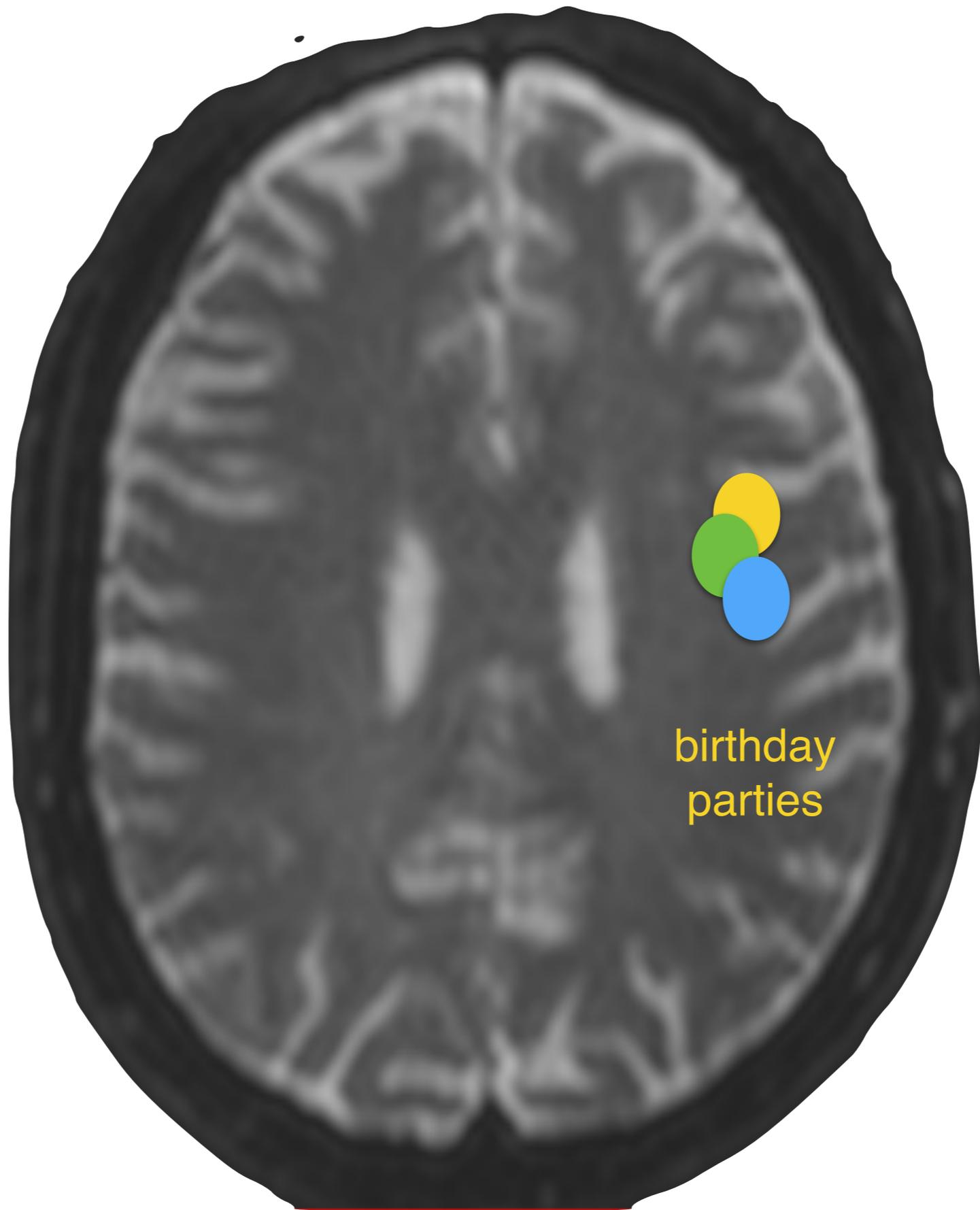
birthday
parties





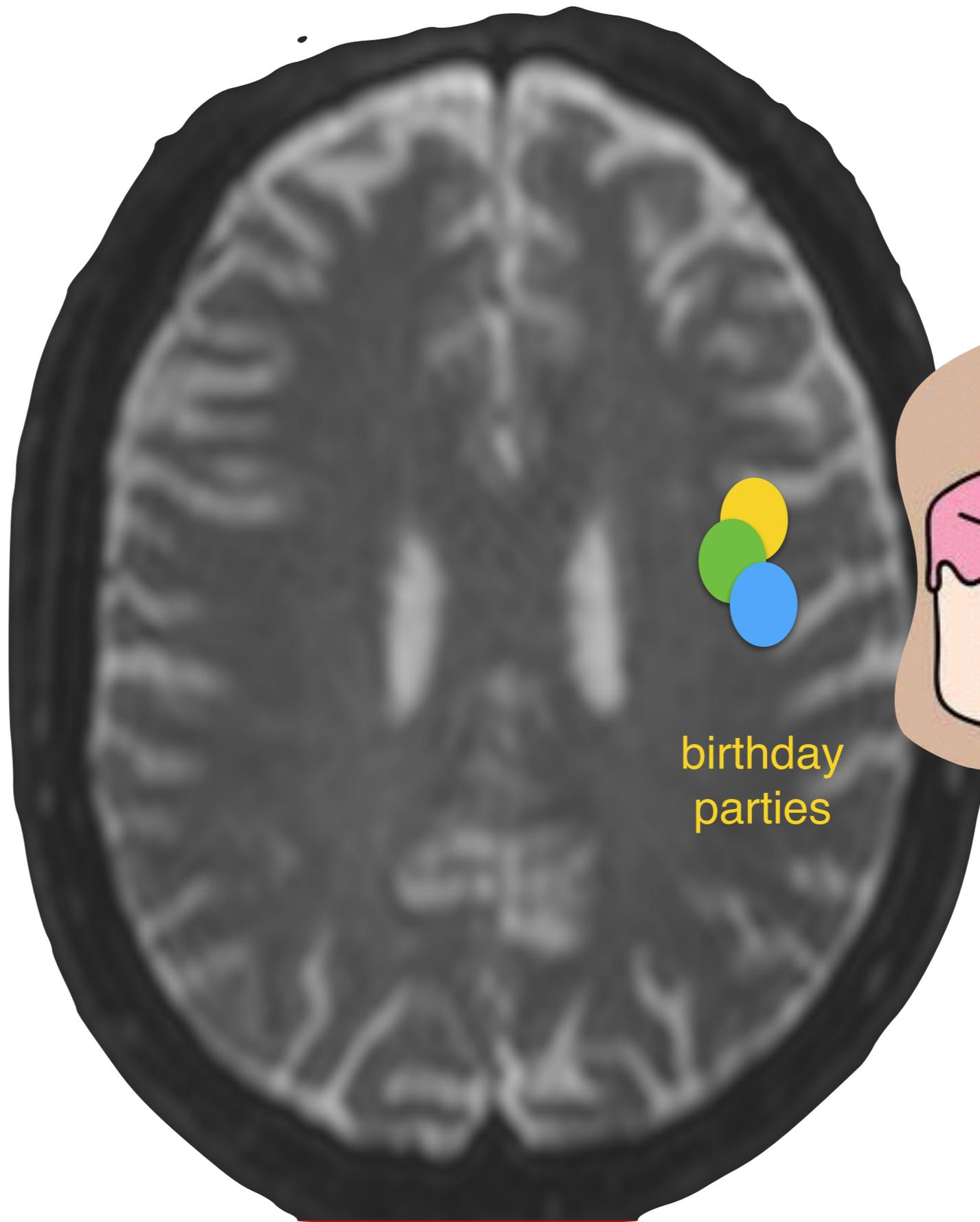
birthday parties





birthday
parties





birthday parties



Predictive Processing



Predictive Processing



Hierarchical Generative Models

Error Coding

Error Coding



Error Coding



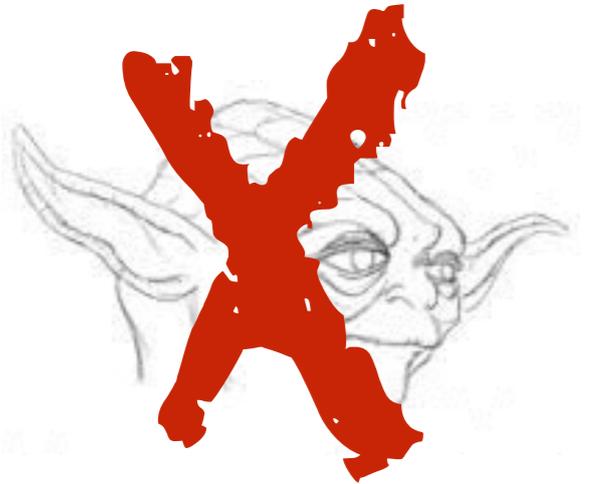
Error Coding



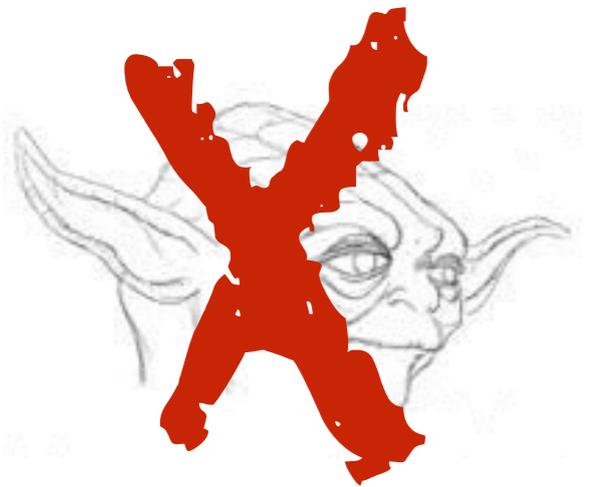
Error Coding



Error Coding



Error Coding



Error Coding



DOPAMINE

Predicting

What is this person is saying?

**The Constitution Center is at the
next stop**

Predicting

What is this person is saying?

The Constitution Center is at the
next stop

Predicting

What is this person is saying?

Predicting

What is this person is saying?

Predicting

What is this person is saying?



**Your brain is predicting right now...
-even against your conscious will!**



**Your brain is predicting right now...
-even against your conscious will!**







Language?

Hierarchical Generative Models

Language?

Grammar

Hierarchical Generative Models

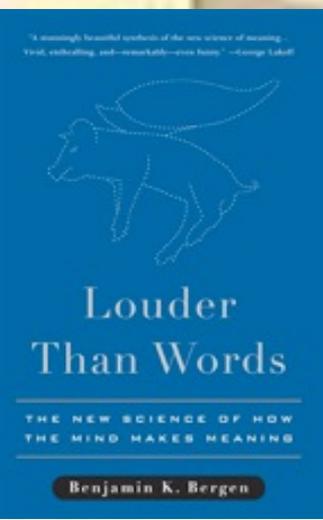
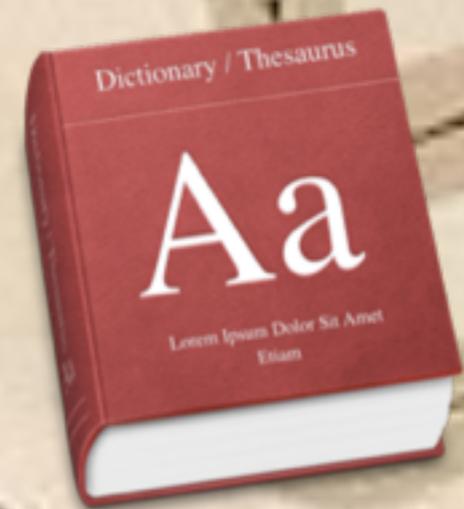
Language?

Simulations

Hierarchical Generative Models

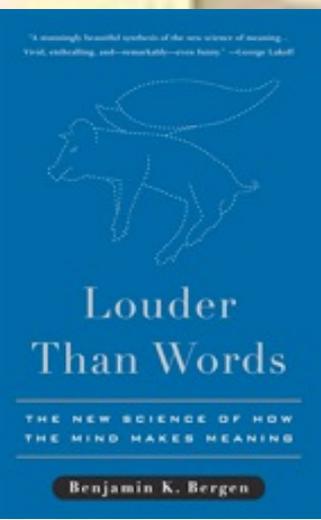
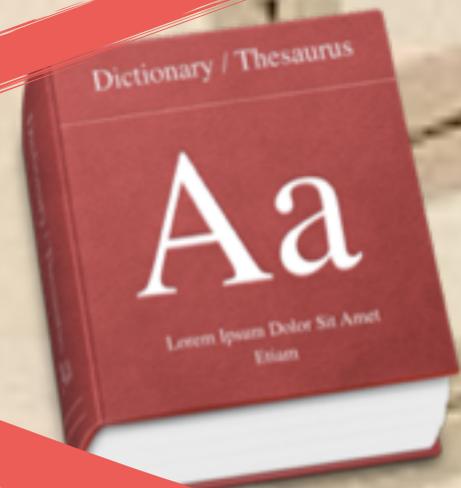
Cerebral
Cortex

Language



Cerebral
Cortex

Language



THE BRAIN



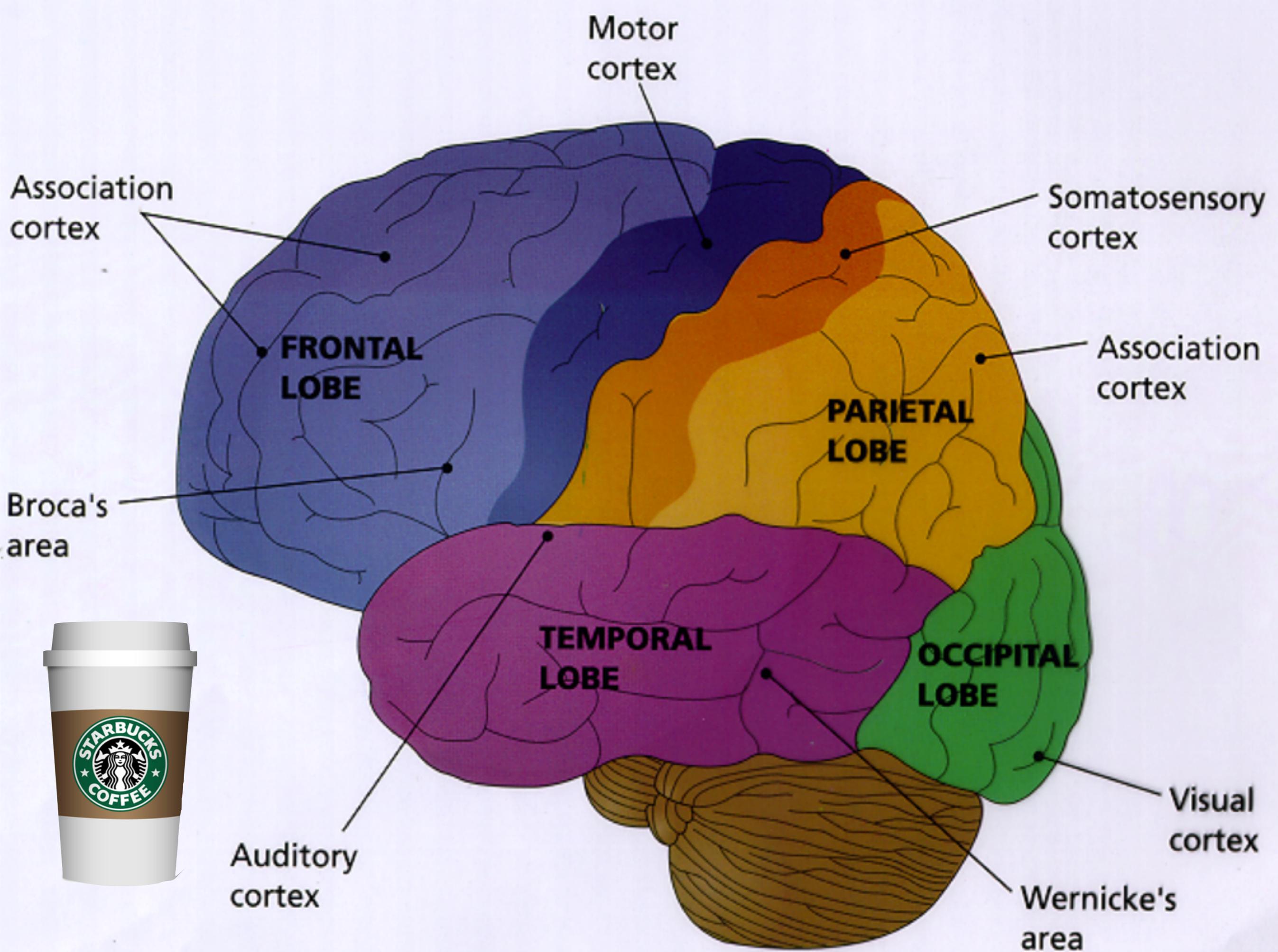
DICTIONARY

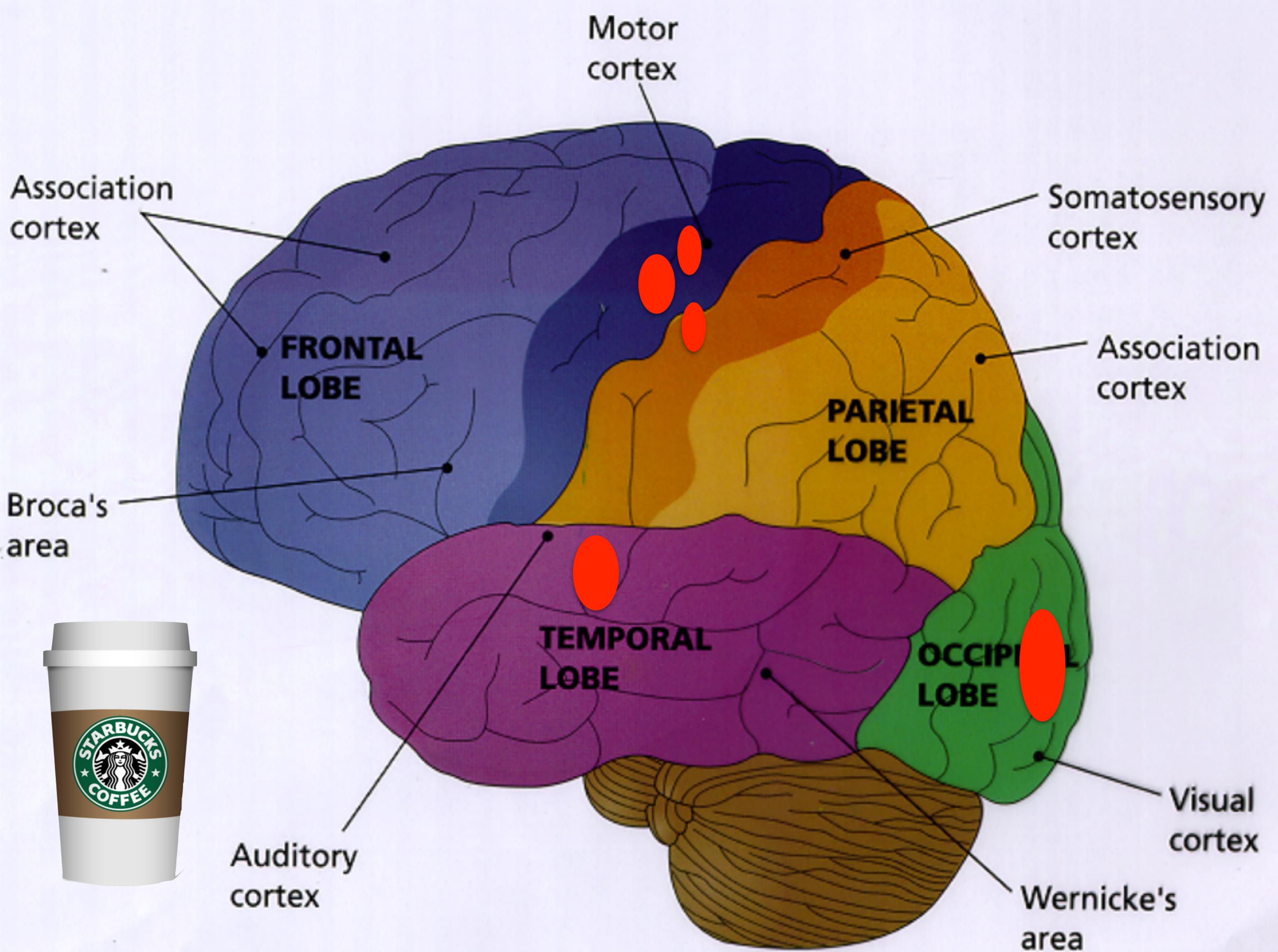
THE BRAIN

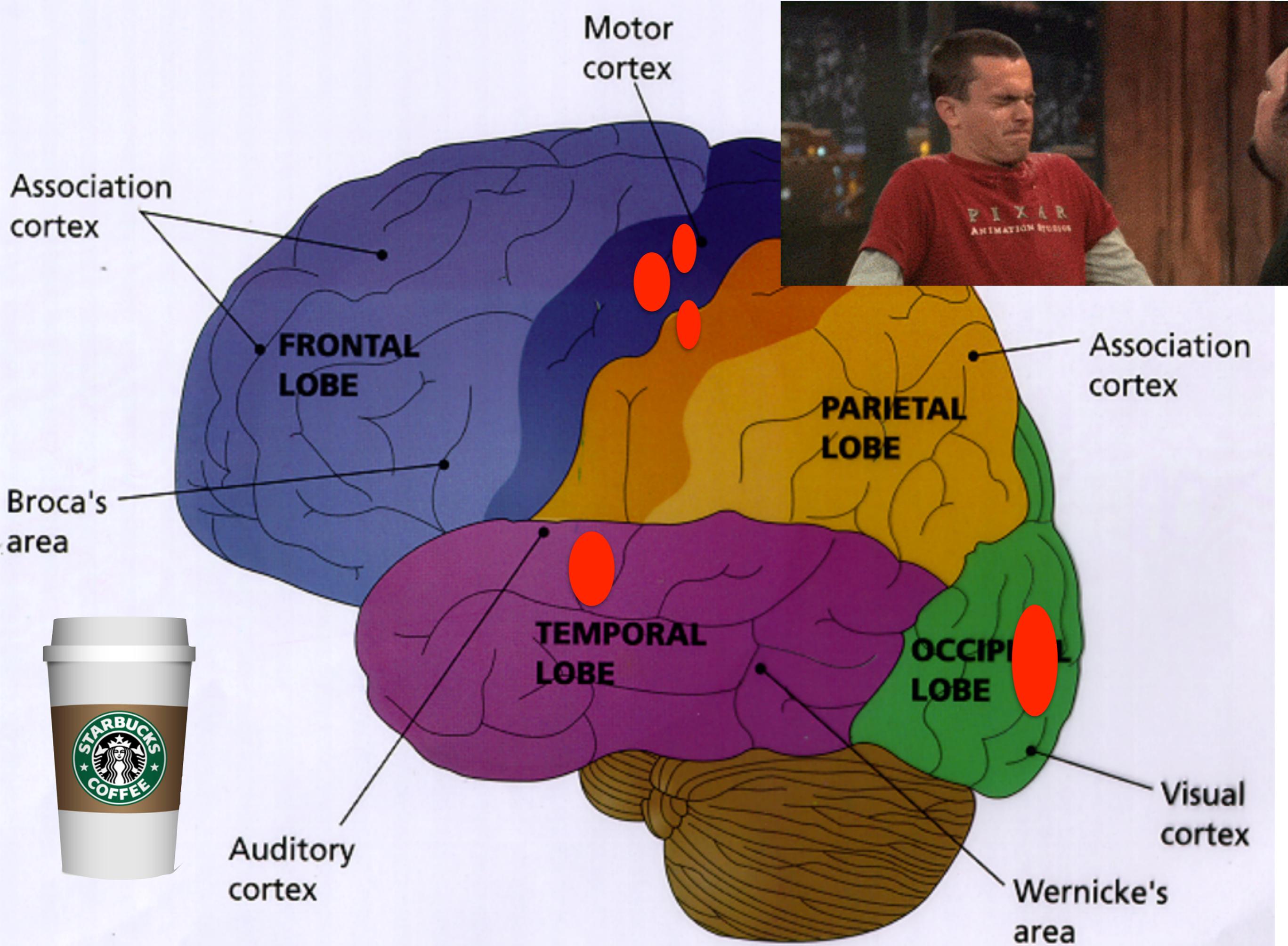


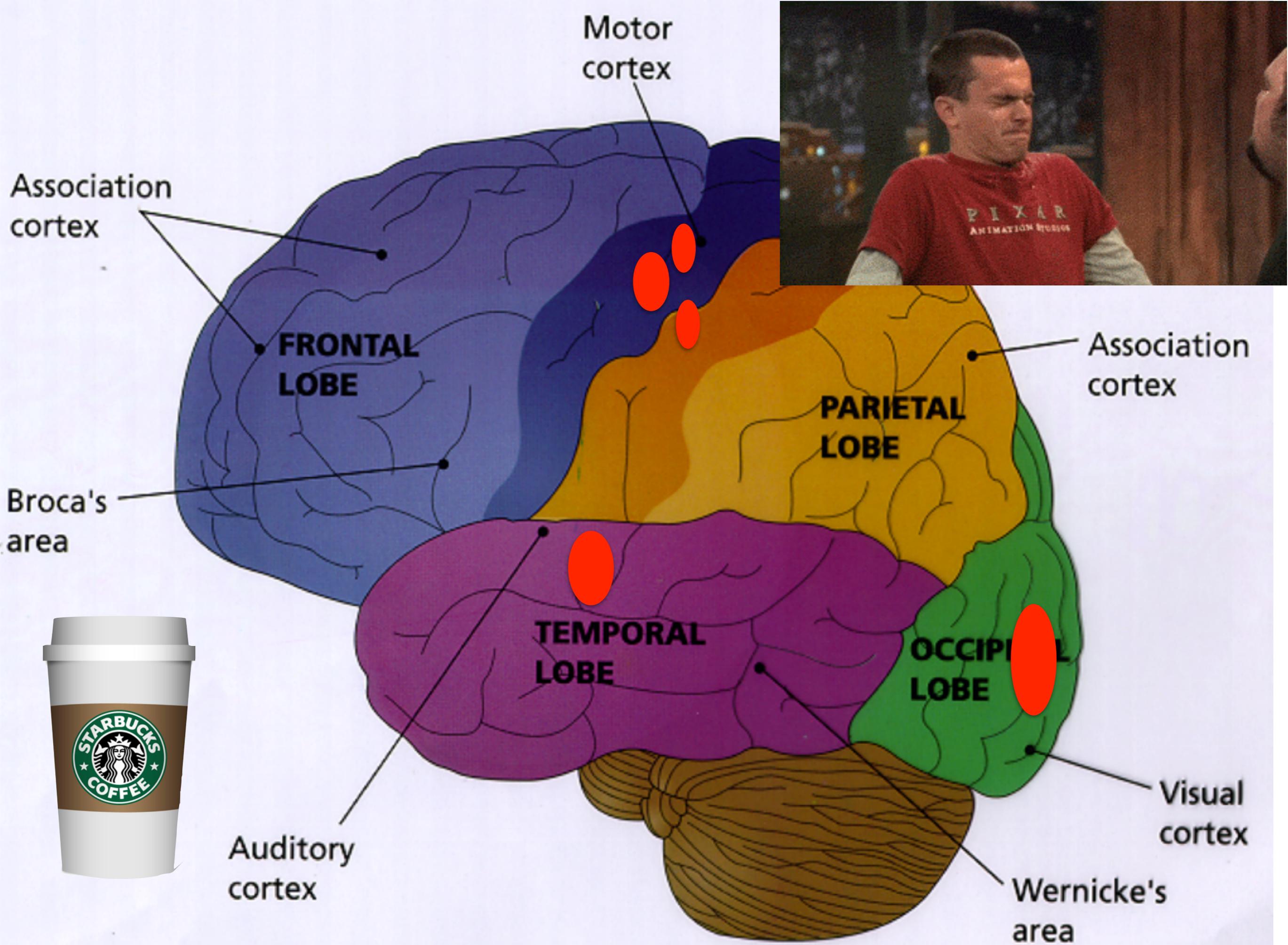
DICTIONARY

*A single brain spot is associated with a number of related words. And each single word lights up many different brain spots. Together they make up **networks** that represent the meanings of each word we use...*

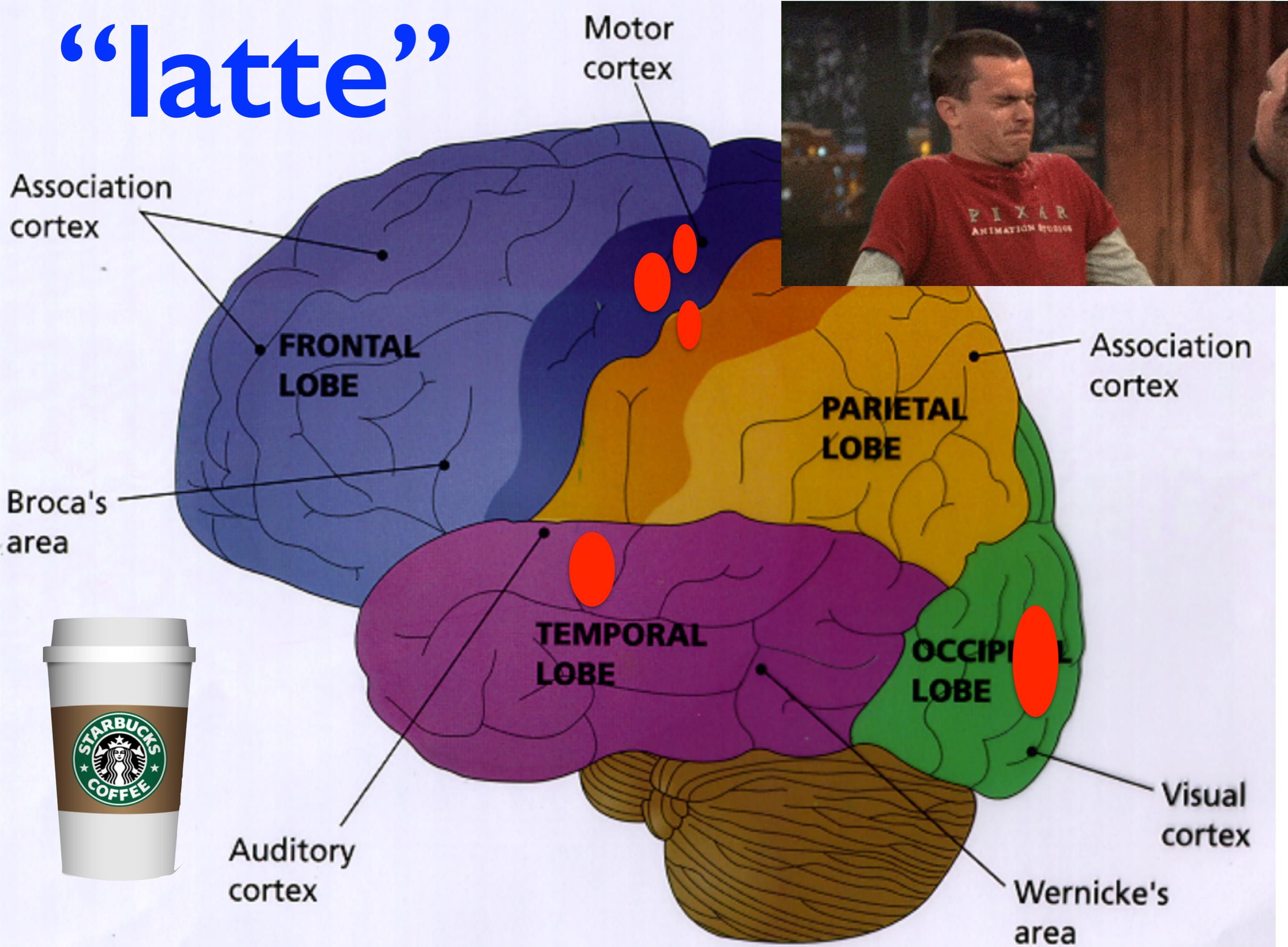








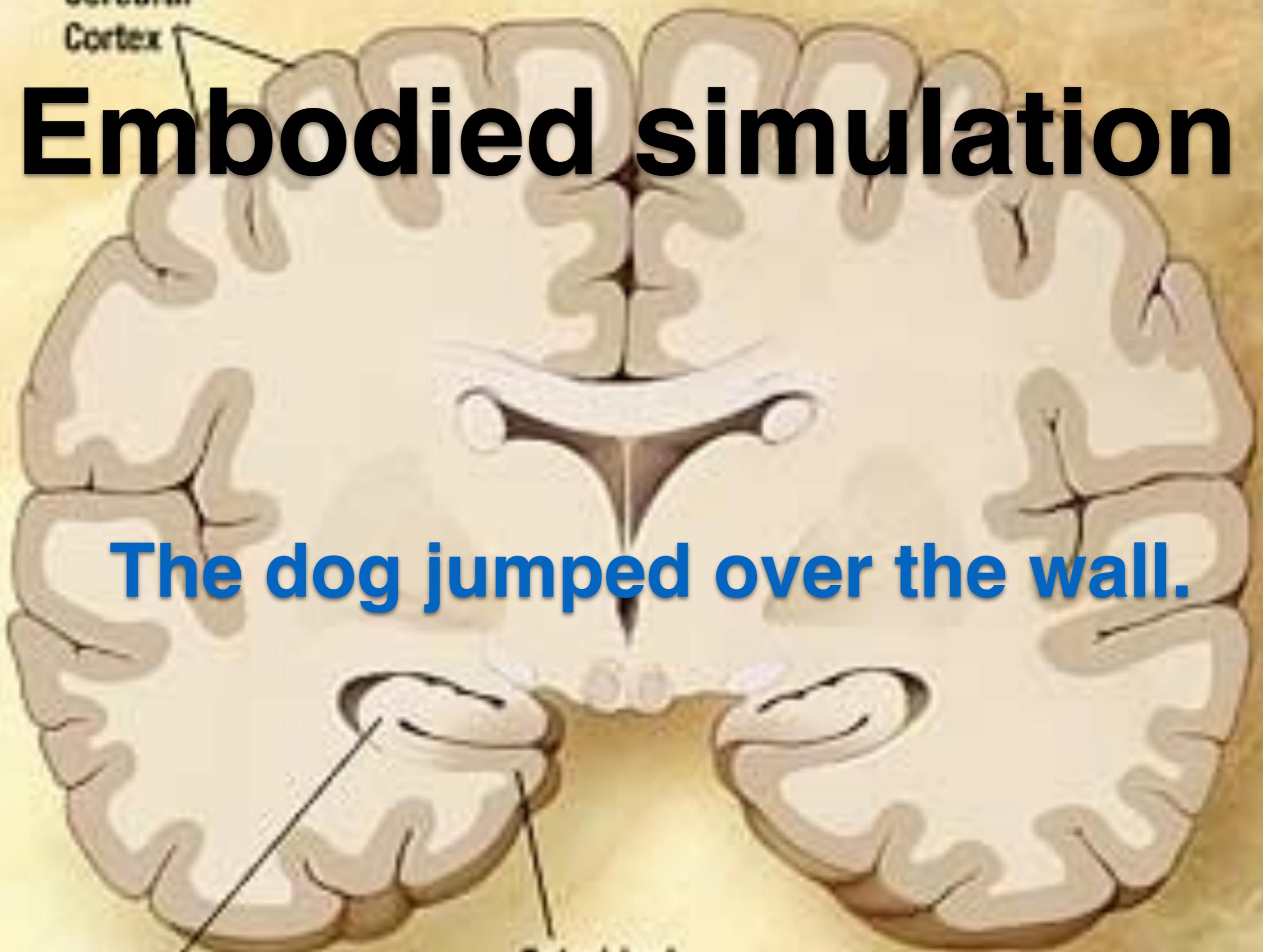
“latte”



Cerebral
Cortex

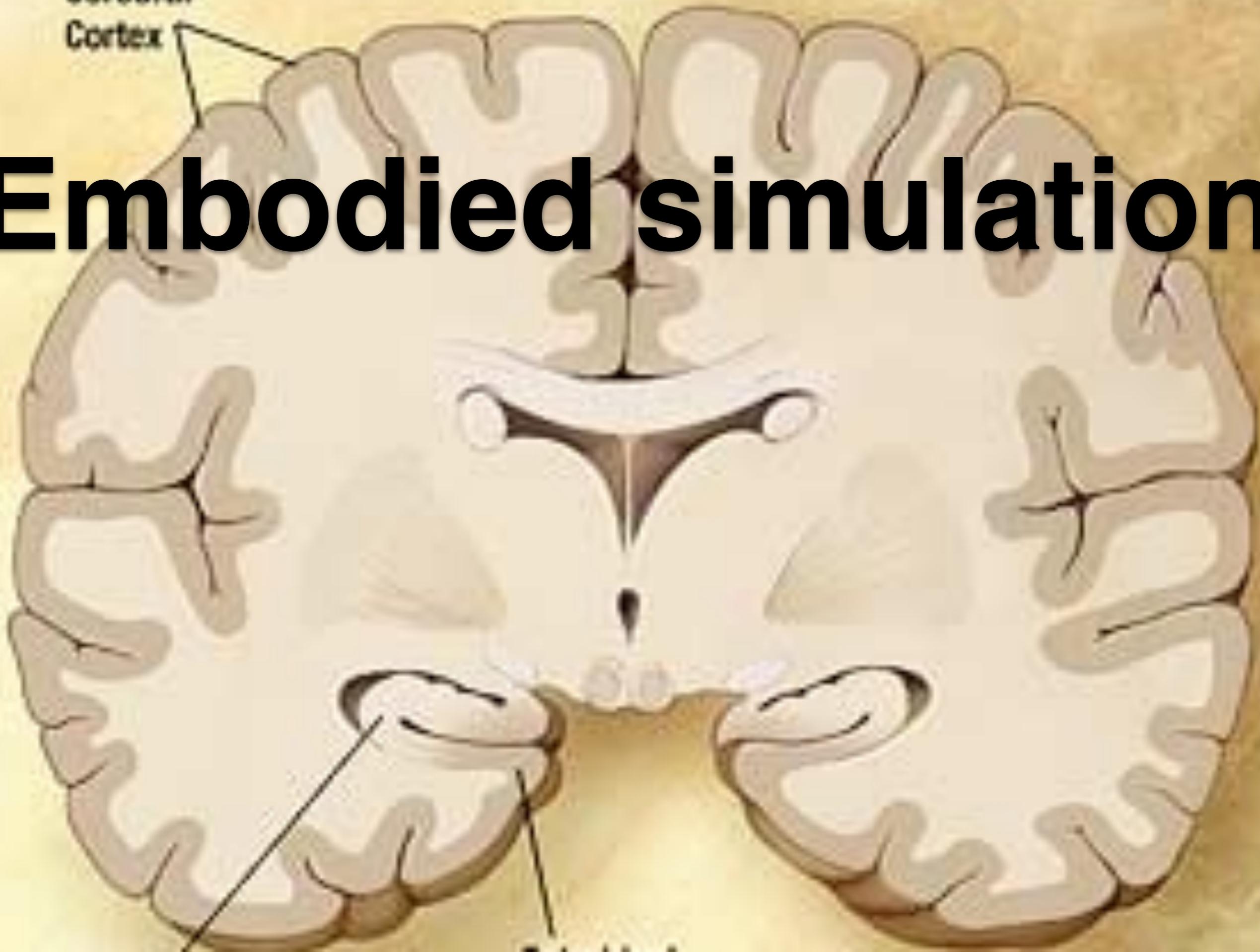
Embodied simulation

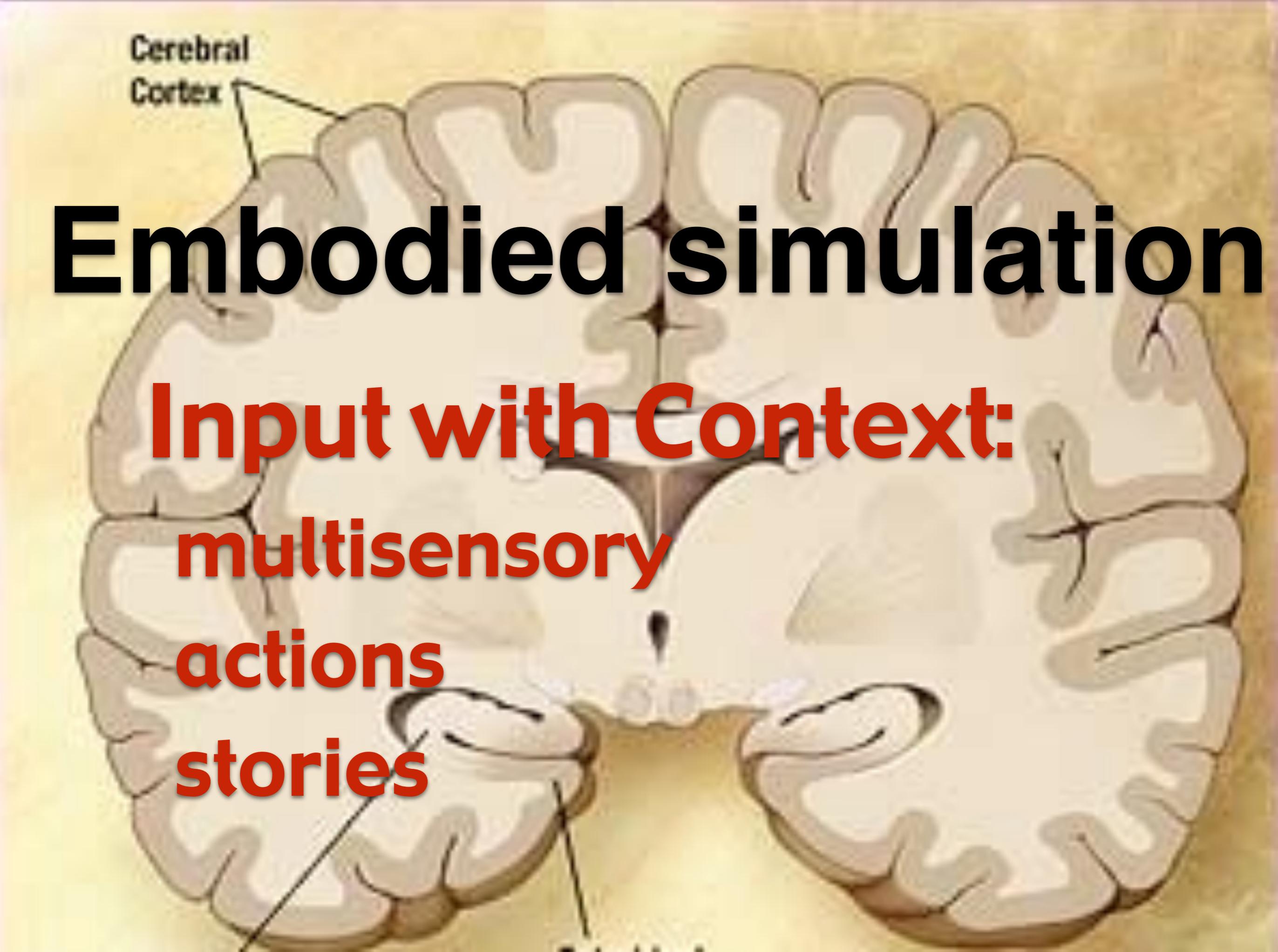
The dog jumped over the wall.



Cerebral
Cortex

Embodied simulation





Cerebral
Cortex

Embodied simulation

Input with Context:

multisensory

actions

stories

Dialog

Dialog & Comm. Task

A: Does John like carrots?

B: Yes. John likes carrots.

A: Does John like beans?

B: No. John does not like beans.



Write

List the pros and cons of “dialogs”.

(2 min)

Lecture on Socializing

Socializing

Language evolved to solve the crisis of visual theft
(and to exploit cooperation and exchange)

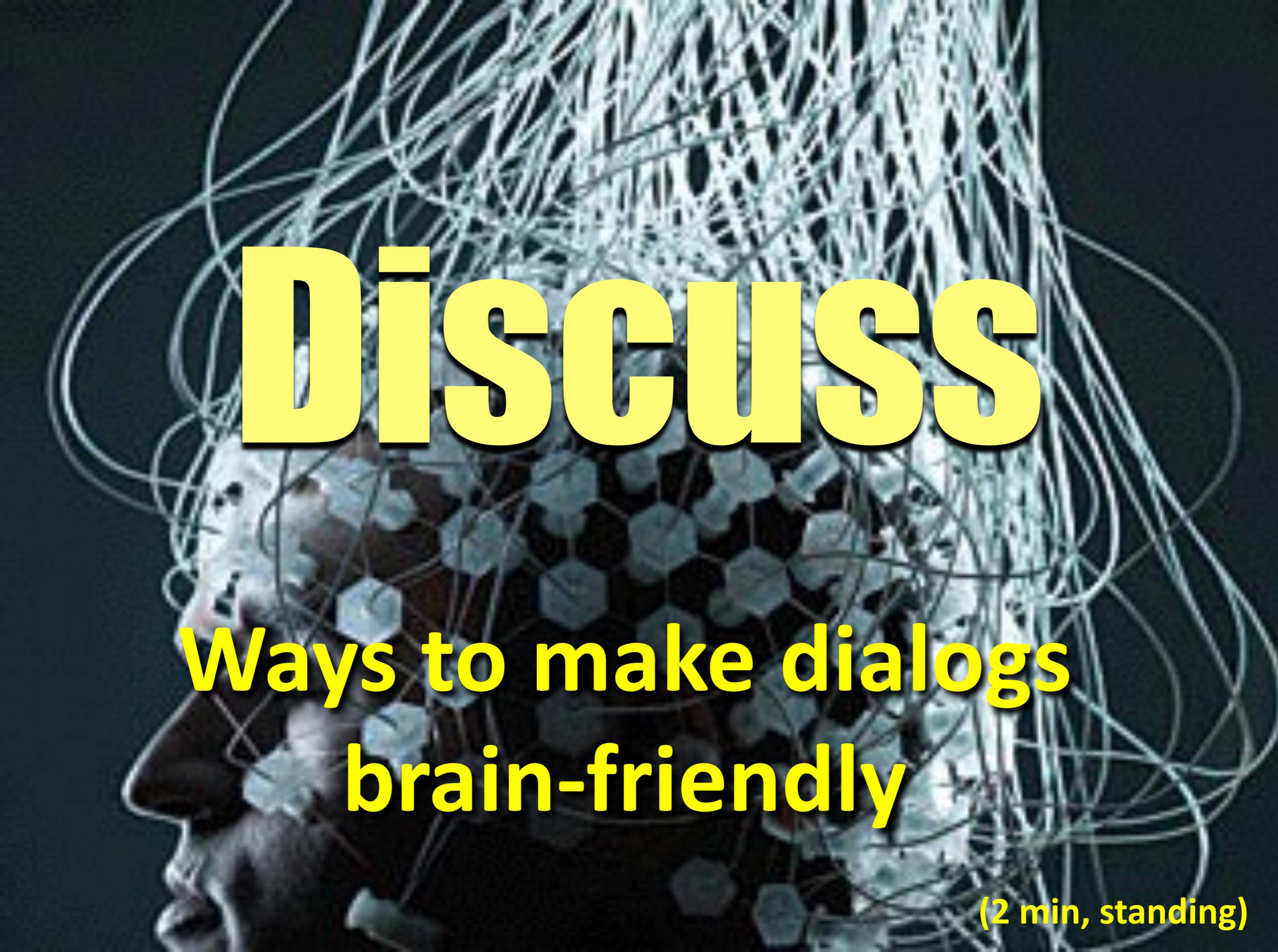


Socializing

Language evolved to solve the crisis of visual theft
(and to exploit cooperation and exchange)







Discuss

Ways to make dialogs
brain-friendly

(2 min, standing)



NIIGATA KASHIWA
NAGoya KYO
HIRASAKI

soil

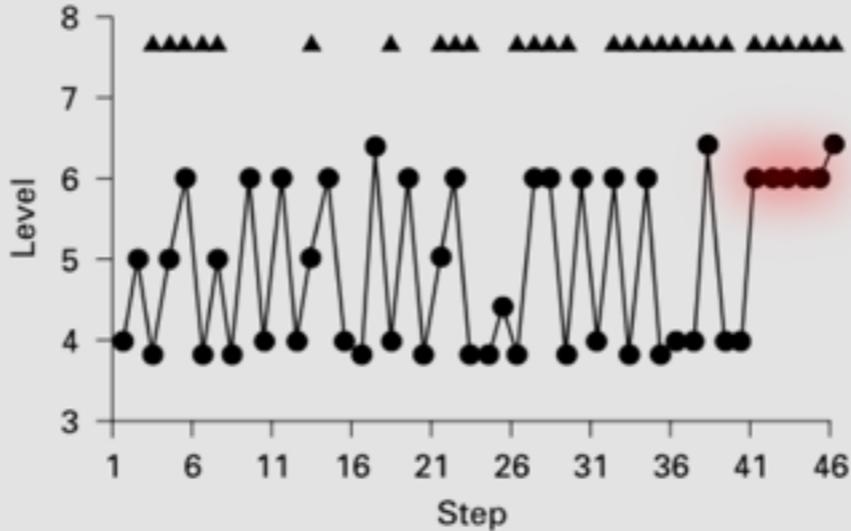
Communicative Task

1 week later (with Joe)

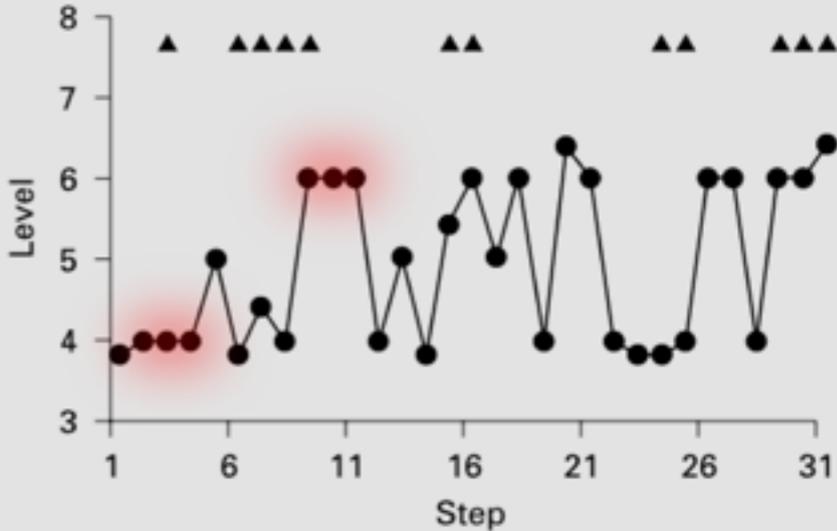
**Lecture on
Regression &
Neural Reuse**

Microdevelopment

Novice



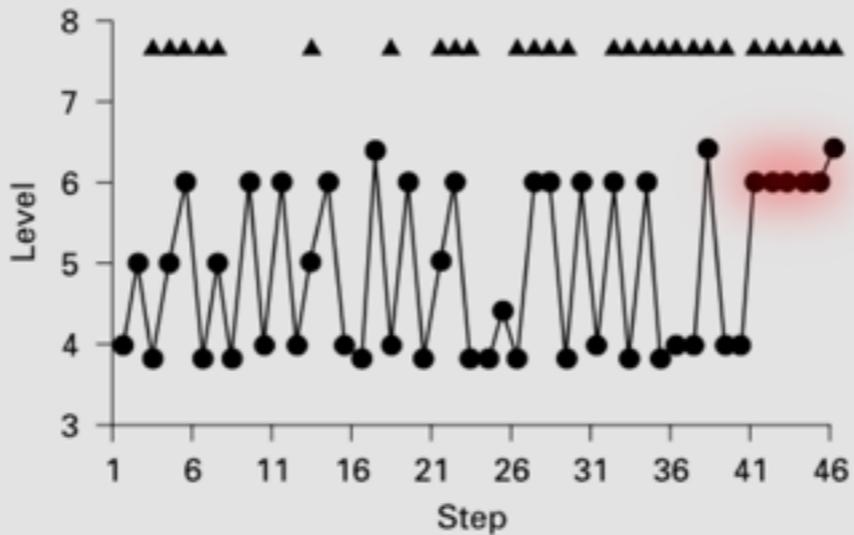
"Susan"



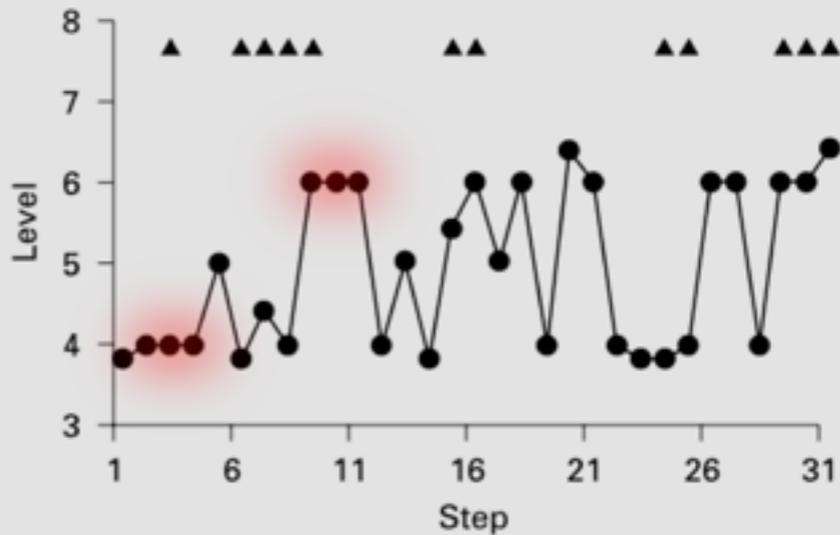
"Tom"

Microdevelopment

Novice

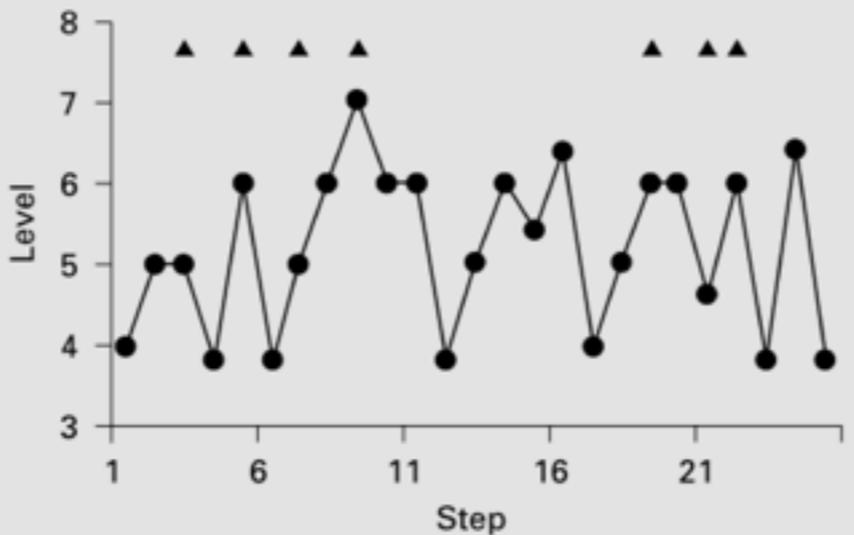


"Susan"

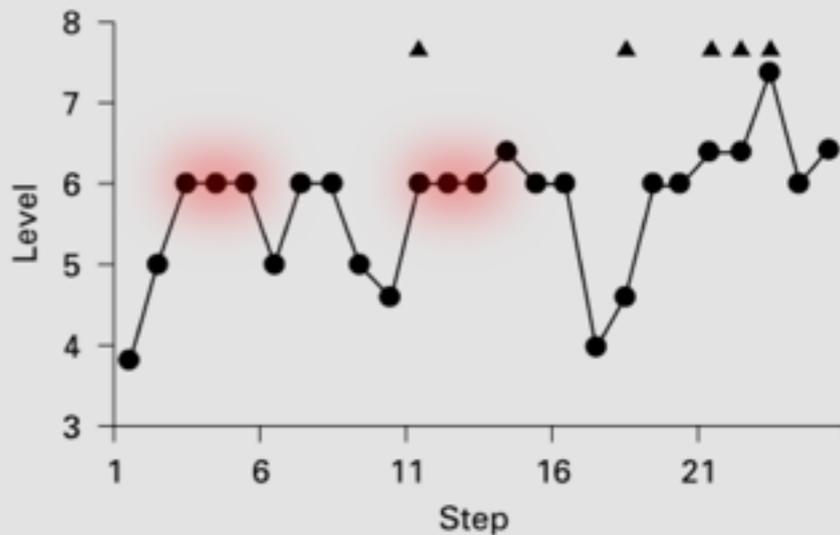


"Tom"

Intermediate



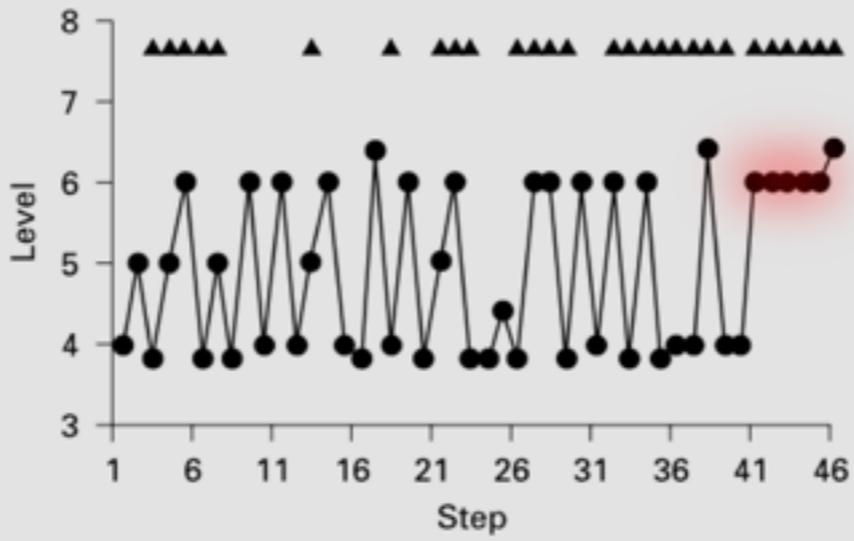
"Kathy"



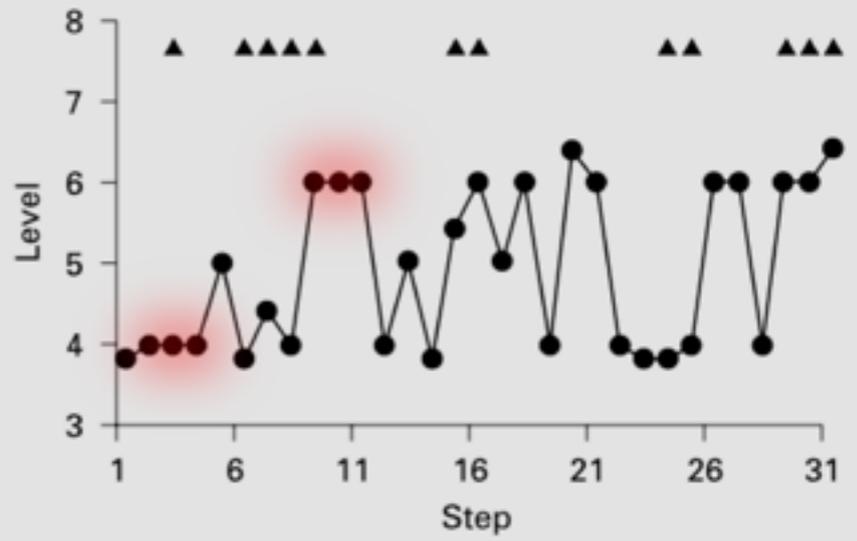
"Jack"

Microdevelopment

Novice

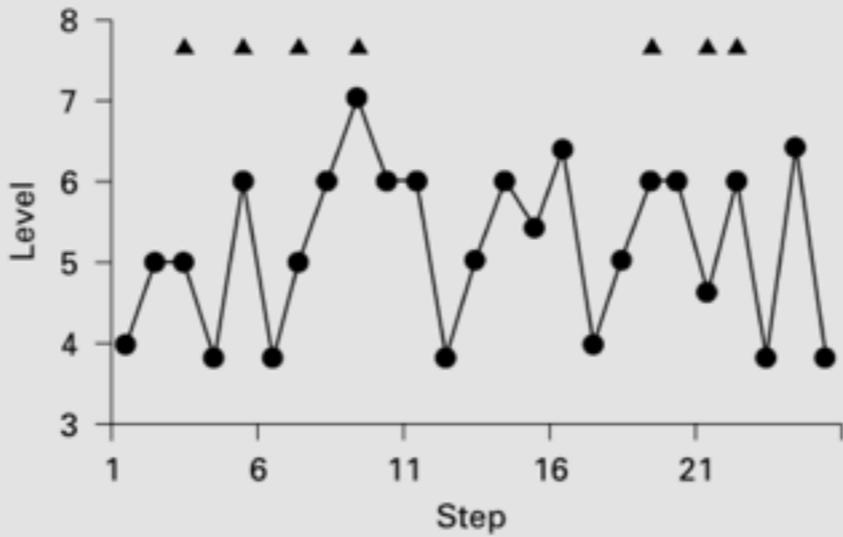


"Susan"

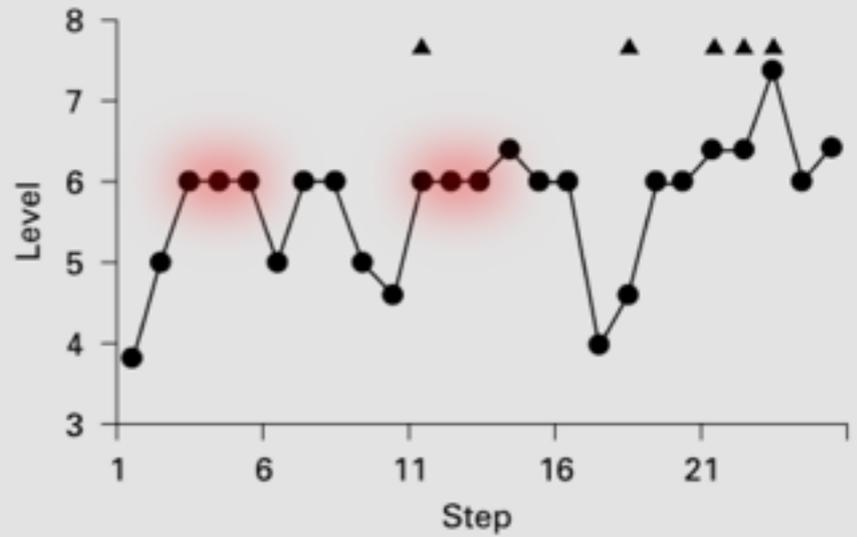


"Tom"

Intermediate

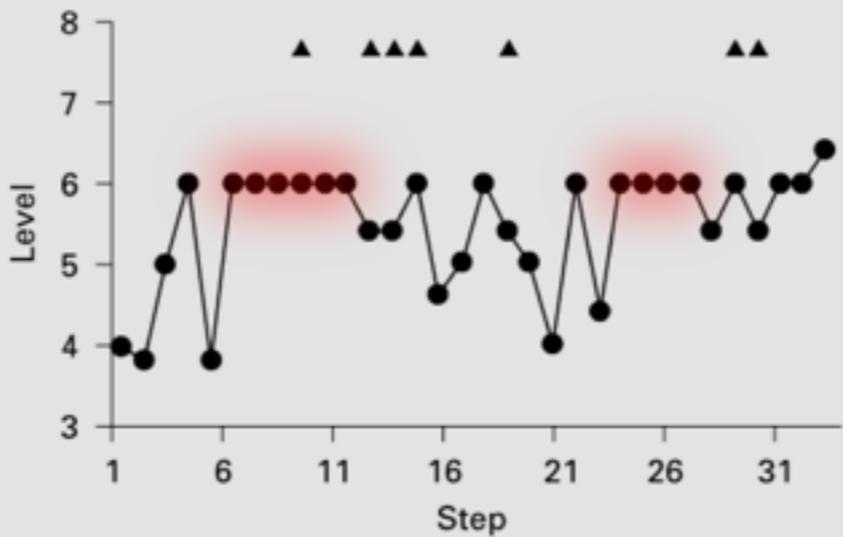


"Kathy"

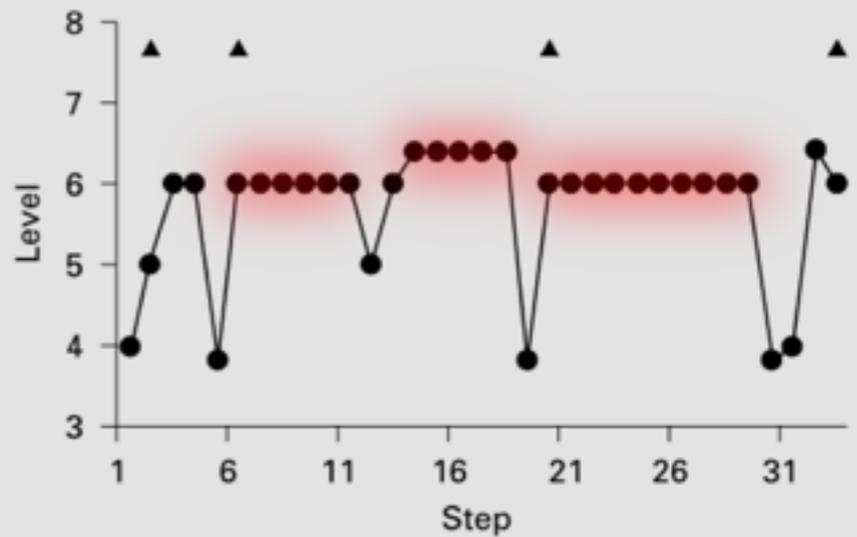


"Jack"

Expert



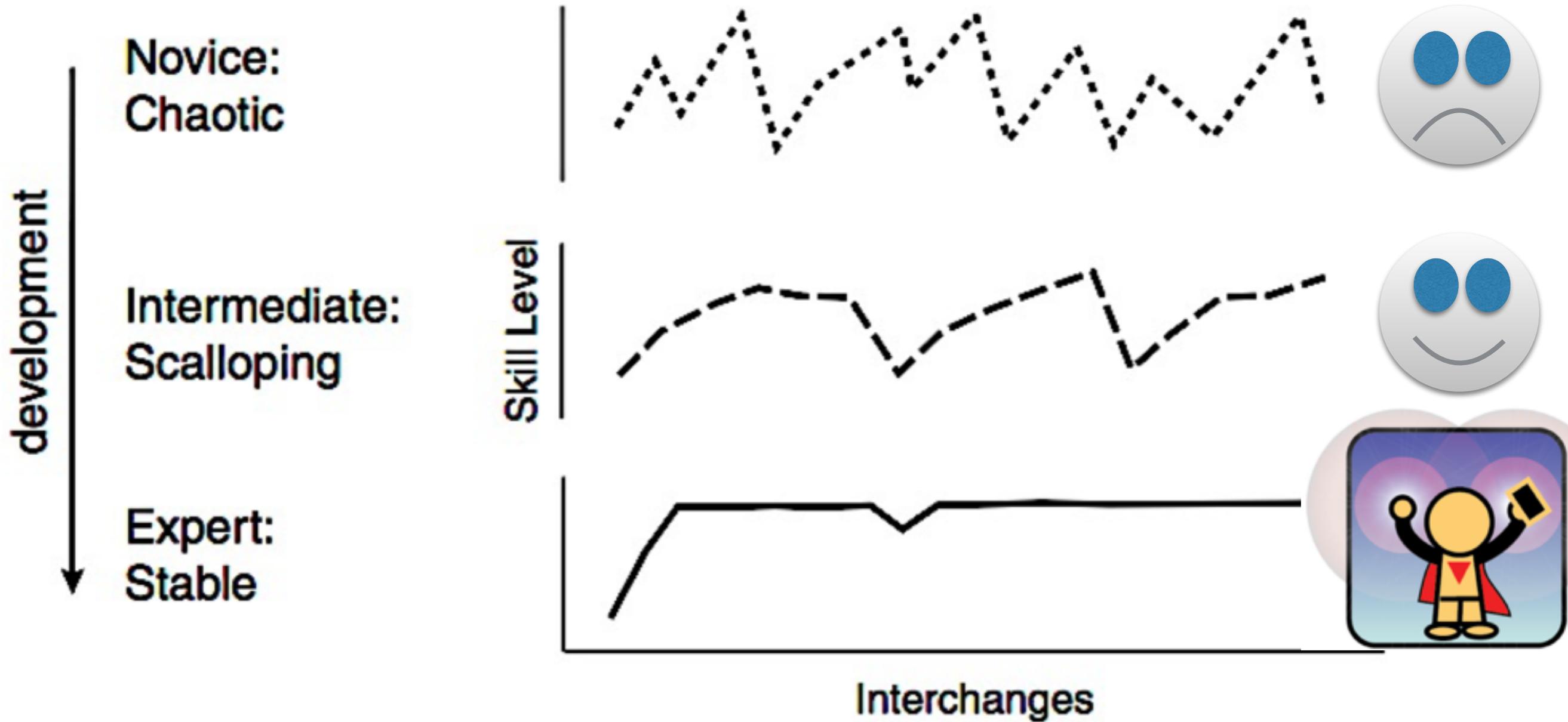
"Lily"



"Mark"

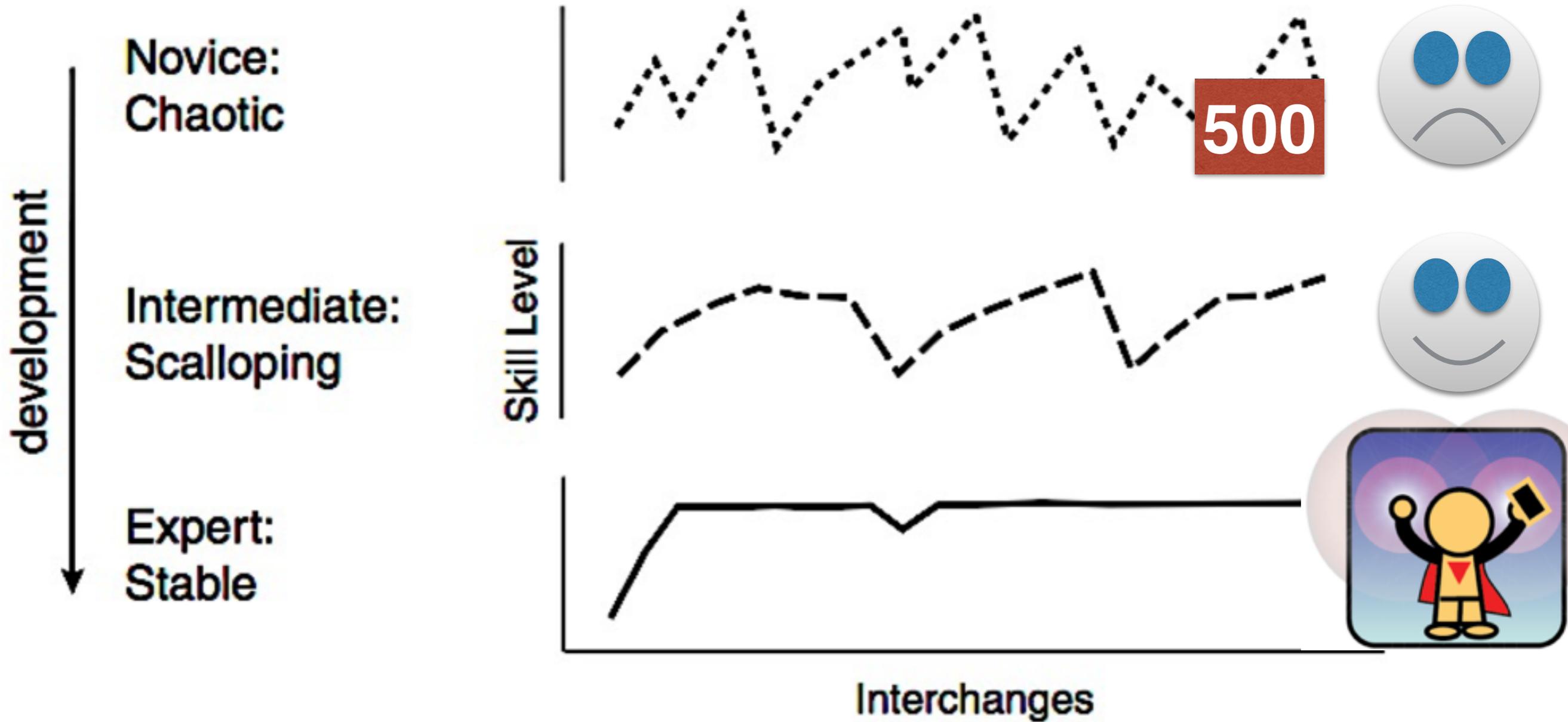
Microdevelopment

Which do you want for your students?



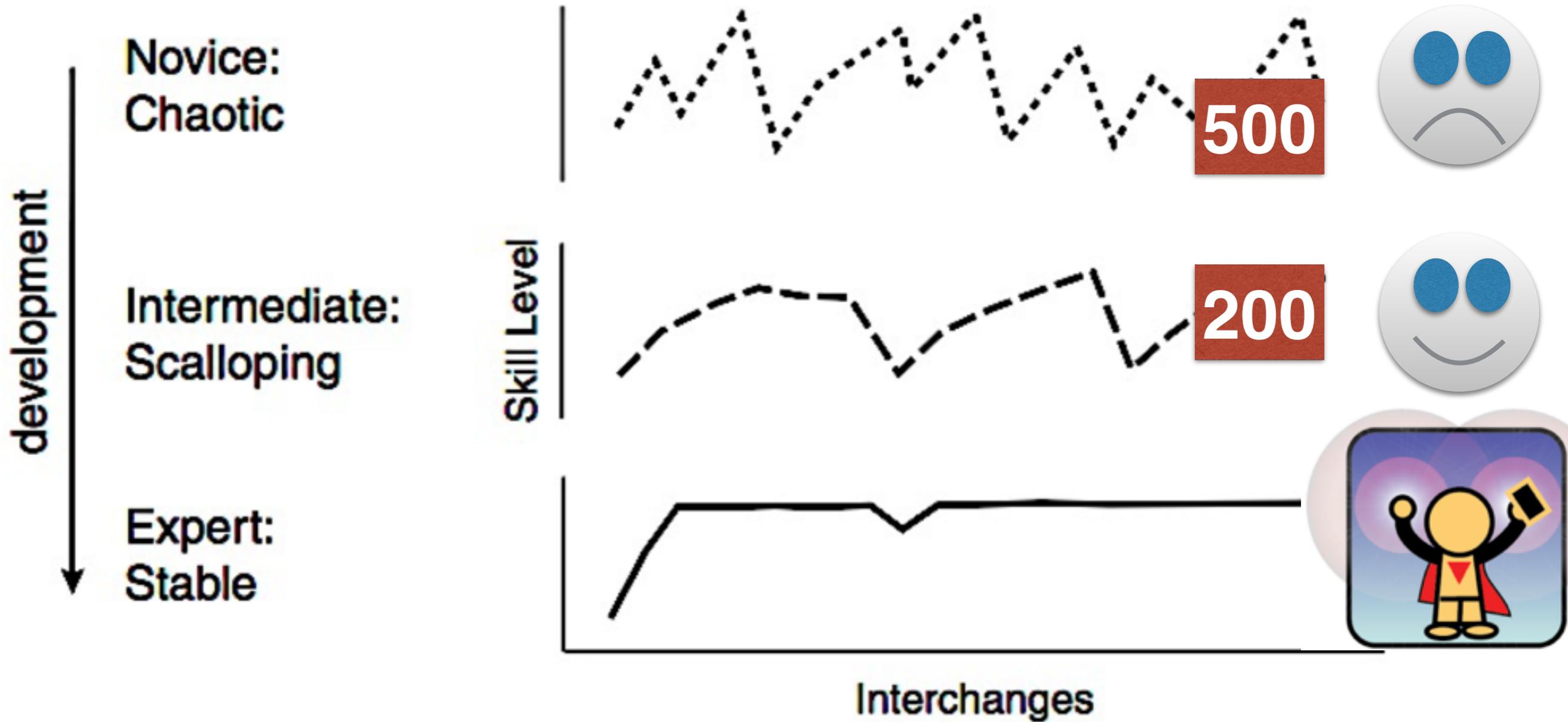
Microdevelopment

Which do you want for your students?



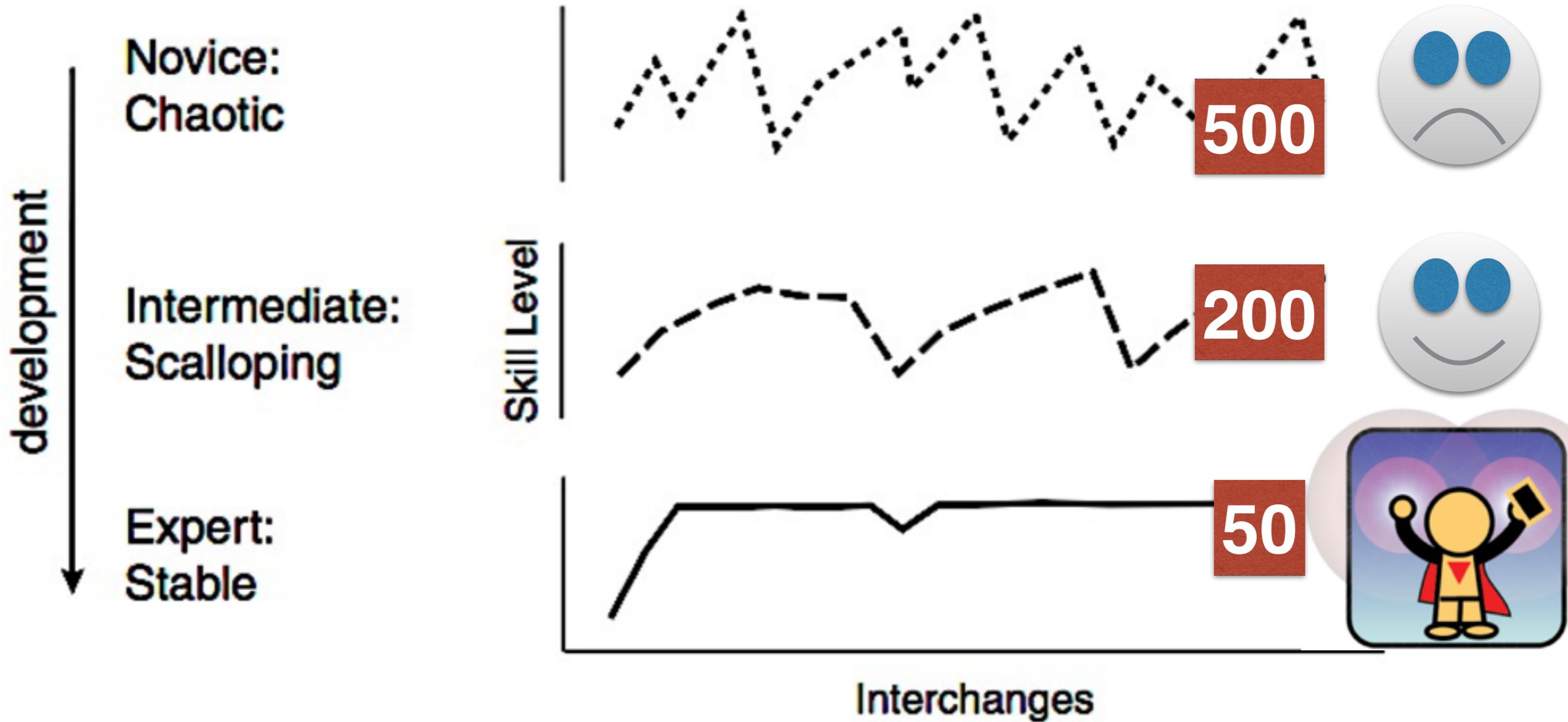
Microdevelopment

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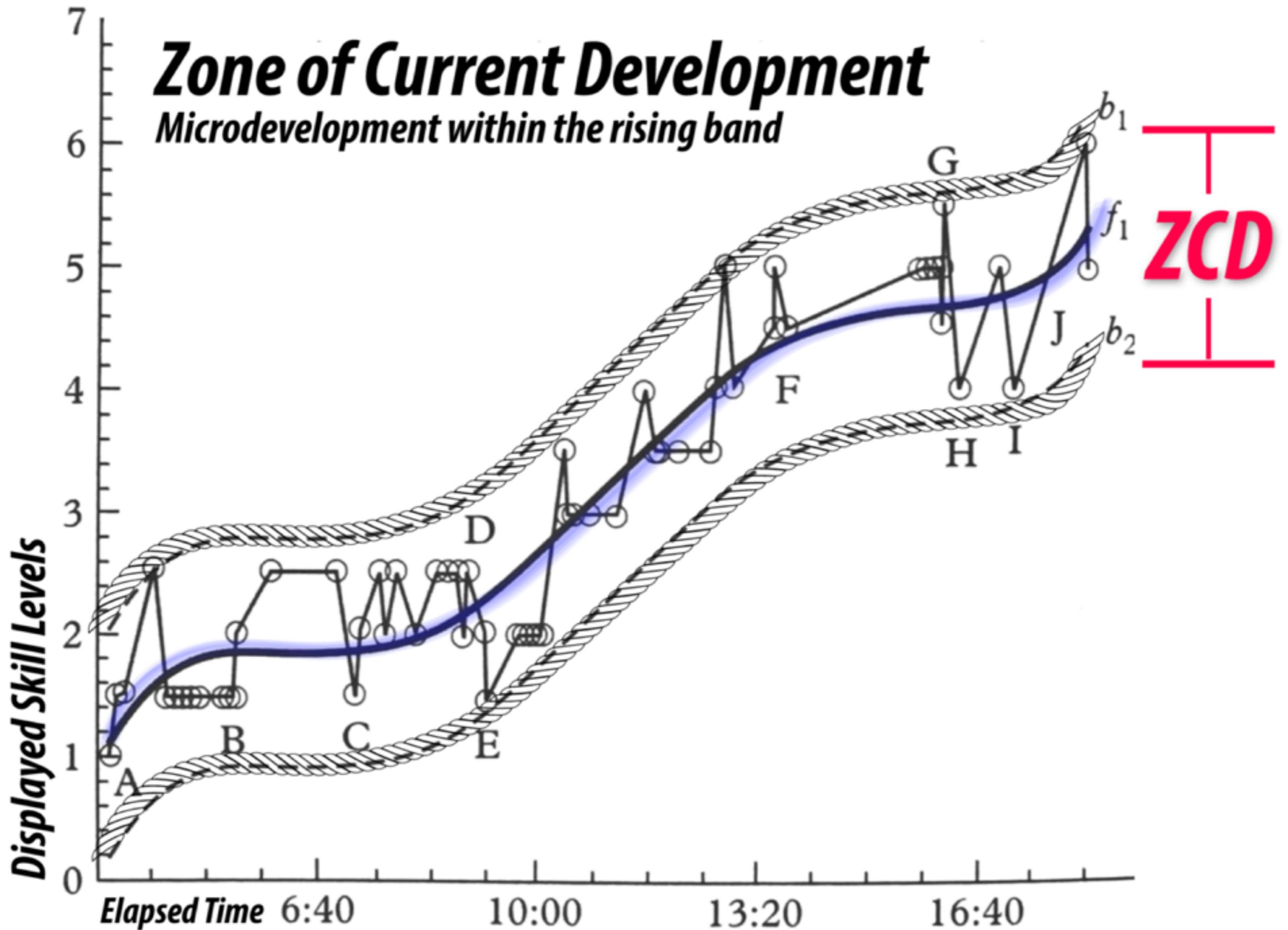
Microdevelopment

Which do you want for your students?



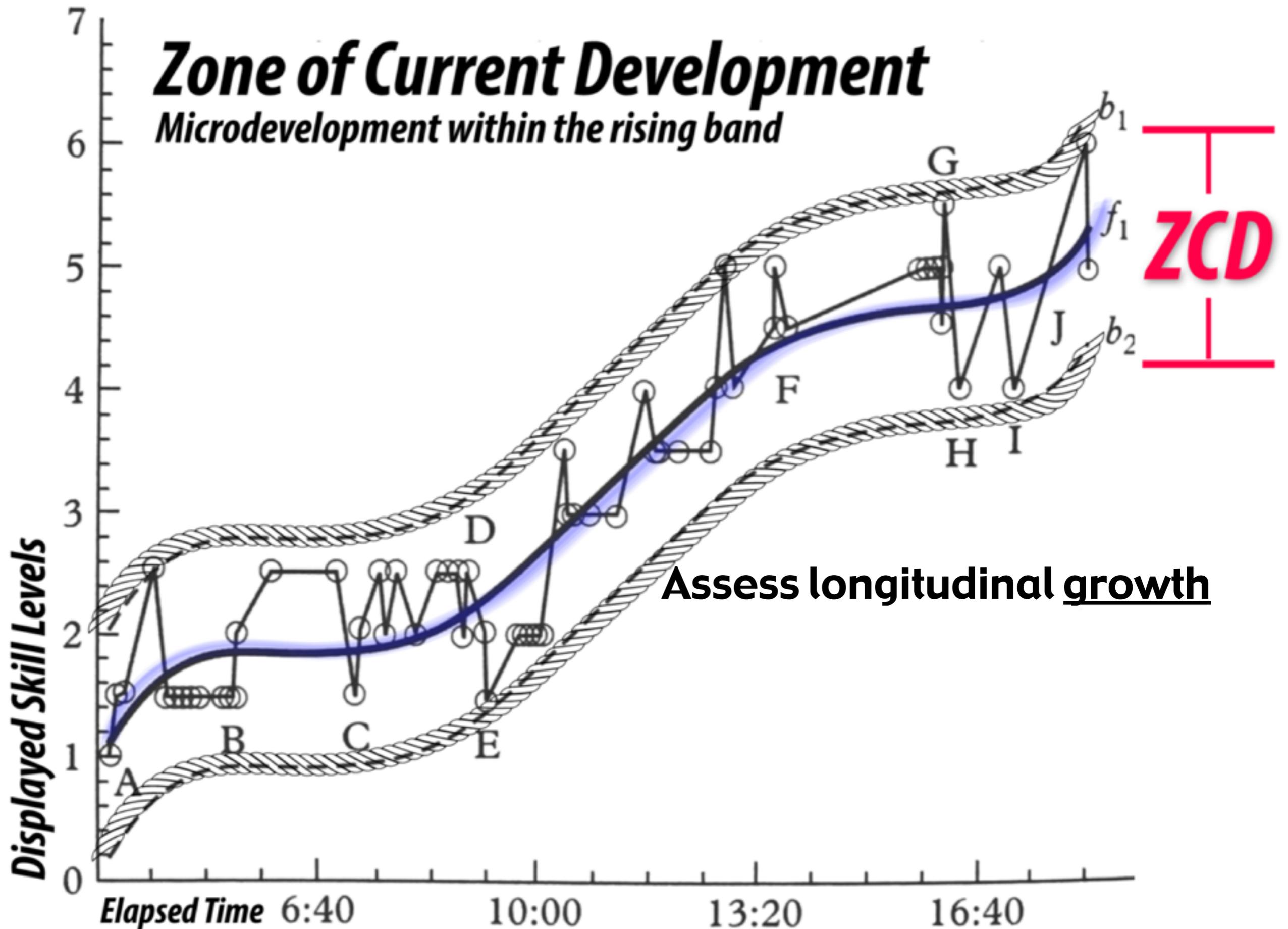
Zone of Current Development

Microdevelopment within the rising band



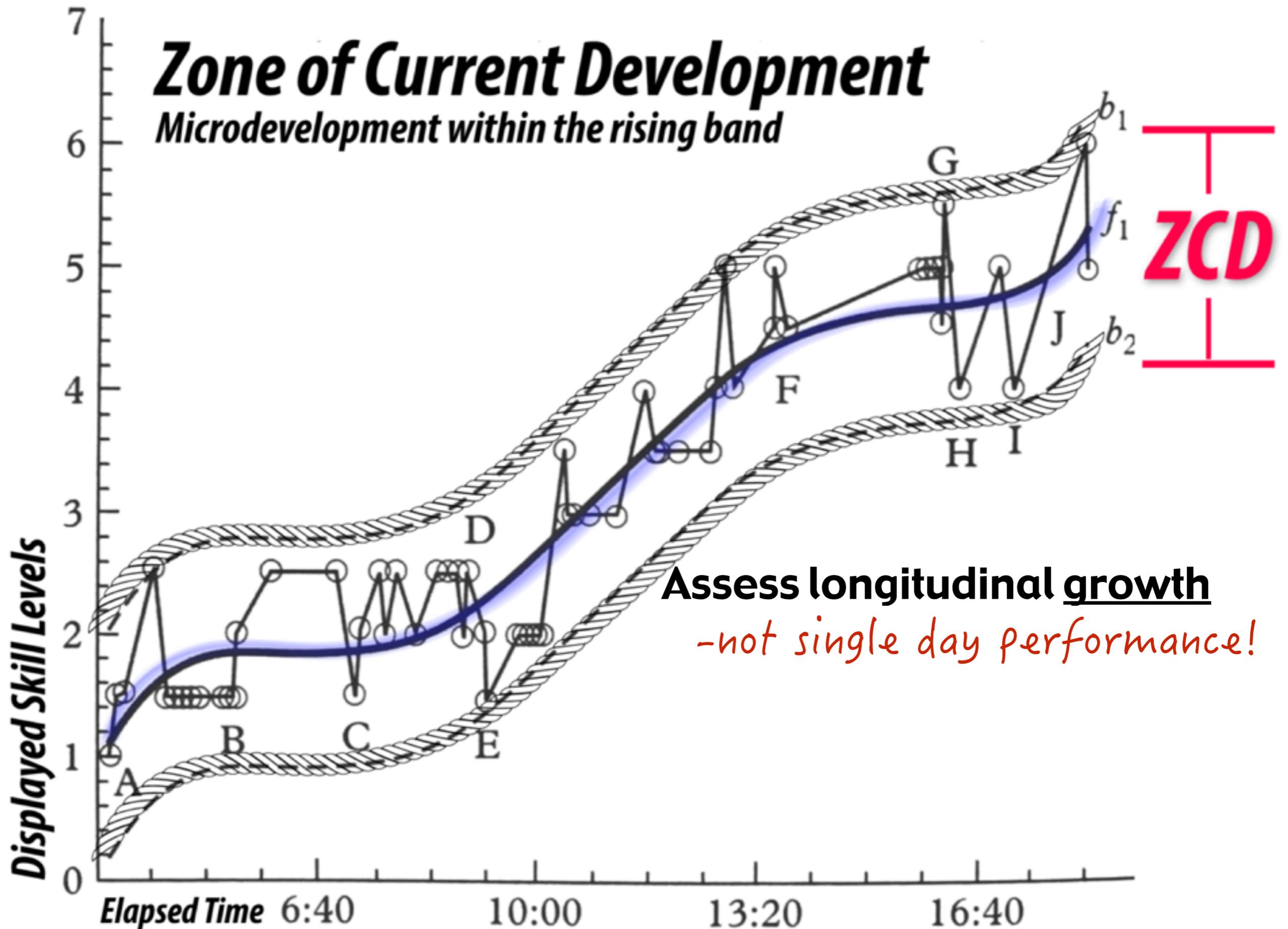
Zone of Current Development

Microdevelopment within the rising band



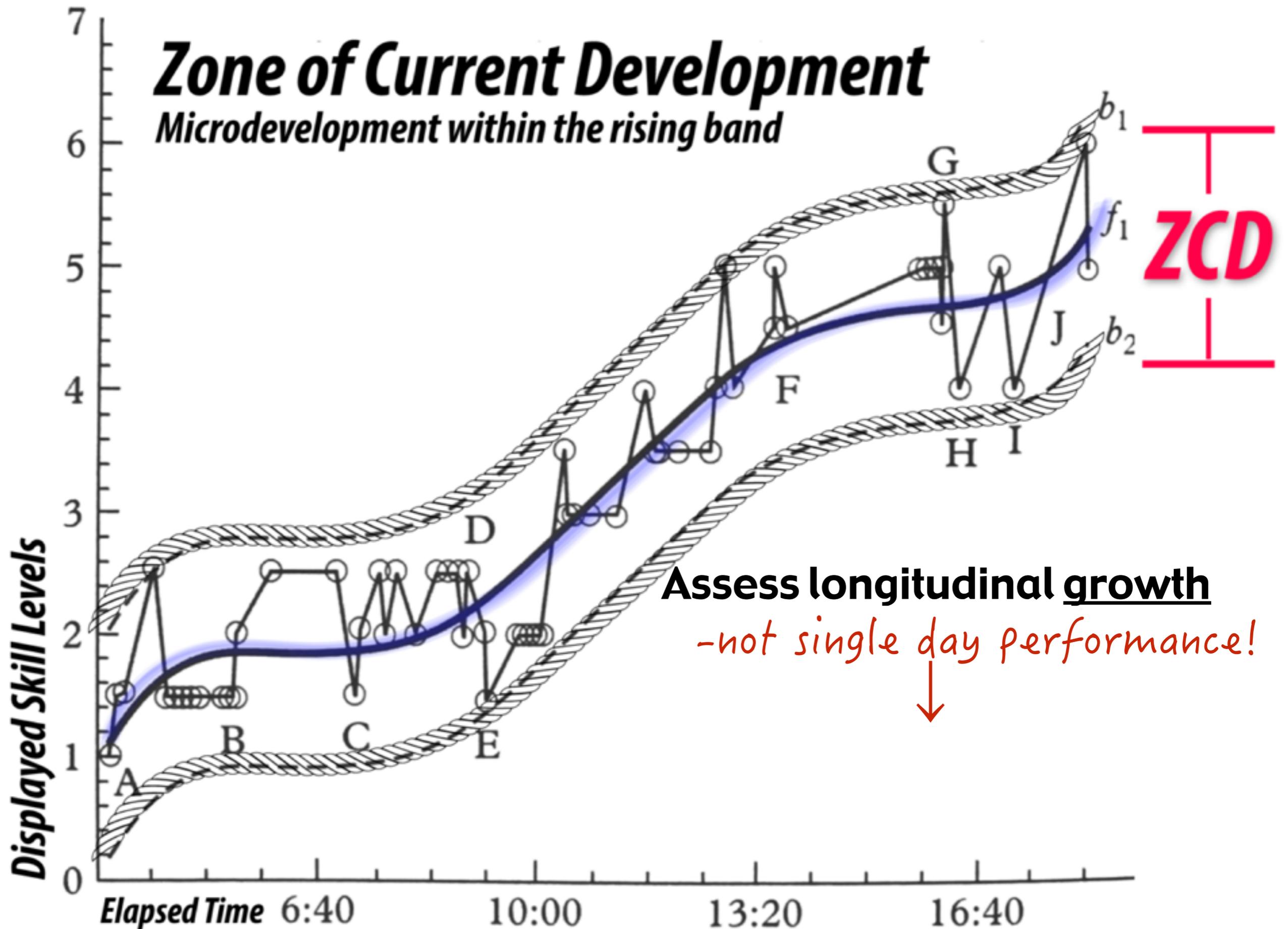
Zone of Current Development

Microdevelopment within the rising band



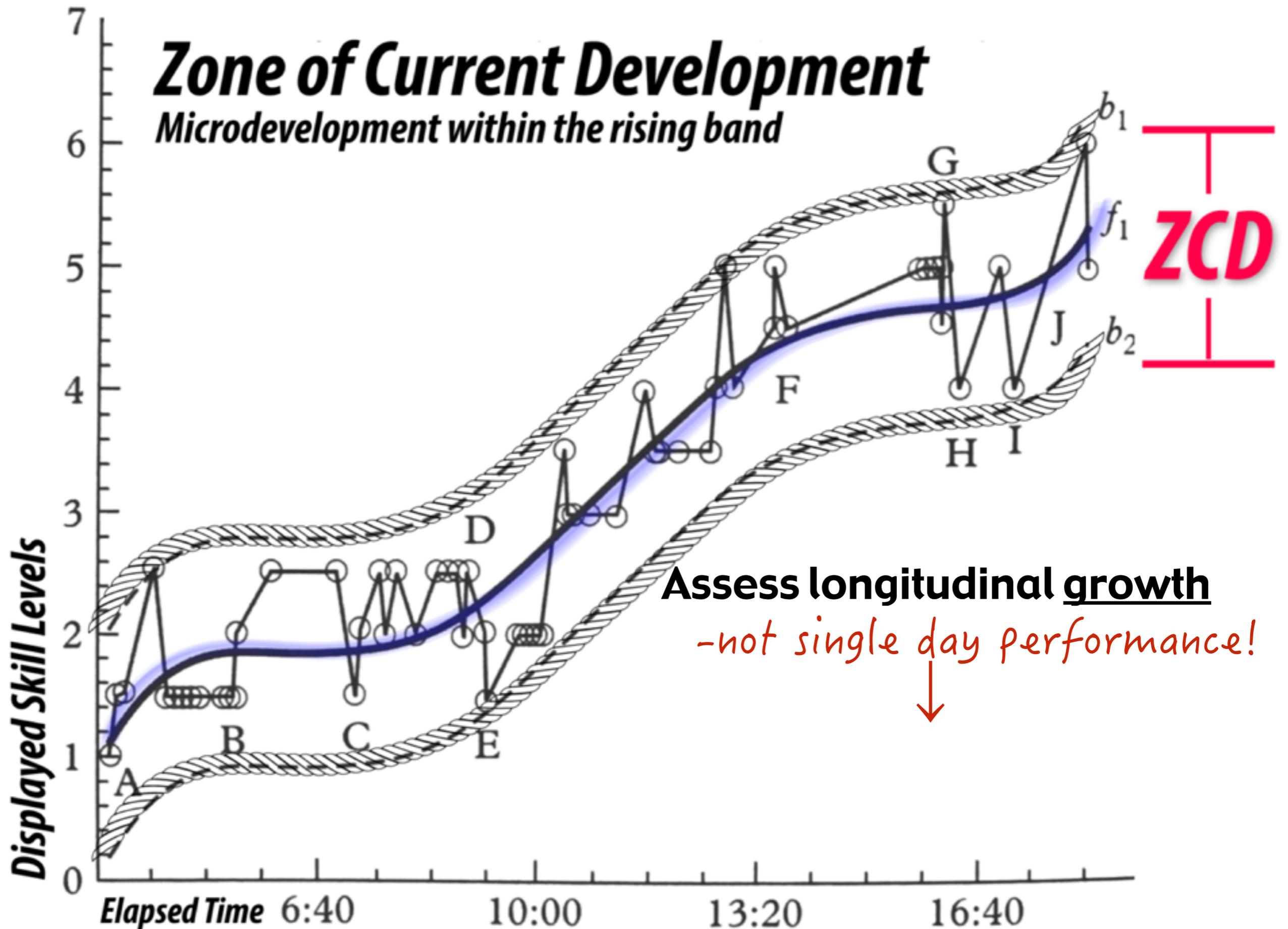
Zone of Current Development

Microdevelopment within the rising band



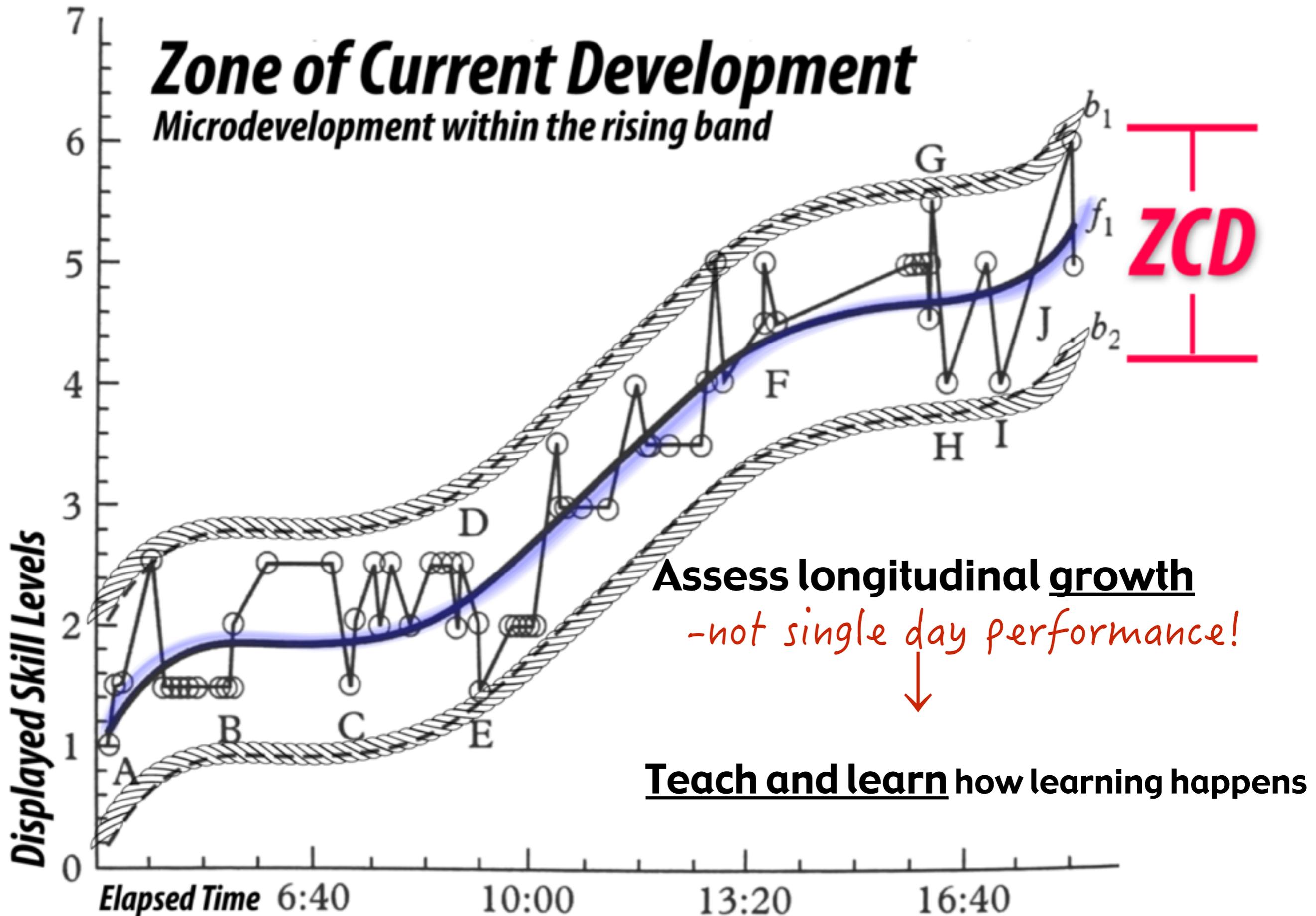
Zone of Current Development

Microdevelopment within the rising band



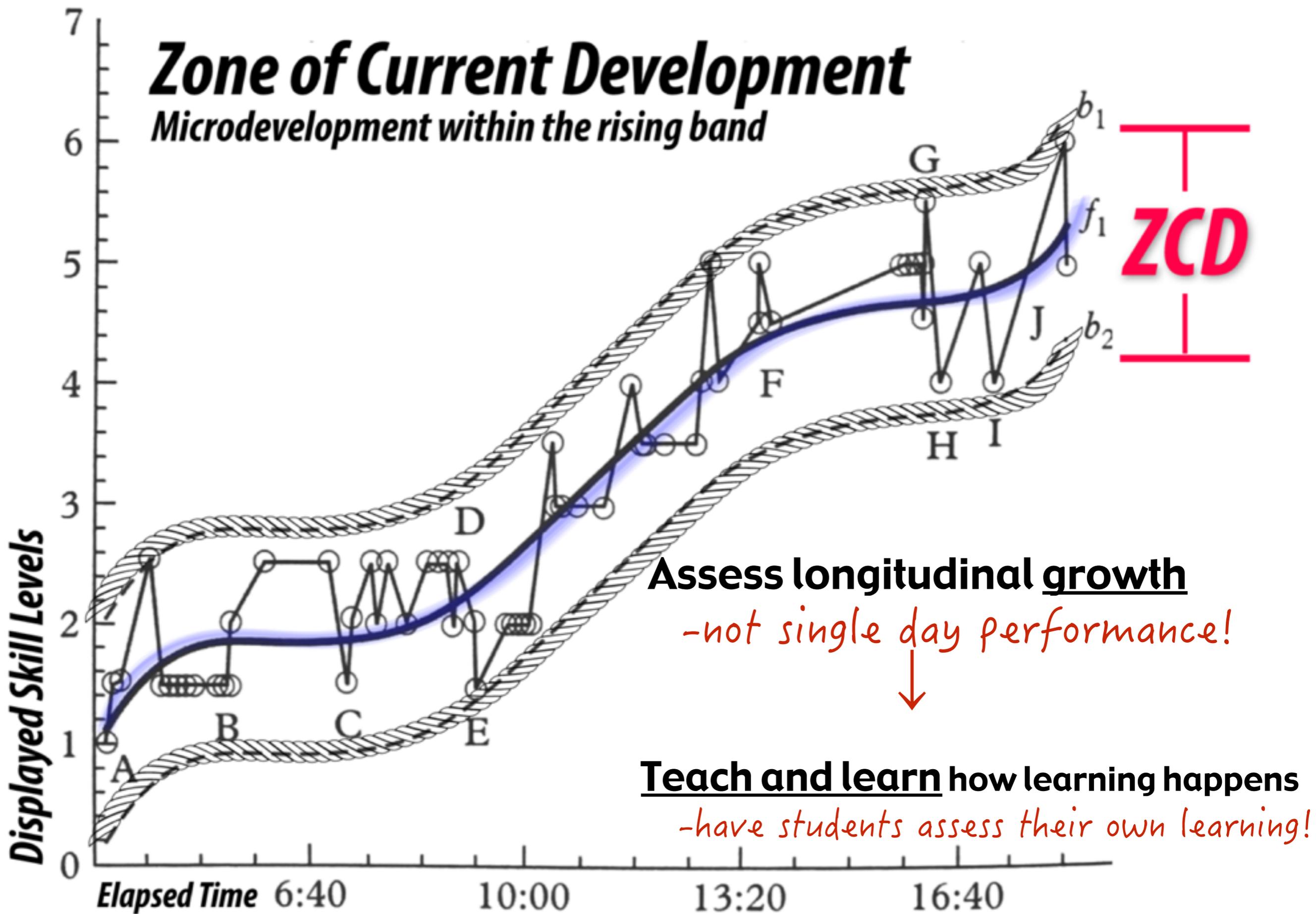
Zone of Current Development

Microdevelopment within the rising band



Zone of Current Development

Microdevelopment within the rising band



Emotion

a strong feeling deriving from one's circumstances, mood, or relationships with others.

Great Teaching



Happy student
Motivated student

Ideal Teaching



Feeling of *autonomy* & *ownership* of the material

Emotion

a strong feeling deriving from one's circumstances, mood, or relationships with others.

Great Teaching



Happy student
Motivated student

How much is learned?

Ideal Teaching



Feeling of *autonomy* &
ownership of the material

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a strong feeling deriving from one's circumstances, mood, or relationships with others.

Great Teaching



**Happy student
Motivated student**

How much is learned?



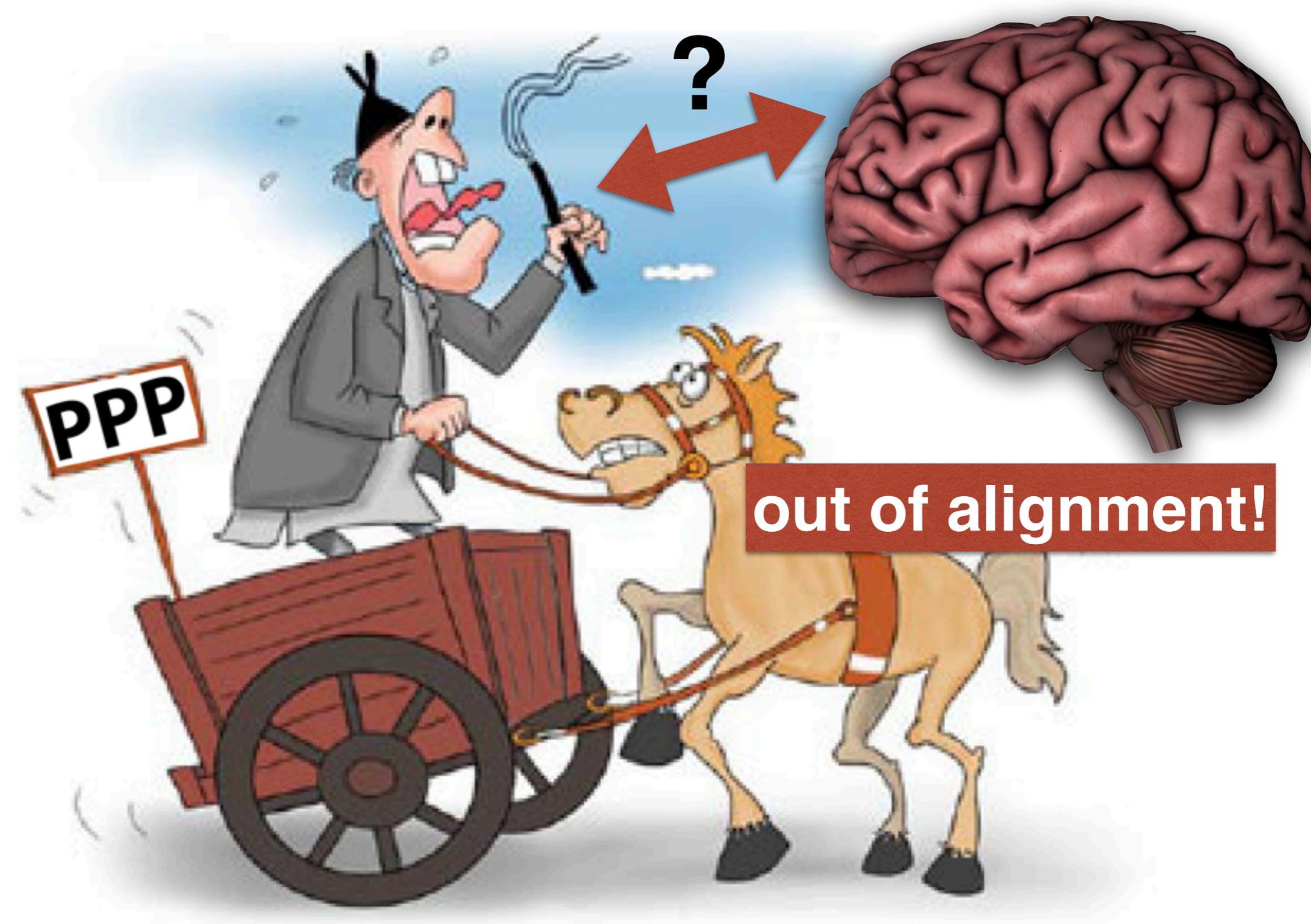
Ideal Teaching



**Feeling of *autonomy* &
ownership of the material**

Will they continue to learn?

Don't let the *content* drive the lesson.



The student's *“aha! moments”* should drive the learning.



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The student's ***“aha! moments”*** should drive the learning.

-so that they will continue to run on their own!



“alignment” issues disappear!

The student’s *“aha! moments”* should drive the learning.

-so that they will continue to run on their own!



“alignment” issues disappear!

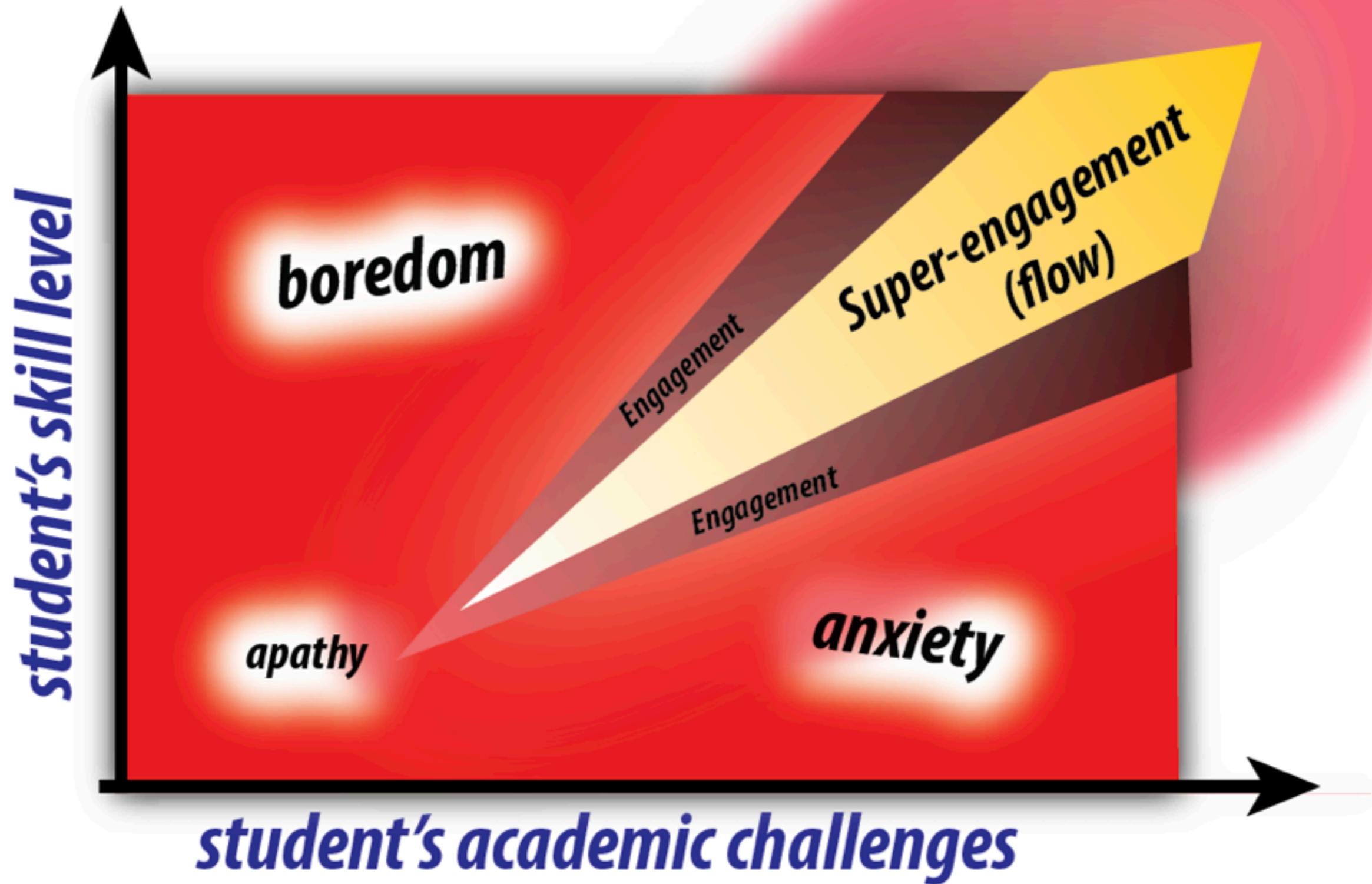
Fully engaged and running!

The student’s *“aha! moments”* should drive the learning.

-so that they will continue to run on their own!

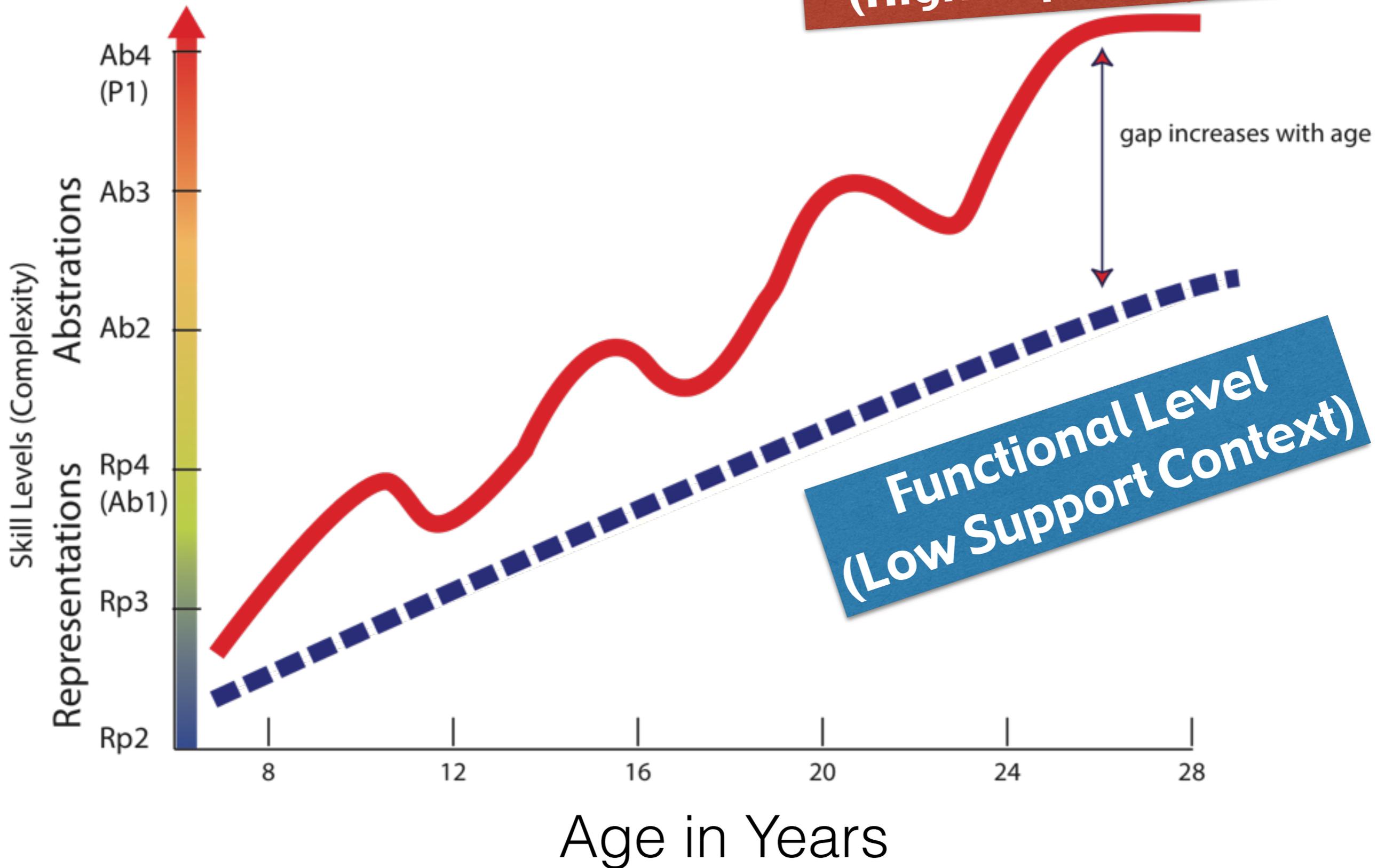
Engagement (flow)

Student skills vs academic challenges



Dynamic Skill Theory

**Optimal Levels
(High Support Context)**



**Functional Level
(Low Support Context)**



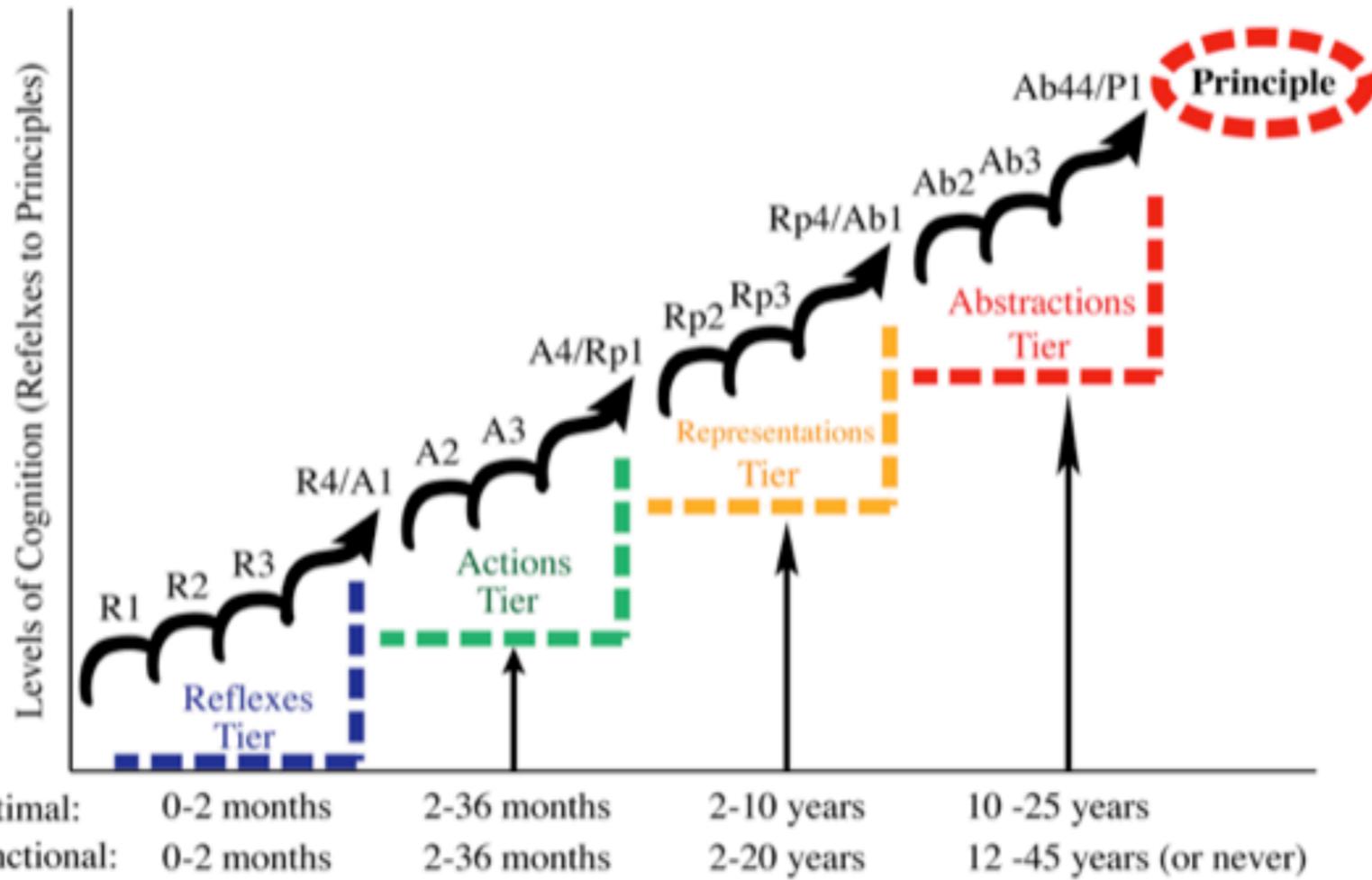
Which glass has more water?



Which glass has more water?

Kurt Fischer

Dynamic Skill Theory



0-2mo



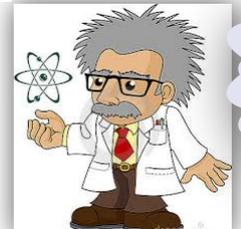
2-36mo



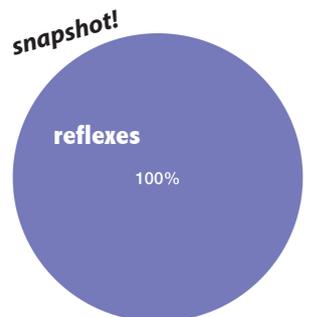
in high support 2-10yrs but, 2-20yrs in low support implications?



in high support 10-25yrs but, 12-never in low support implications?

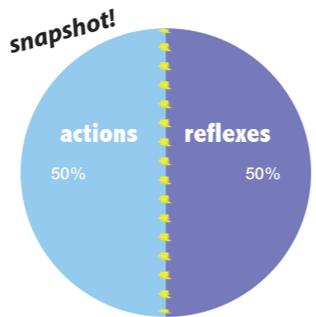


in high support 25y - never but, 30-never in low support implications?



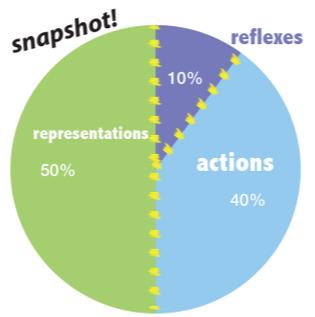
- Reflexes
- Actions
- Representations
- Abstractions
- Principles

microdevelopment & network reorganization



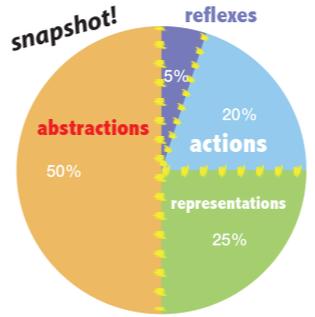
- Reflexes
- Actions
- Representations
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- Principles

microdevelopment & network reorganization



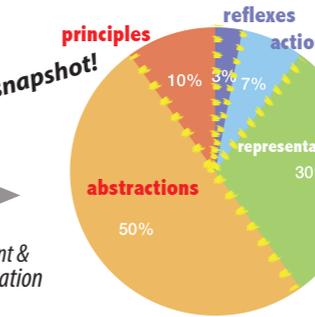
- Reflexes
- Actions
- Representations
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microdevelopment & network reorganization



- Reflexes
- Actions
- Representations
- Abstractions
- Principles

microdevelopment & network reorganization



- Reflexes
- Actions
- Representations
- Abstractions
- Principles

reflexes only

reflexes & actions

reflexes, actions & representations

reflexes, actions, representations, & abstractions

reflexes, actions, rep., abstractions, & principles

(Ratios dynamically change with context)

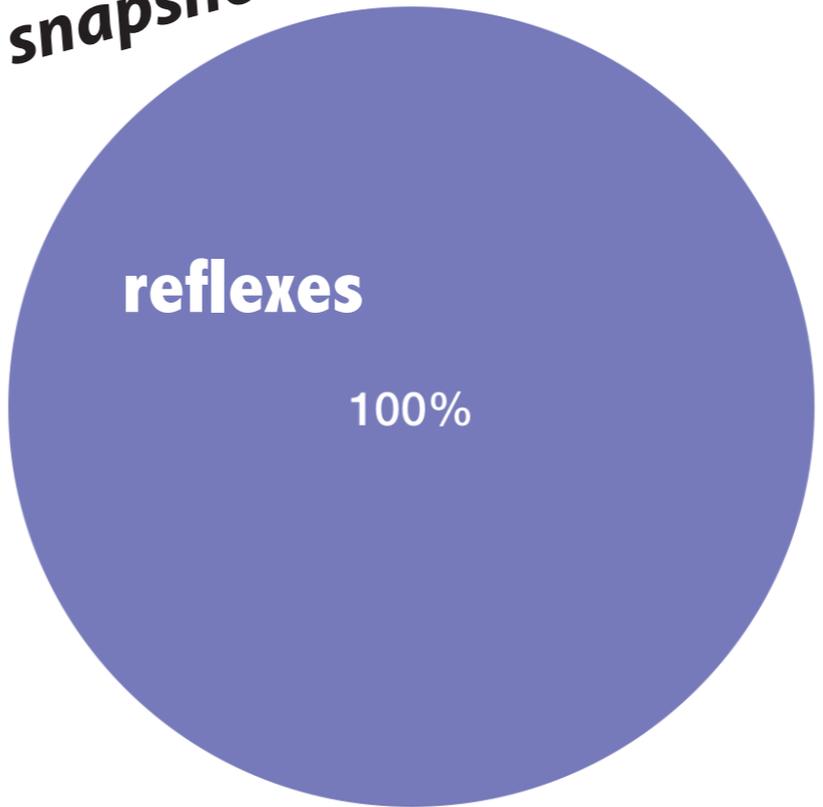
Attainability

Complexity implications?

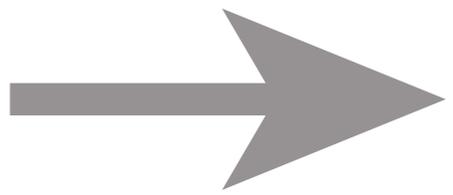


0-2mo

snapshot!



- Reflexes
- Actions
- Representations
- Abstractions
- Principles



microdevelopment & network reorganization

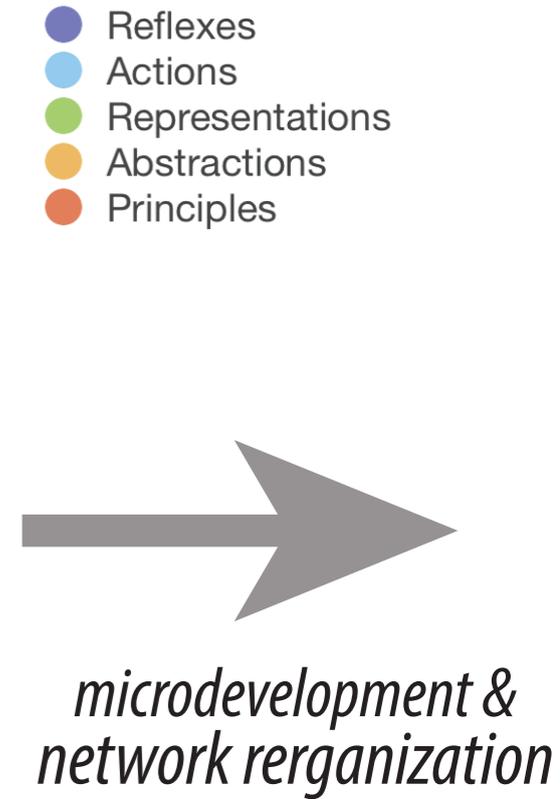
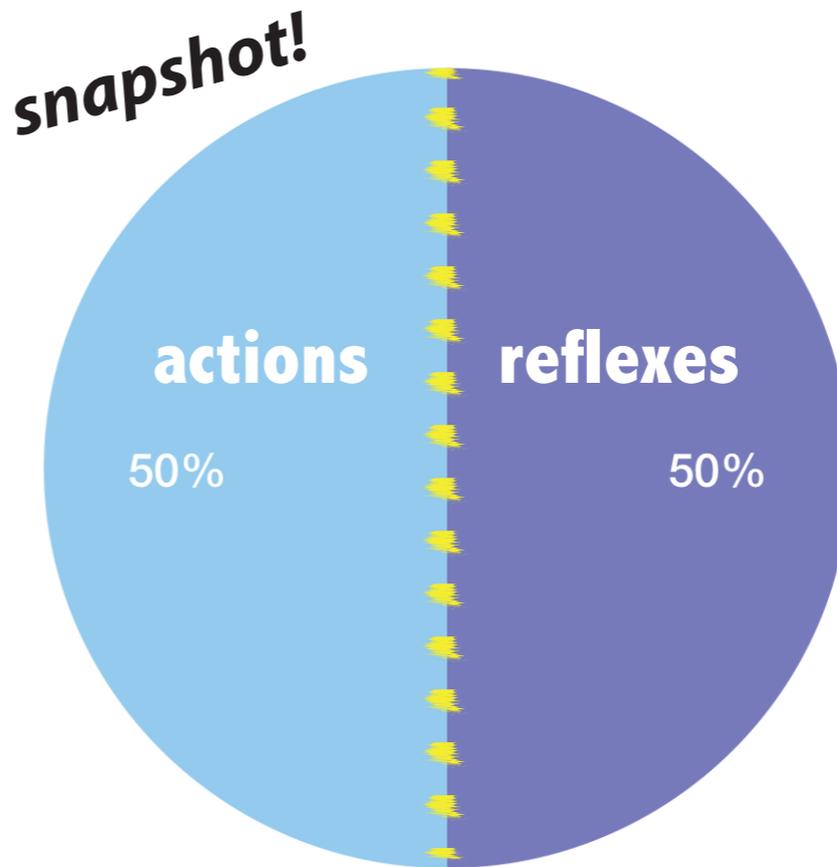
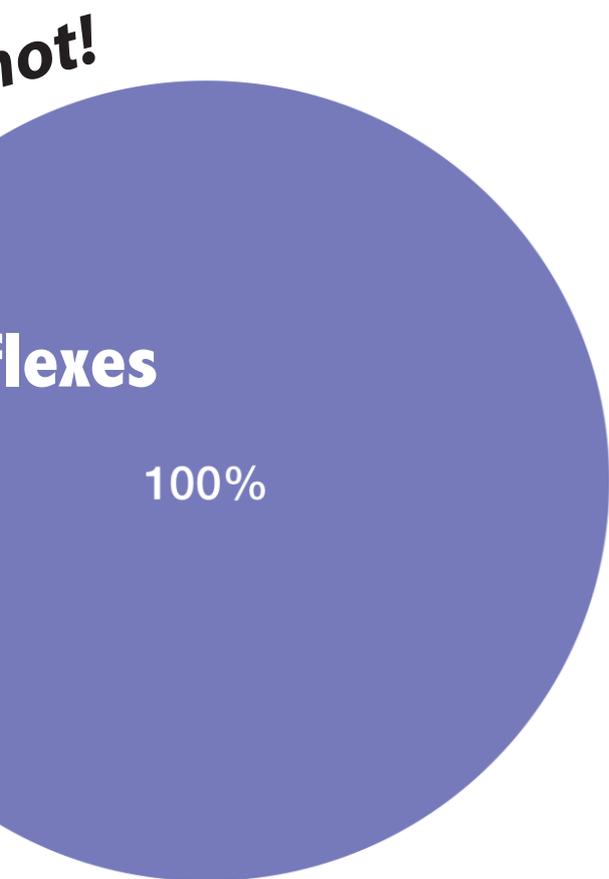
***reflexes
only***



0-2mo



2-36mo



reflexes only

reflexes & actions

(Ratios dynamically change with context)



**in high support
2-10yrs** but,
2-20yrs
in low support

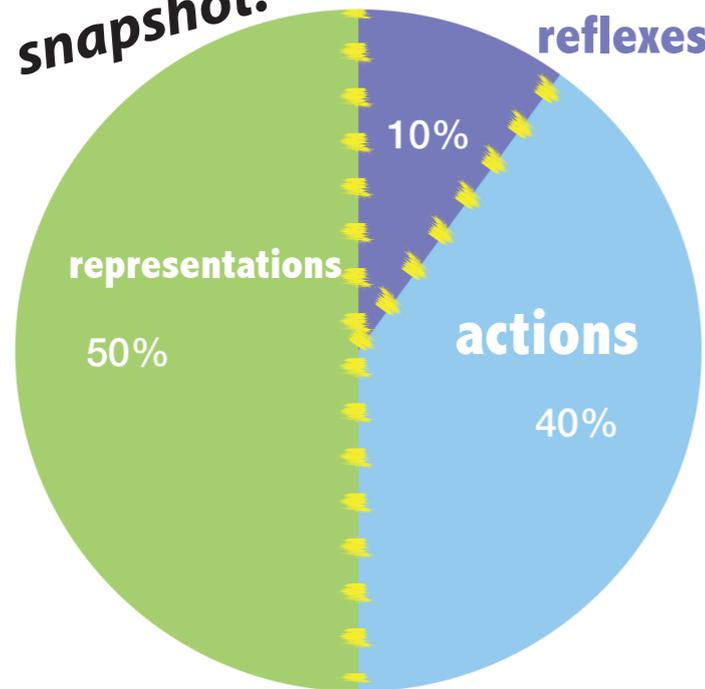
implications?



**in high support
10-25yrs** but,
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implications?

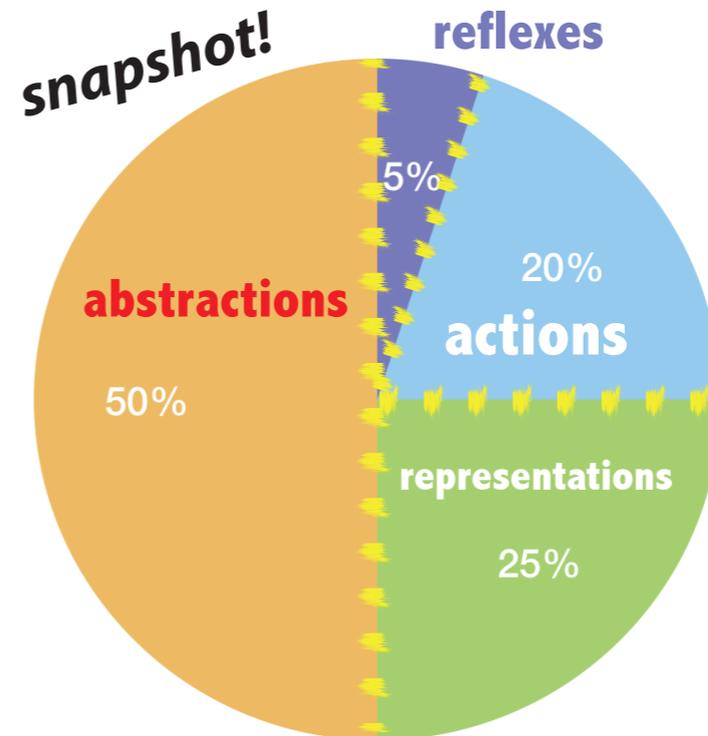
snapshot!



- Reflexes
- Actions
- Representations
- Abstractions
- Principles

*microdevelopment &
network reorganization*

snapshot!



- Reflexes
- Actions
- Representations
- Abstractions
- Principles

*microdevelopment &
network reorganization*

**reflexes, actions &
representations**

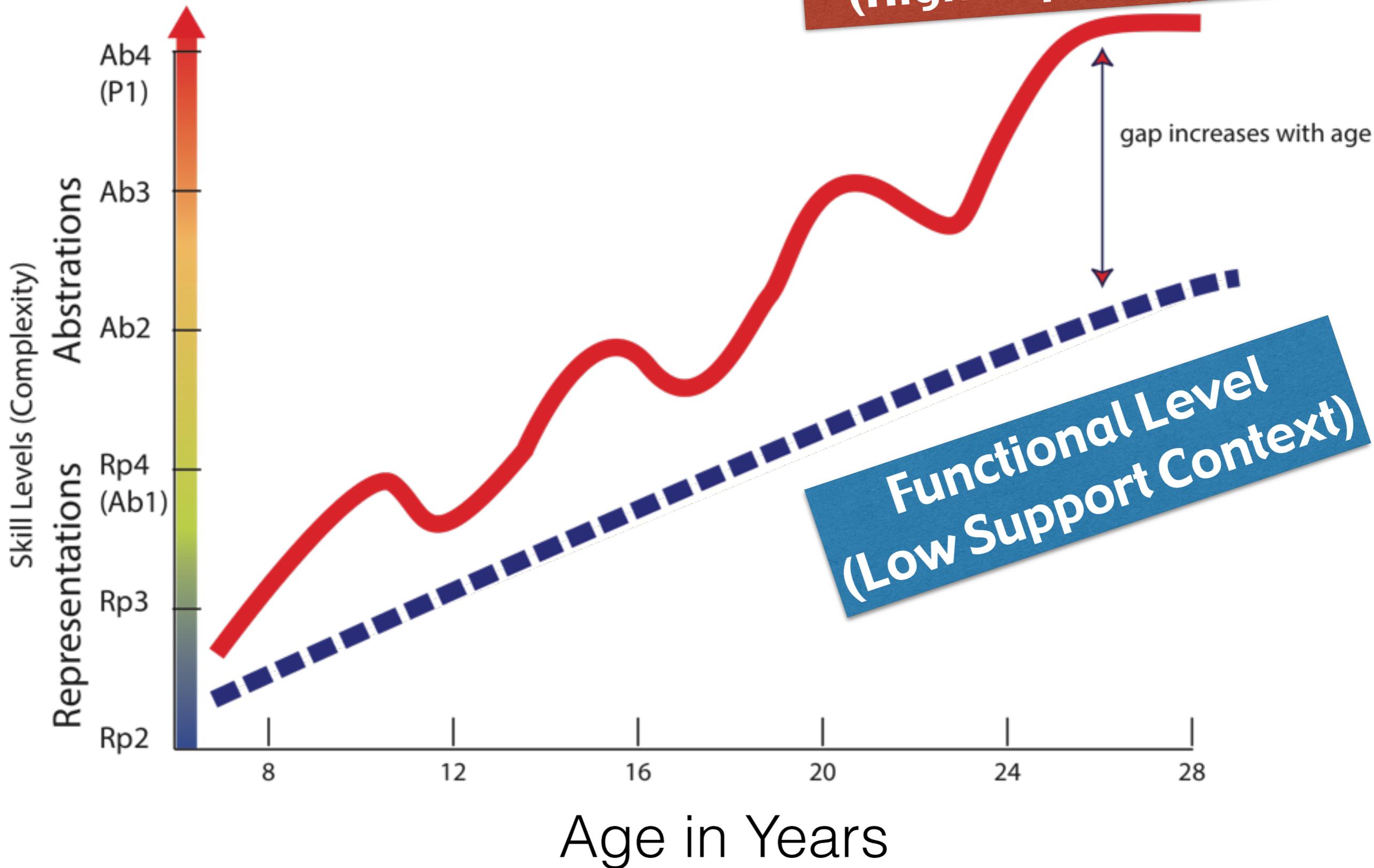
(Ratios dynamically change with context)

**reflexes, actions,
representations, & abstractions**

(Ratios dynamically change with context)

Dynamic Skill Theory

**Optimal Levels
(High Support Context)**



gap increases with age

**Functional Level
(Low Support Context)**

***It would seem our job is to
create high support
contexts for our students.***

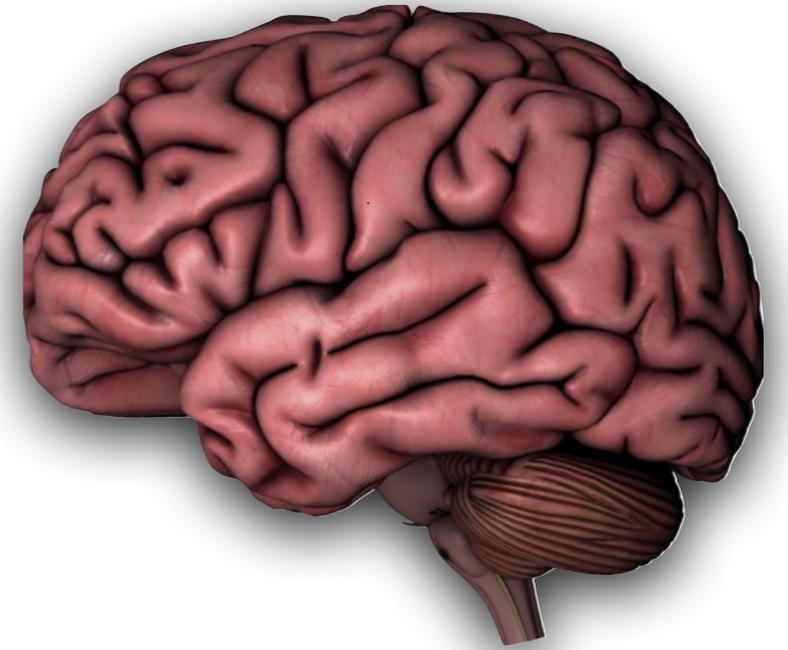


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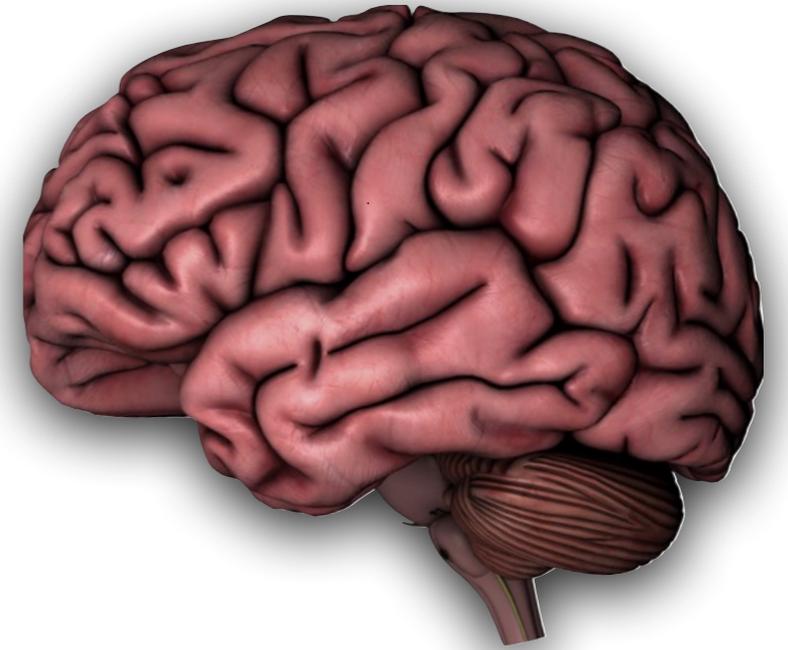
**How do we create
a high support context?**

How to create a high support context



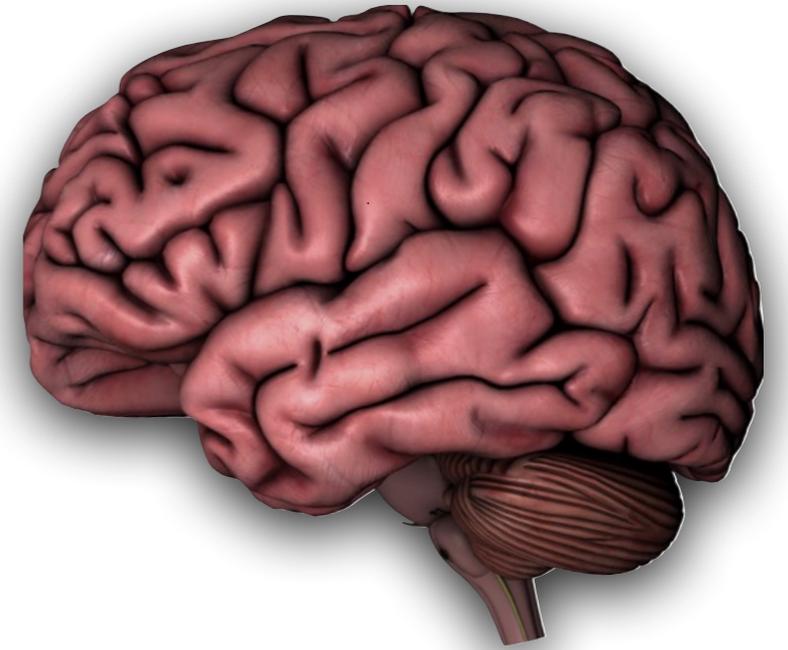
How to create a high support context

1. Make learning a “thinking-centered” experience



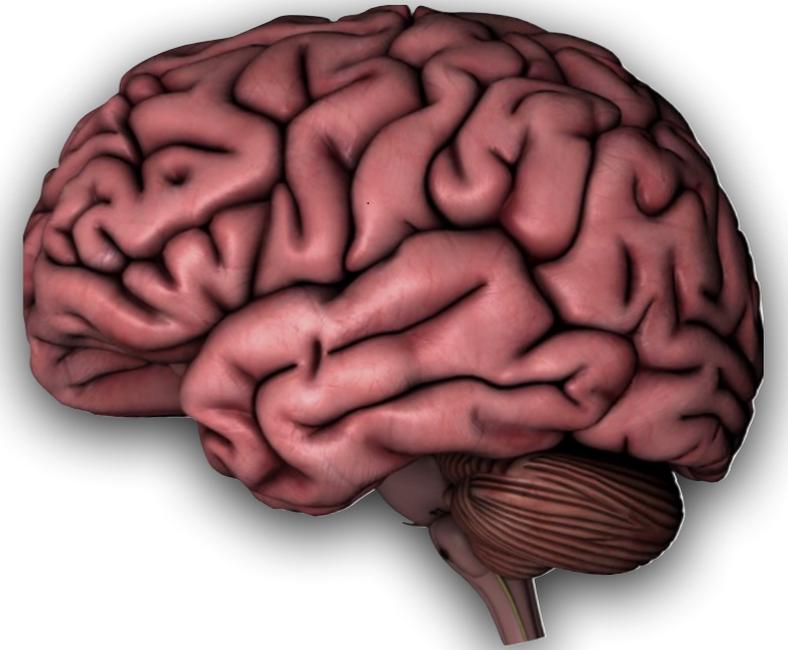
How to create a high support context

- 1. Make learning a “thinking-centered” experience**
-with dopamine rushes!



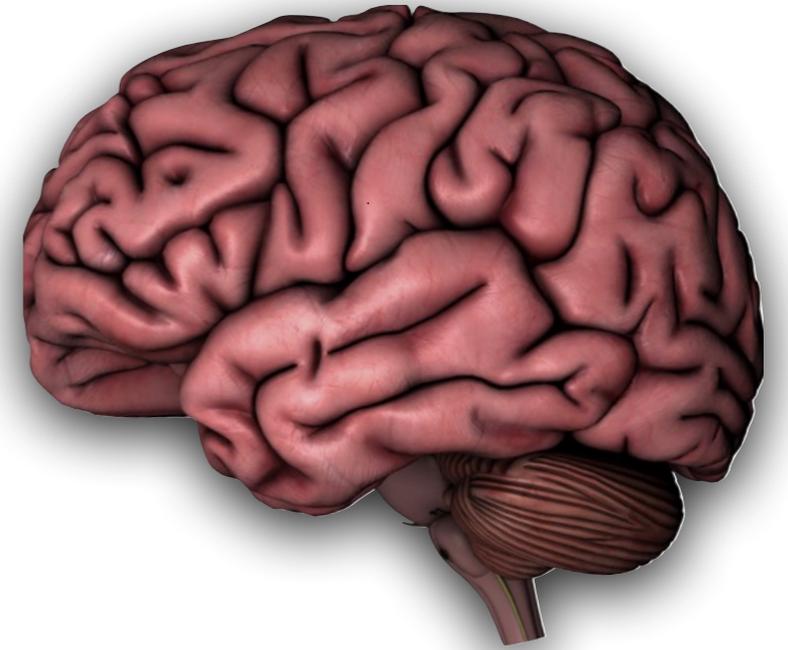
How to create a high support context

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How to create a high support context

- 1. Make learning a “thinking-centered” experience**
-with dopamine rushes!
- 2. Assess longitudinal growth**



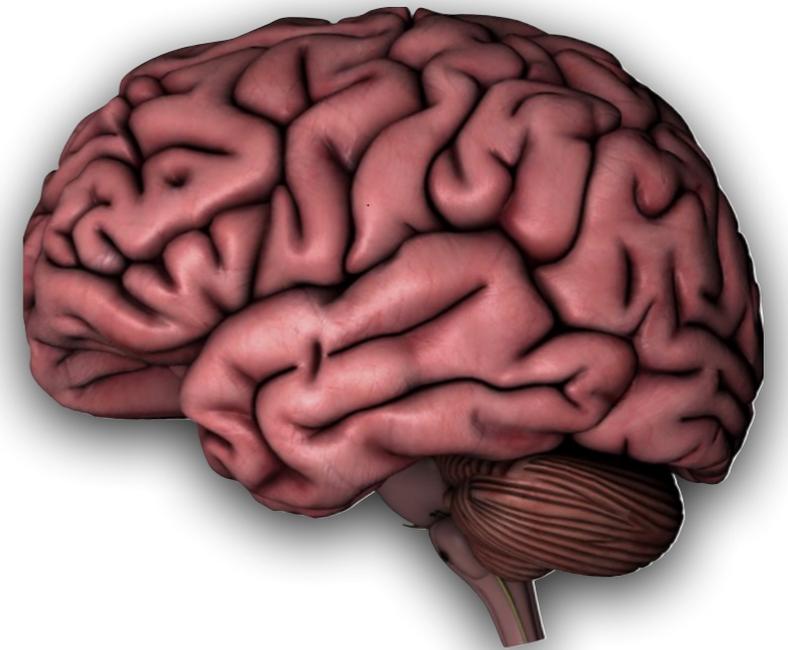
How to create a high support context

1. Make learning a “thinking-centered” experience

-with dopamine rushes!

2. Assess longitudinal growth

-not single day performance!



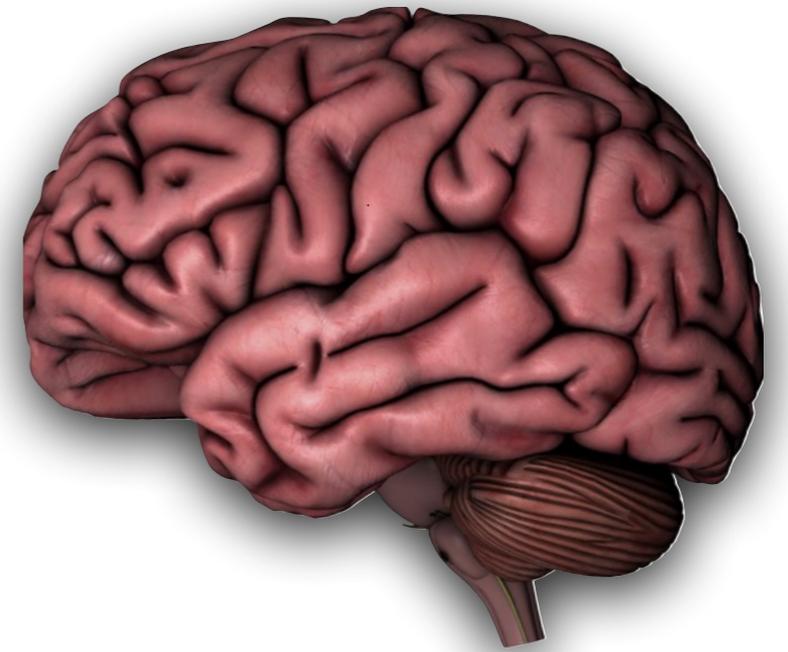
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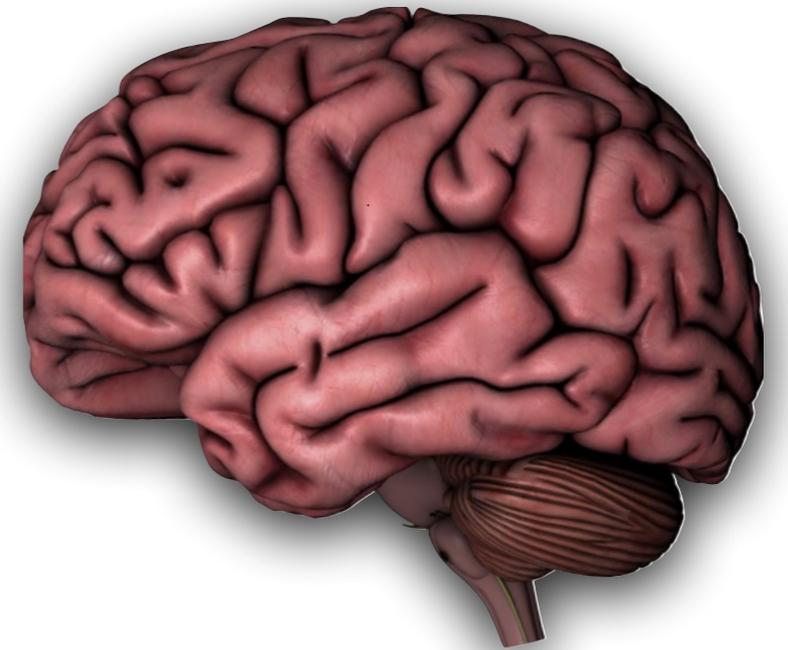
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3. Teach and learn how learning happens



How to create a high support context

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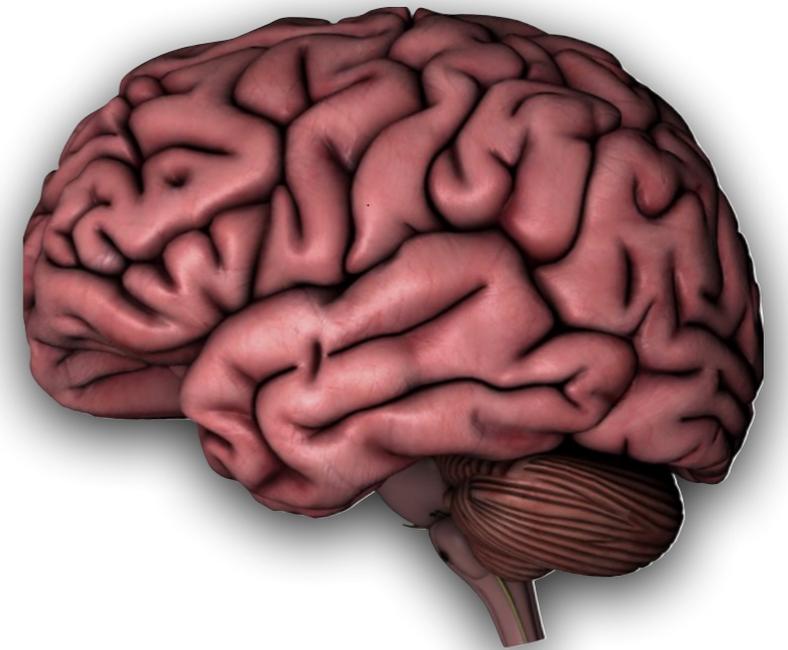
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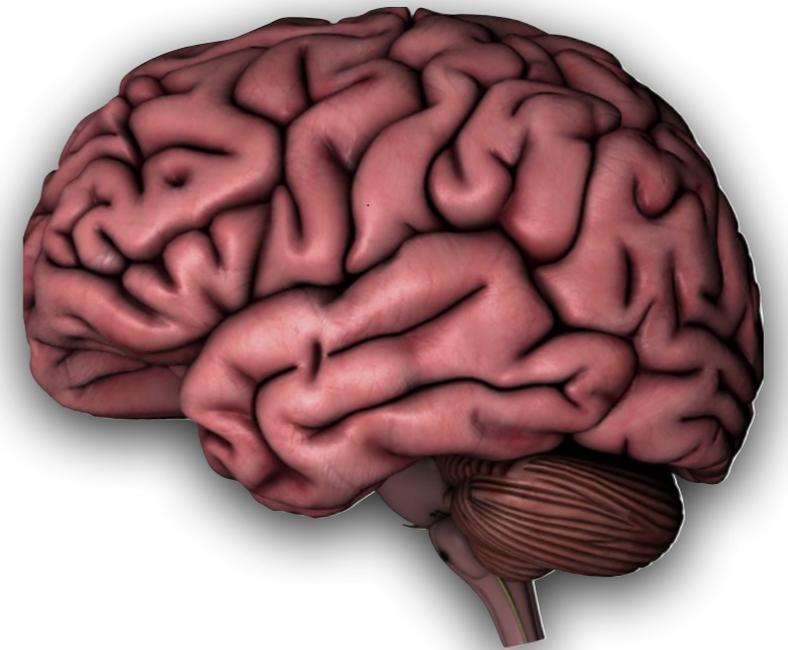
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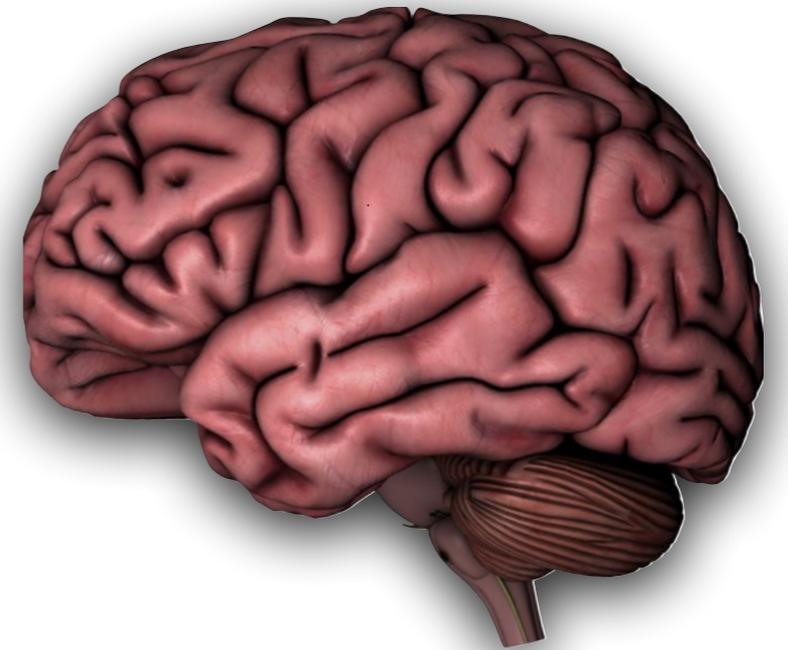
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4. Emotionally engage the students in the subject



How to create a high support context

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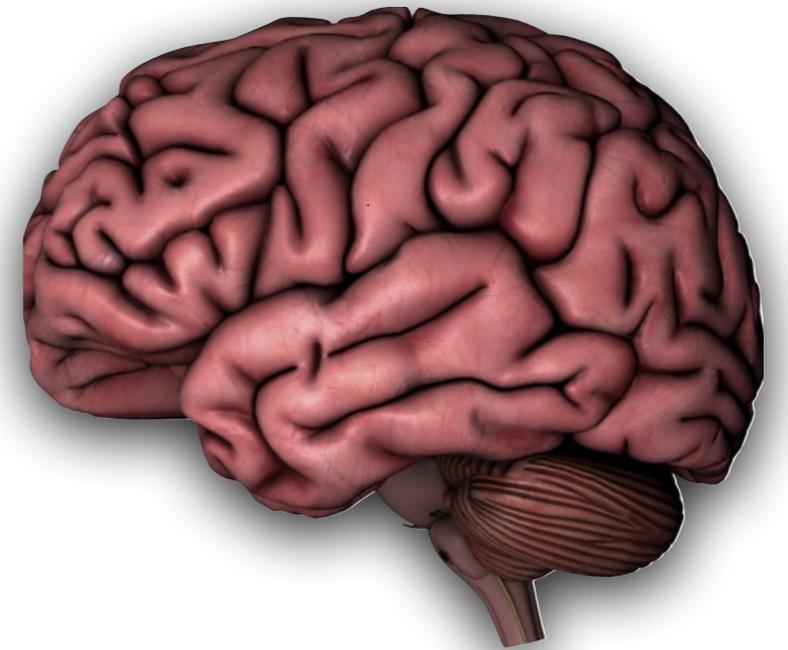


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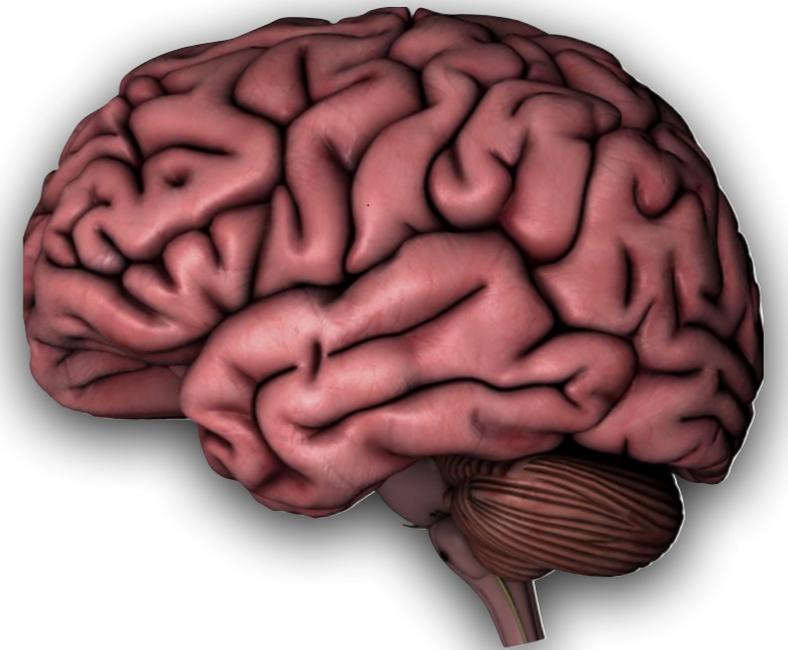


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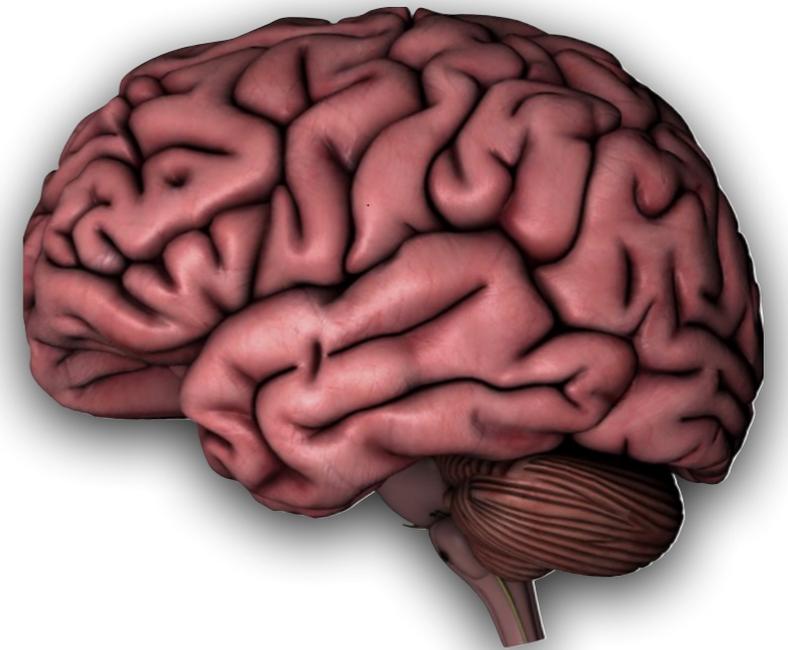
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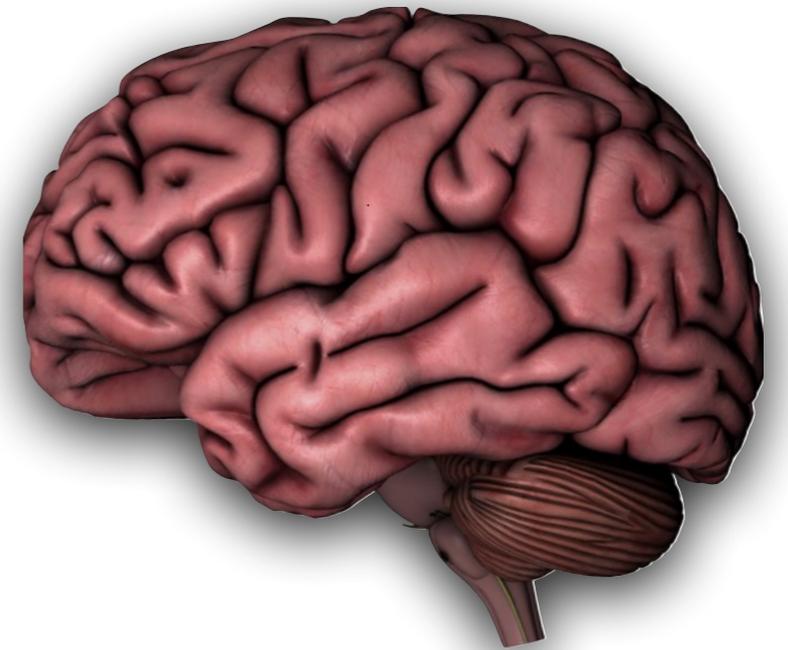
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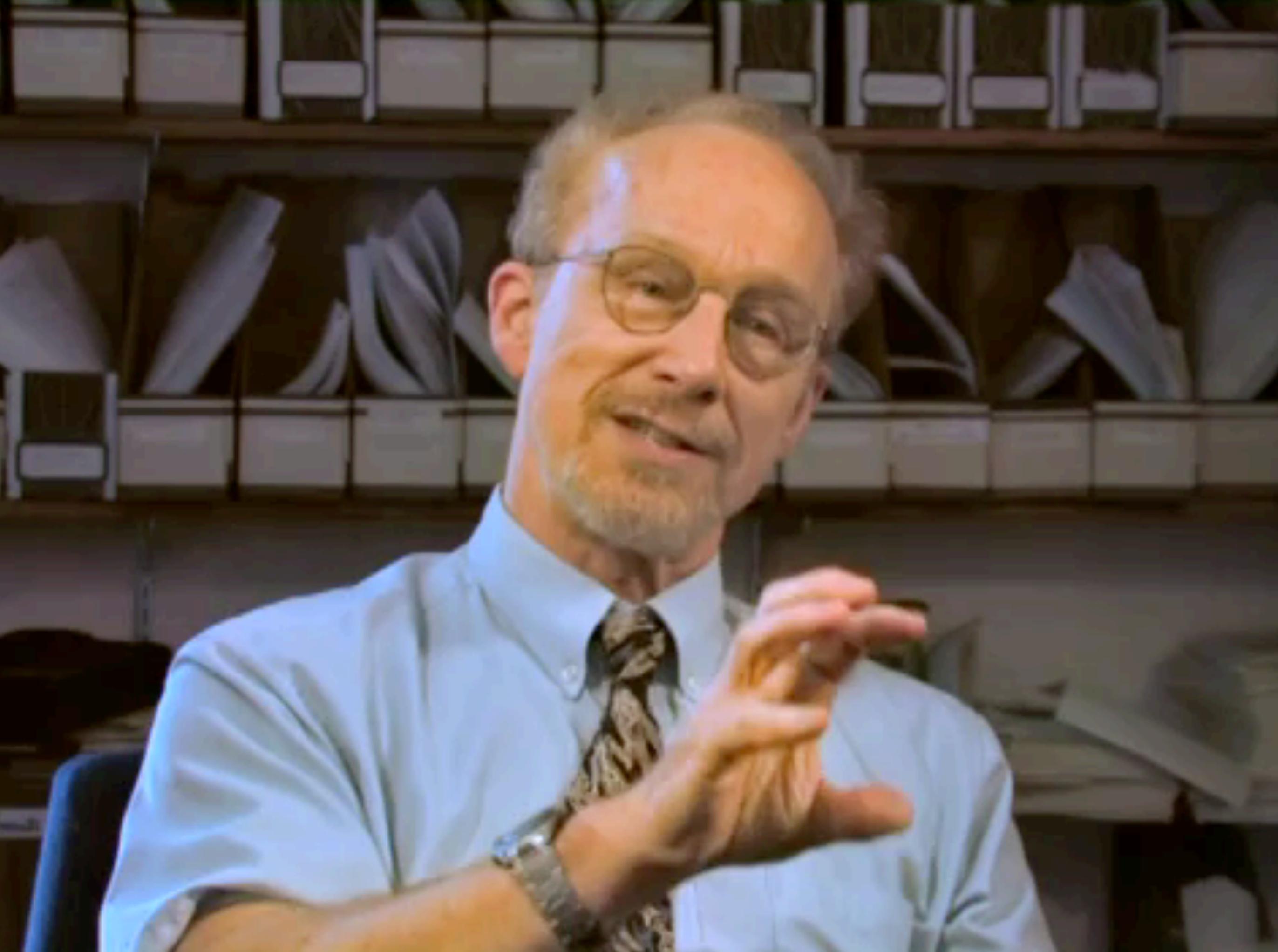
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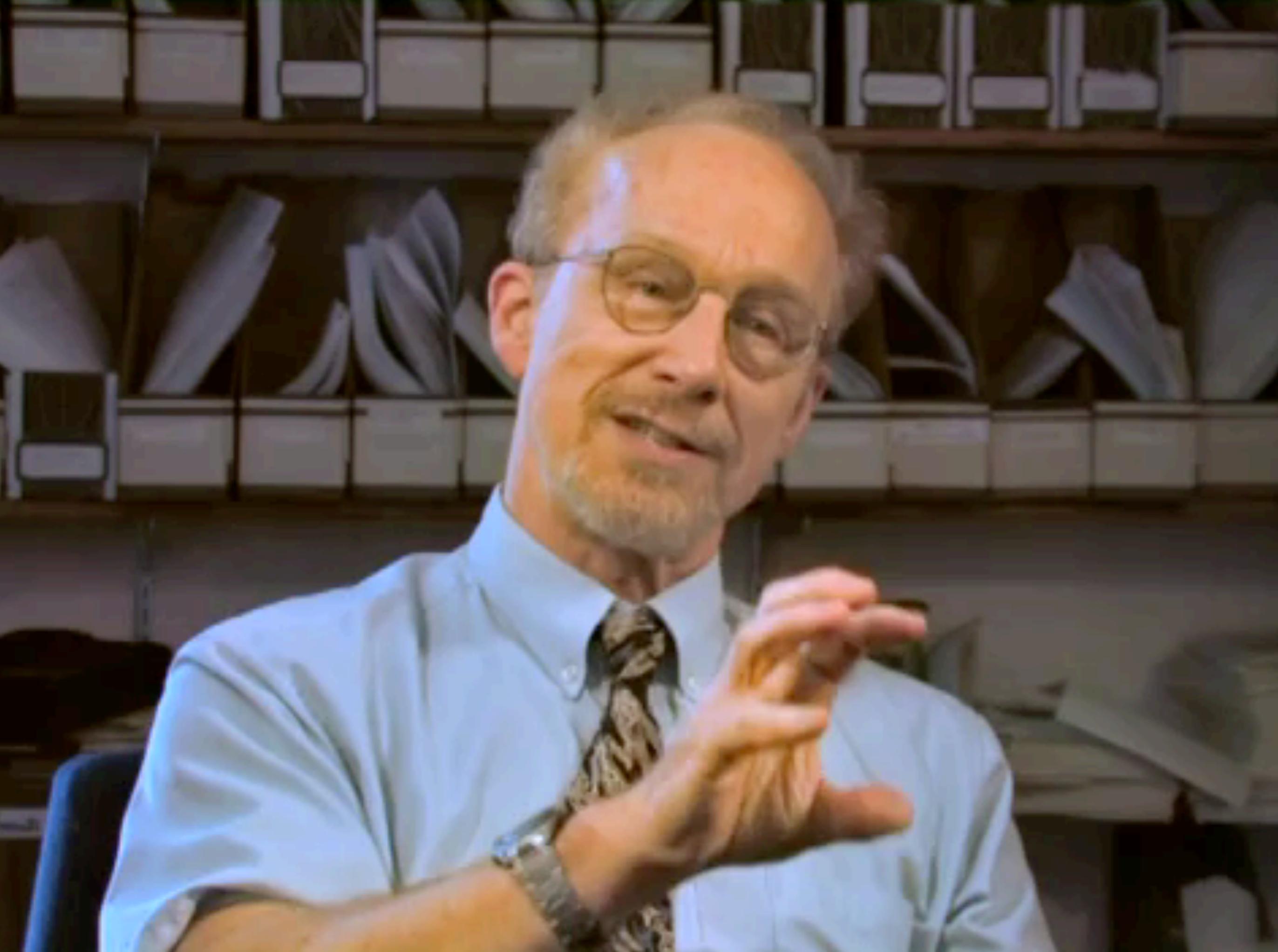
-don't simply lecture! "Hands on!"

5. Learning goal transparency is key for alignment

-don't put the cart before the horse!



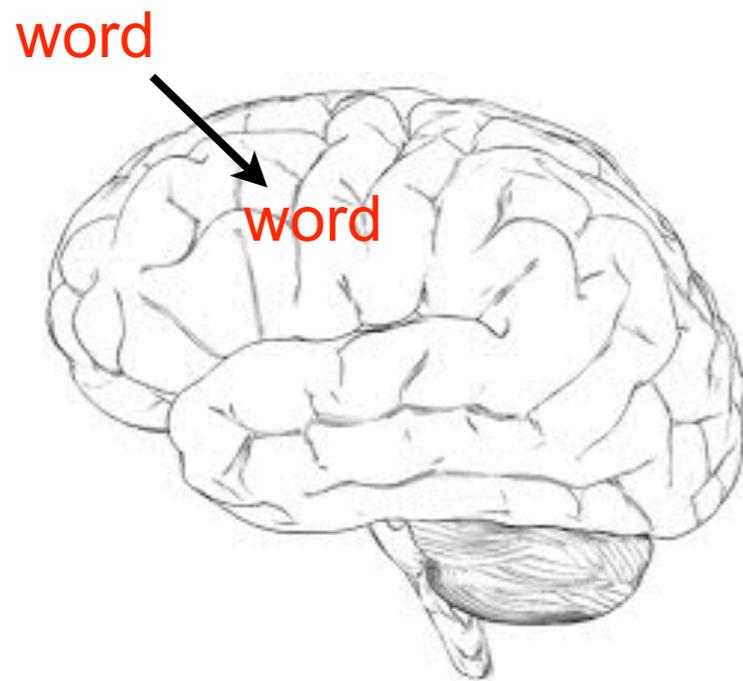




Lecture on

Neural Assemblies

How does a brain learn language?



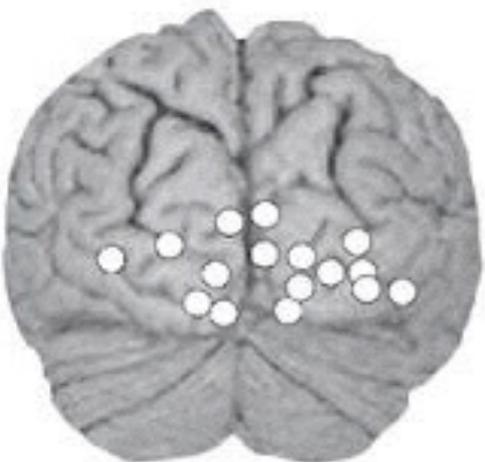
reading paradox



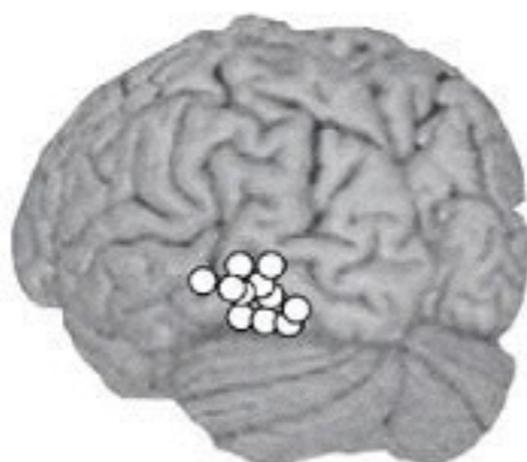
reading paradox



Visual feature analysis



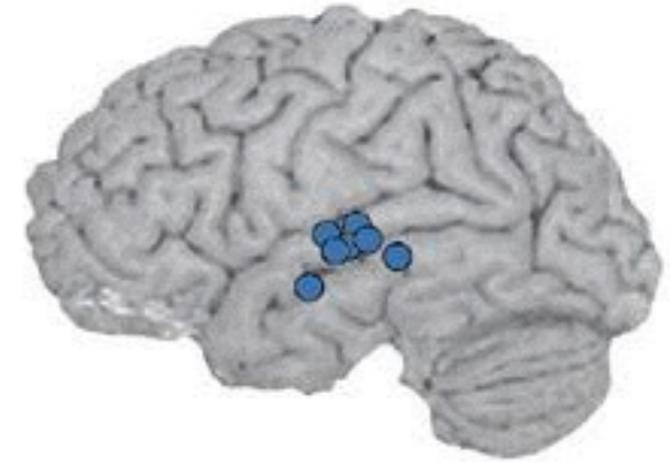
Letter-string analysis



Semantic analysis



Phonological analysis



Innate Language Acquisition Device



- Innatist Theory
- The **L**anguage **A**cquisition **D**evice (**LAD**)
- Children have an innate knowledge of the basic grammatical structure that is the basis to all languages
- The **U**niversal **G**rammar (**UG**)
- The Critical Period –

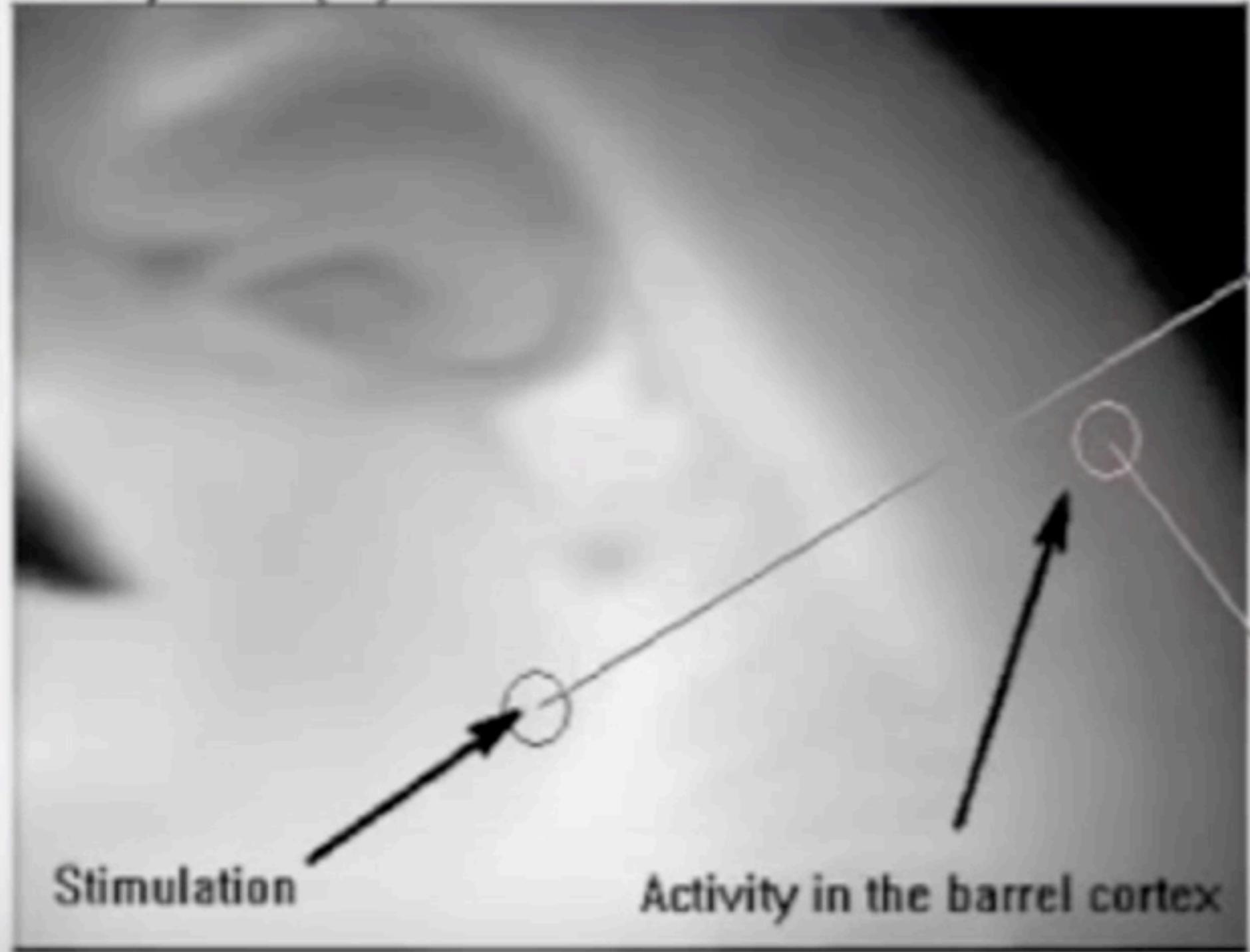
Innate Language Acquisition Device



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ActivityGlobal[01]



Stimulation

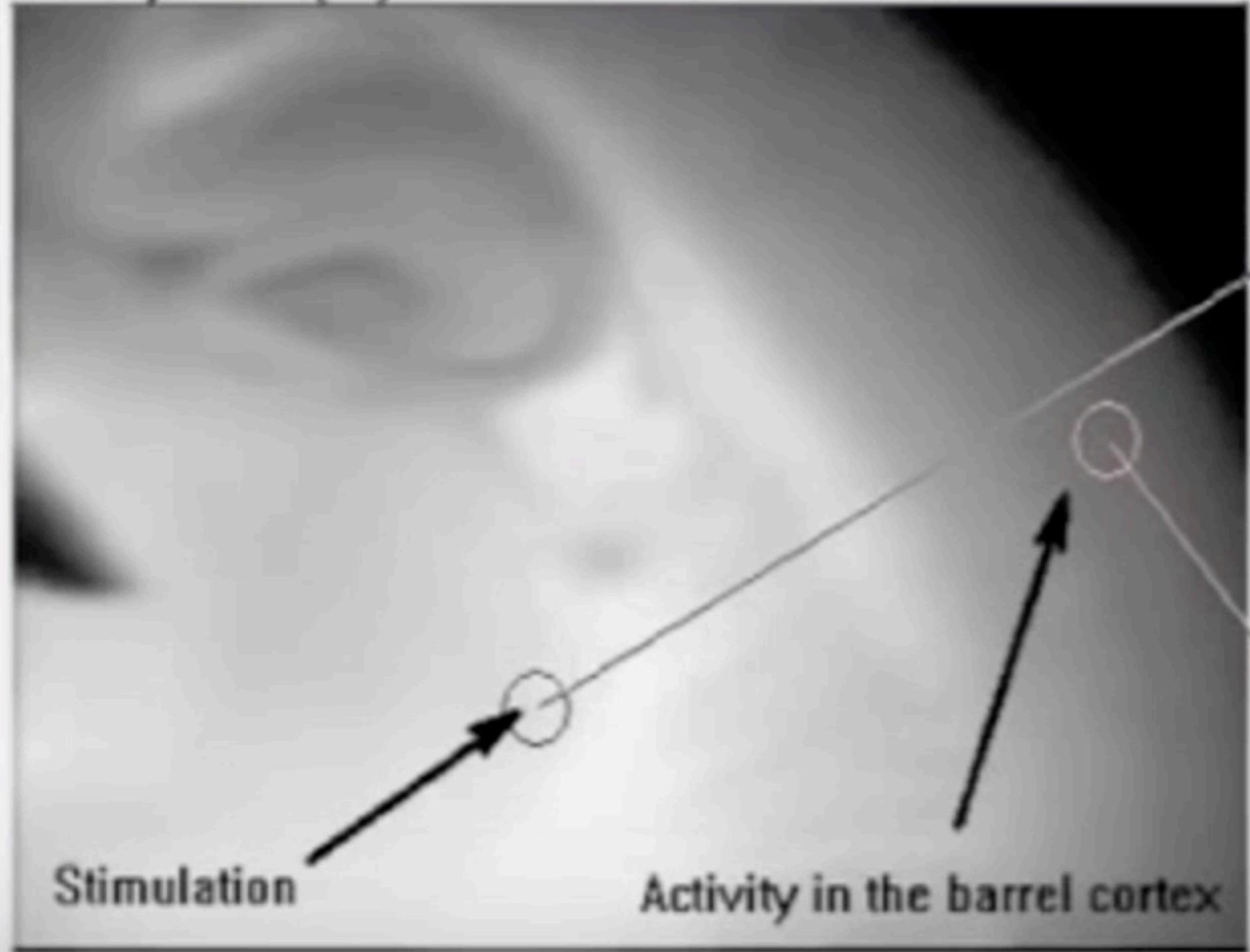
Activity in the barrel cortex

0.00 ms

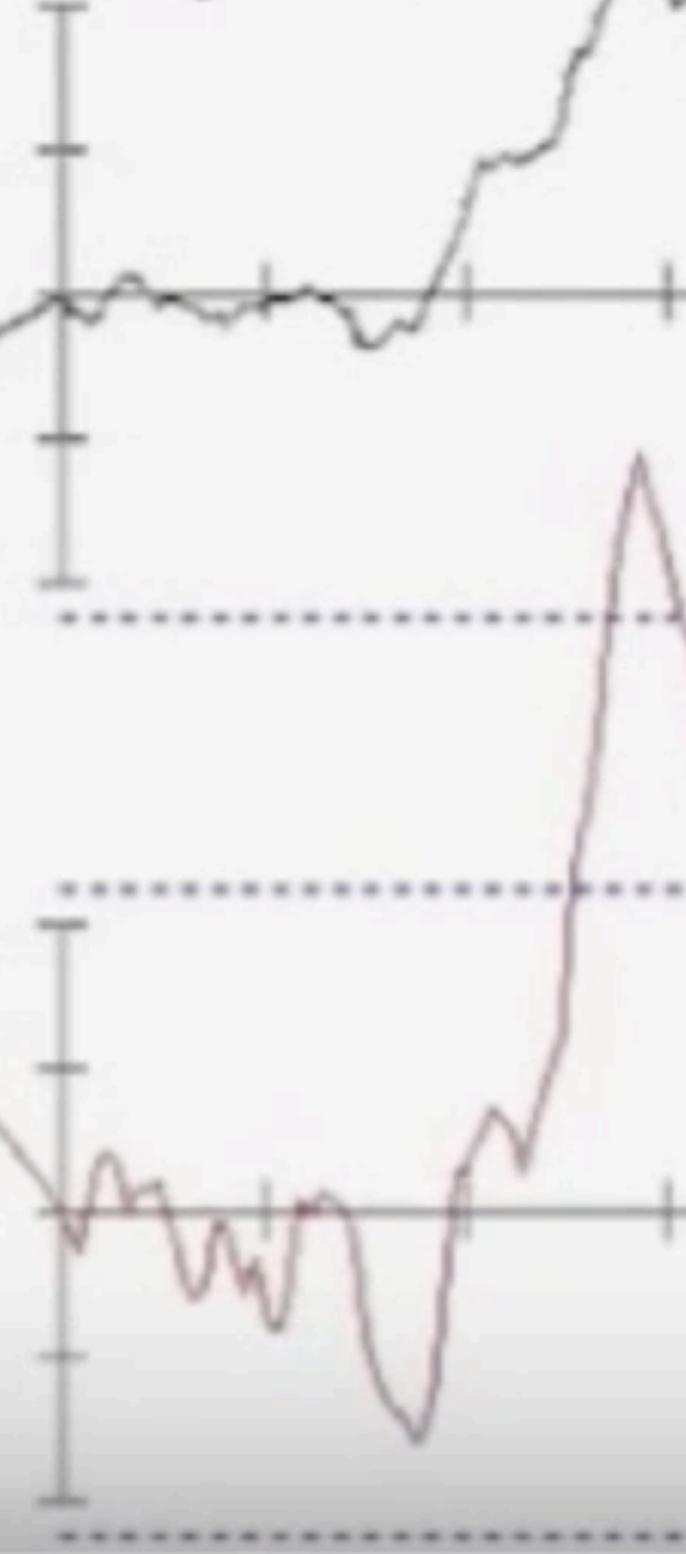
0.006%/div



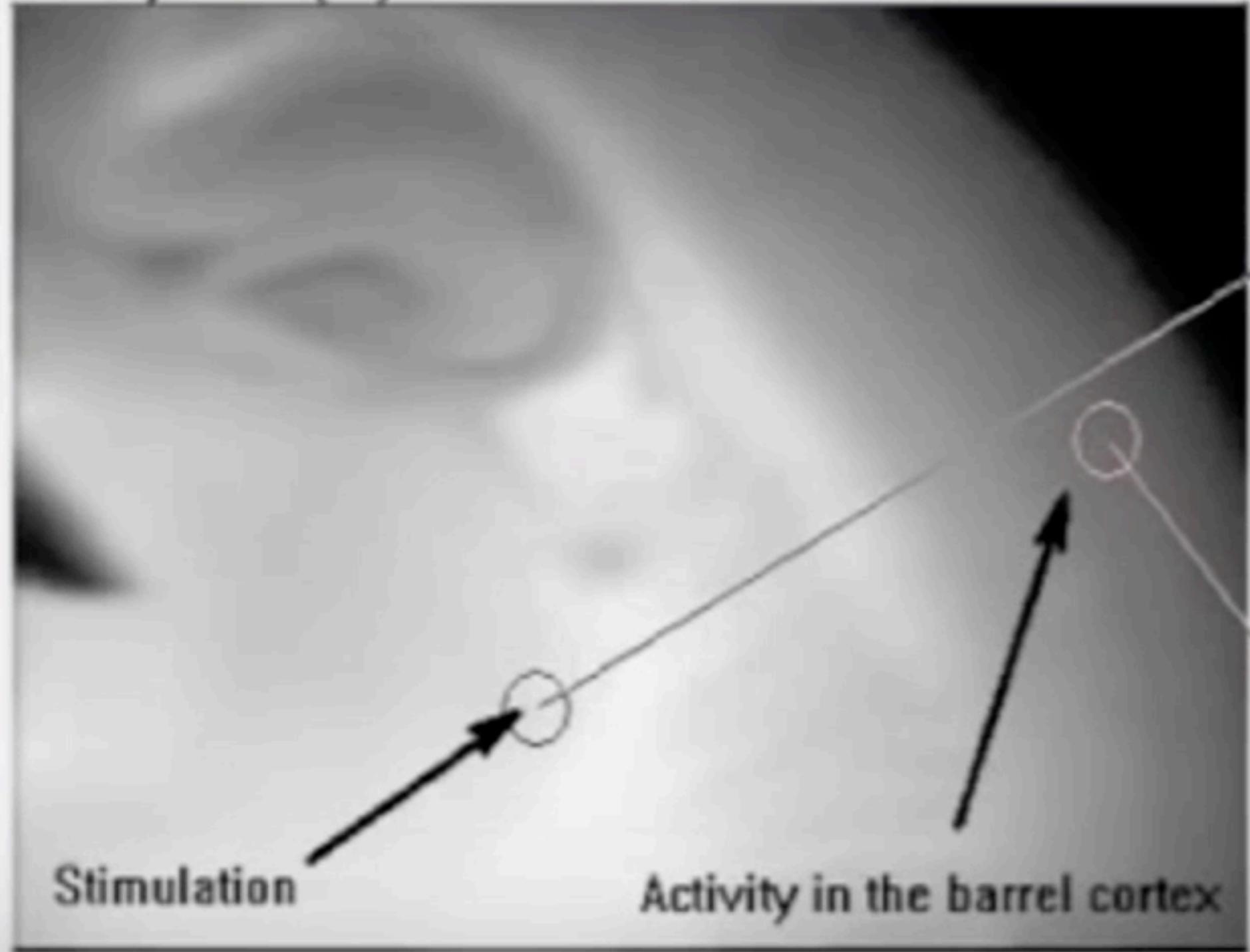
ActivityGlobal[01]



0.006%/div



ActivityGlobal[01]

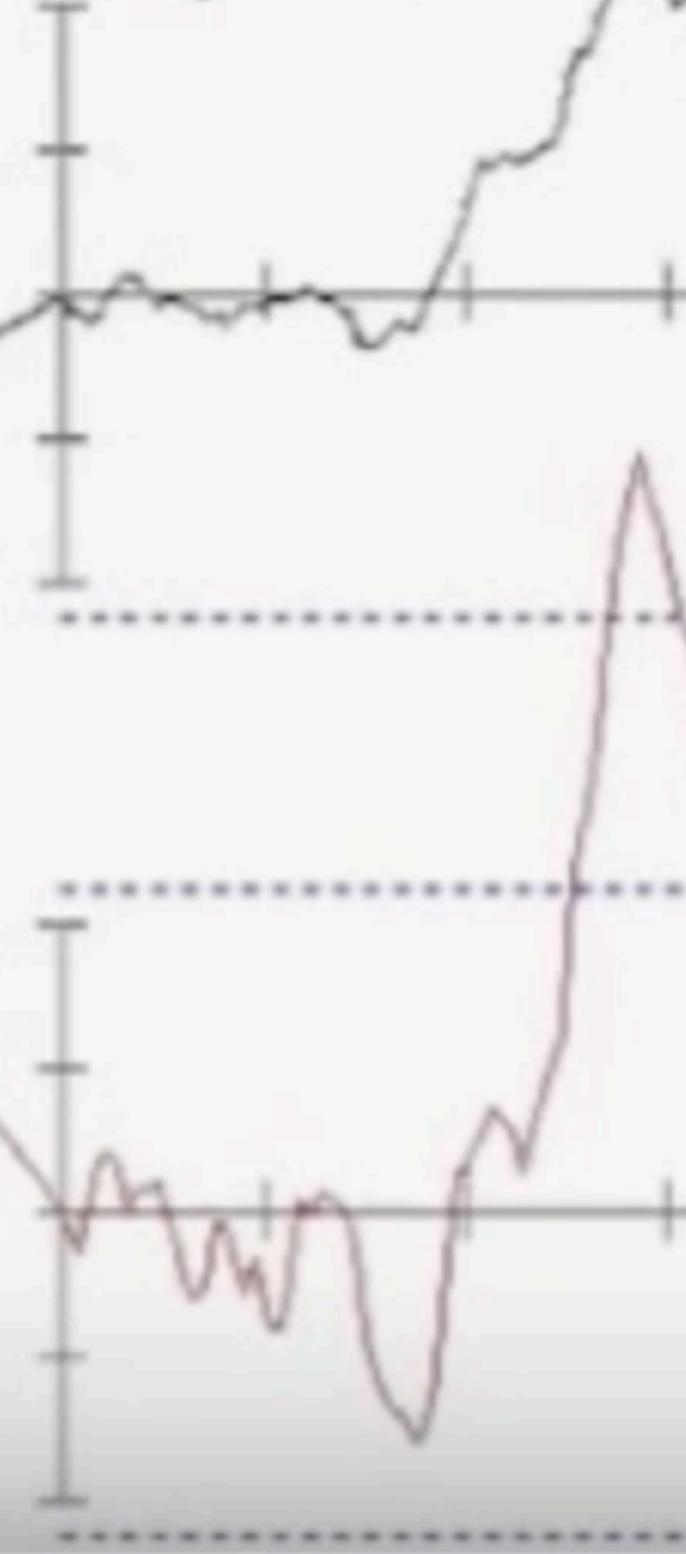


Stimulation

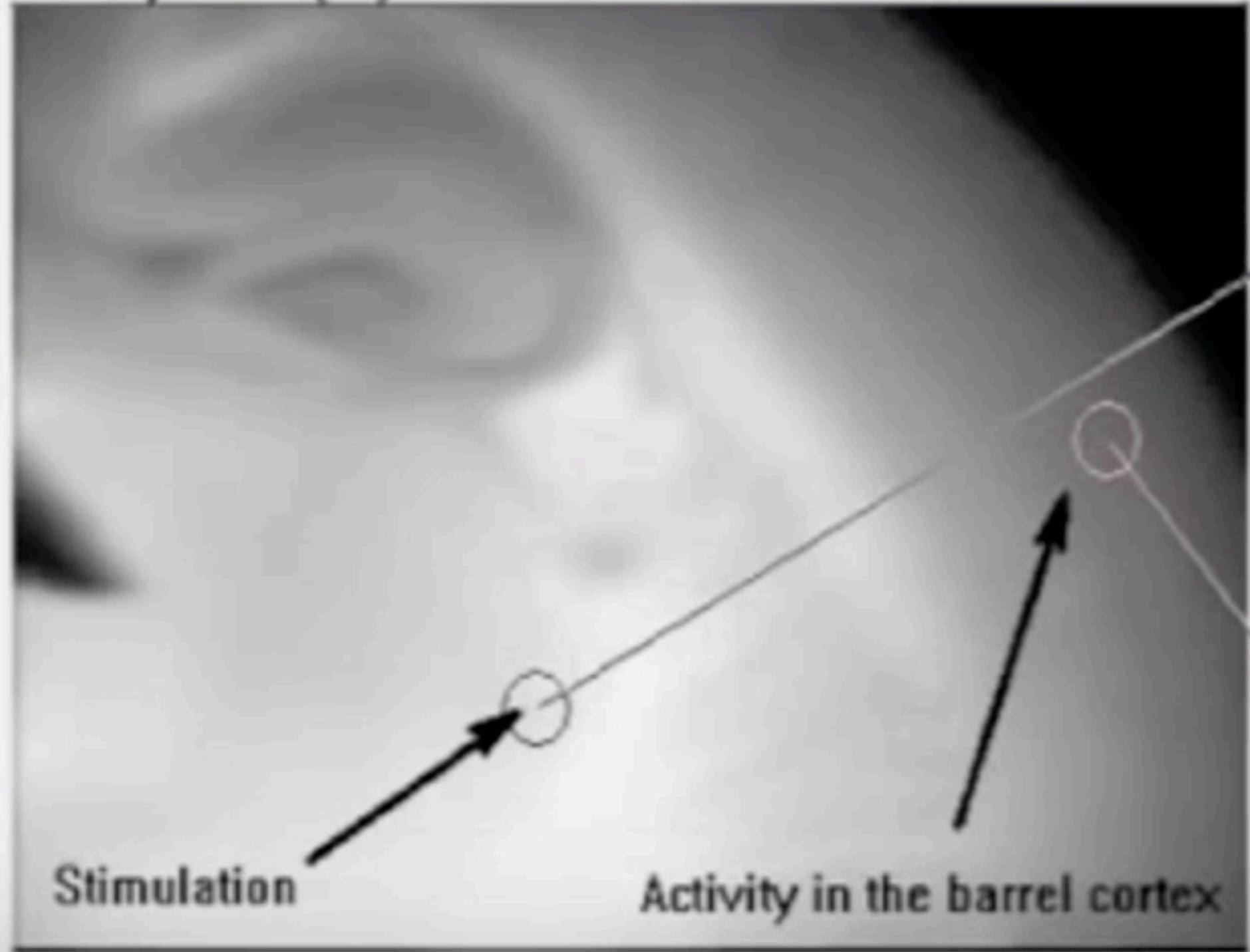
Activity in the barrel cortex

0.00 ms

0.006%/div



ActivityGlobal[01]

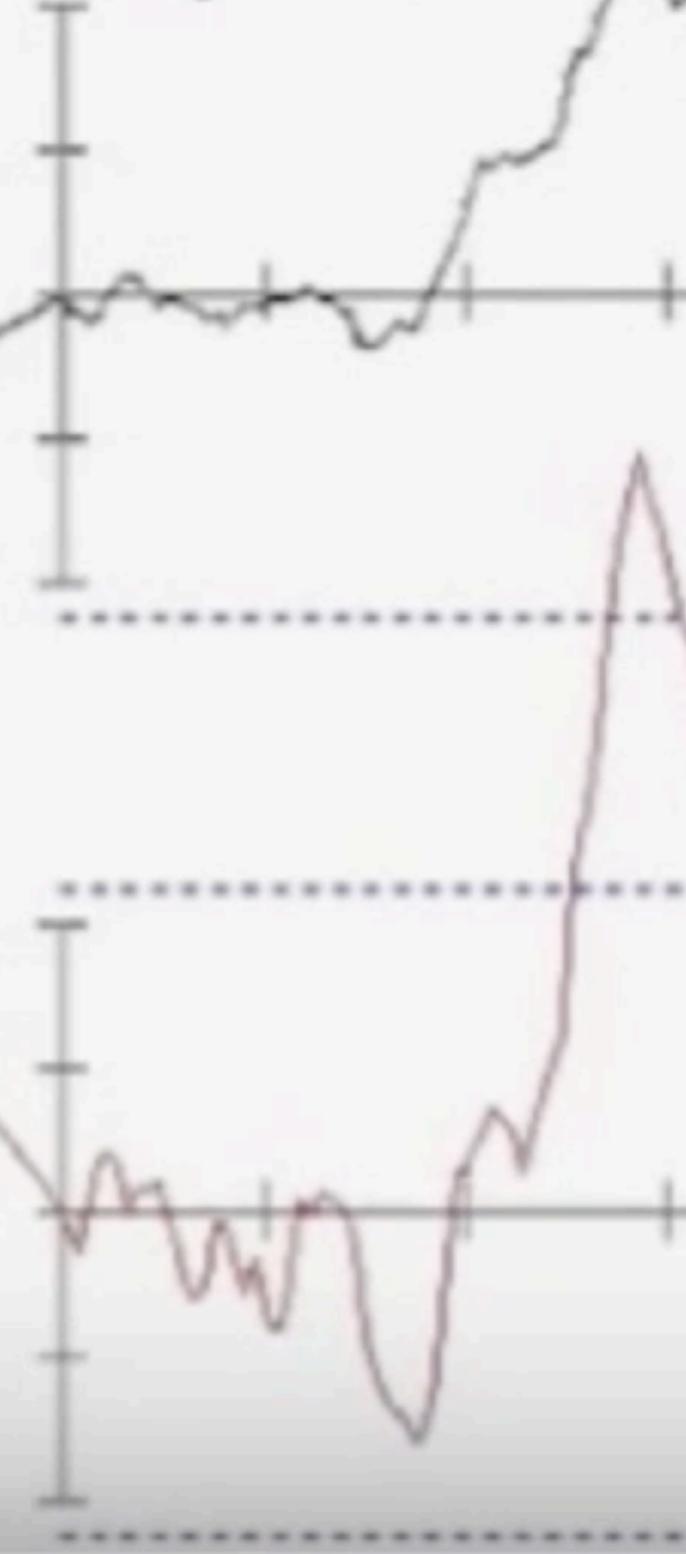


Stimulation

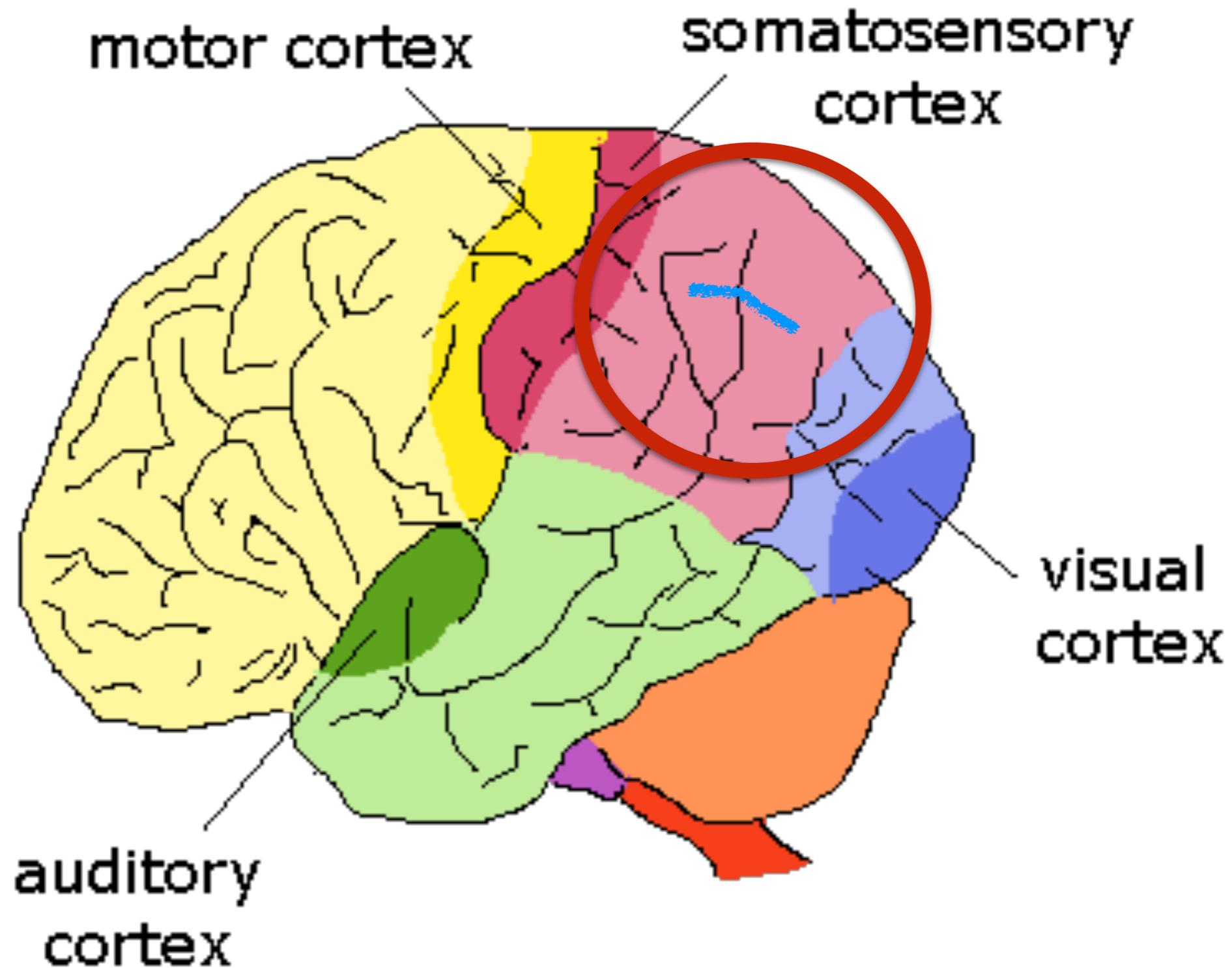
Activity in the barrel cortex

0.00 ms

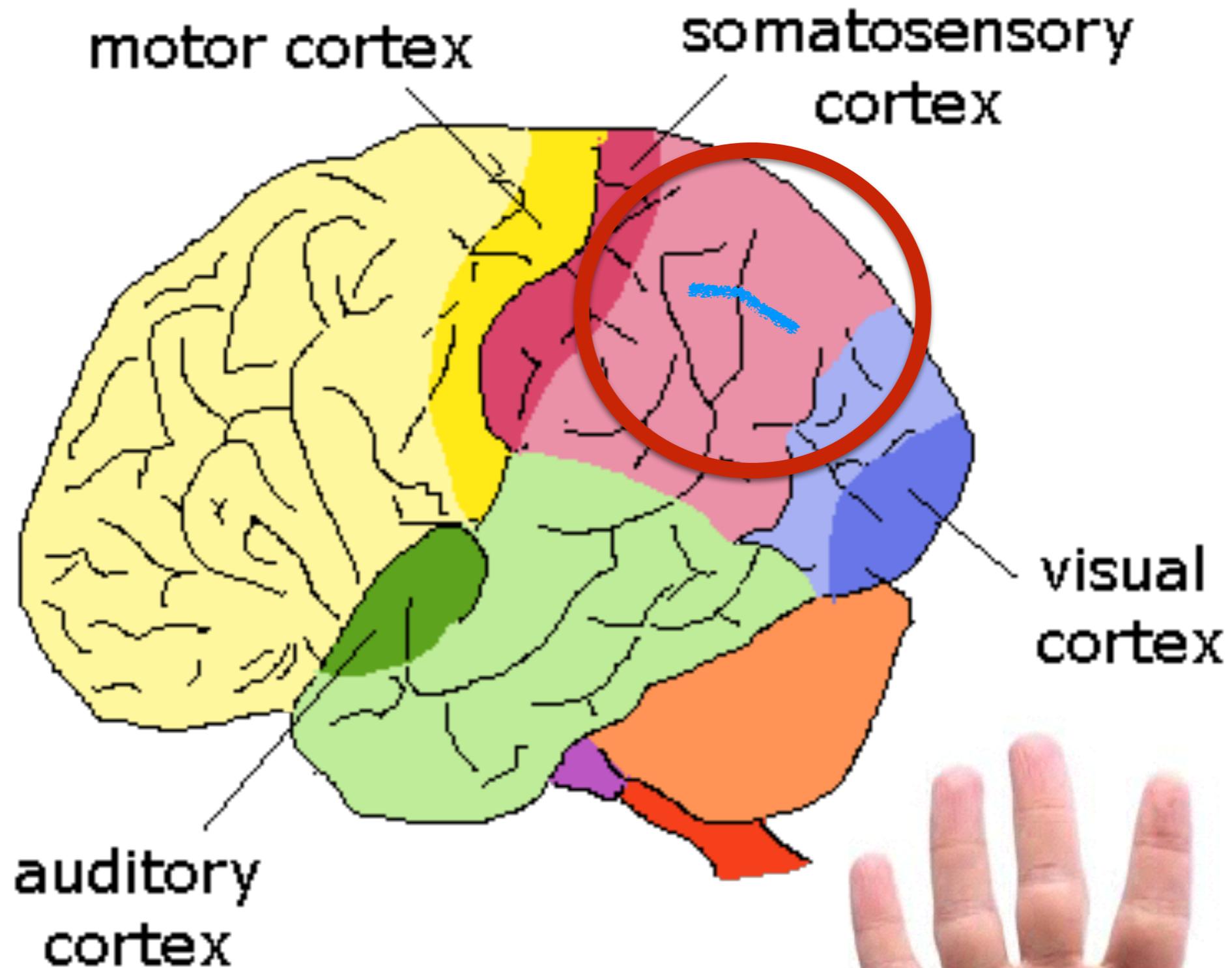
0.006%/div



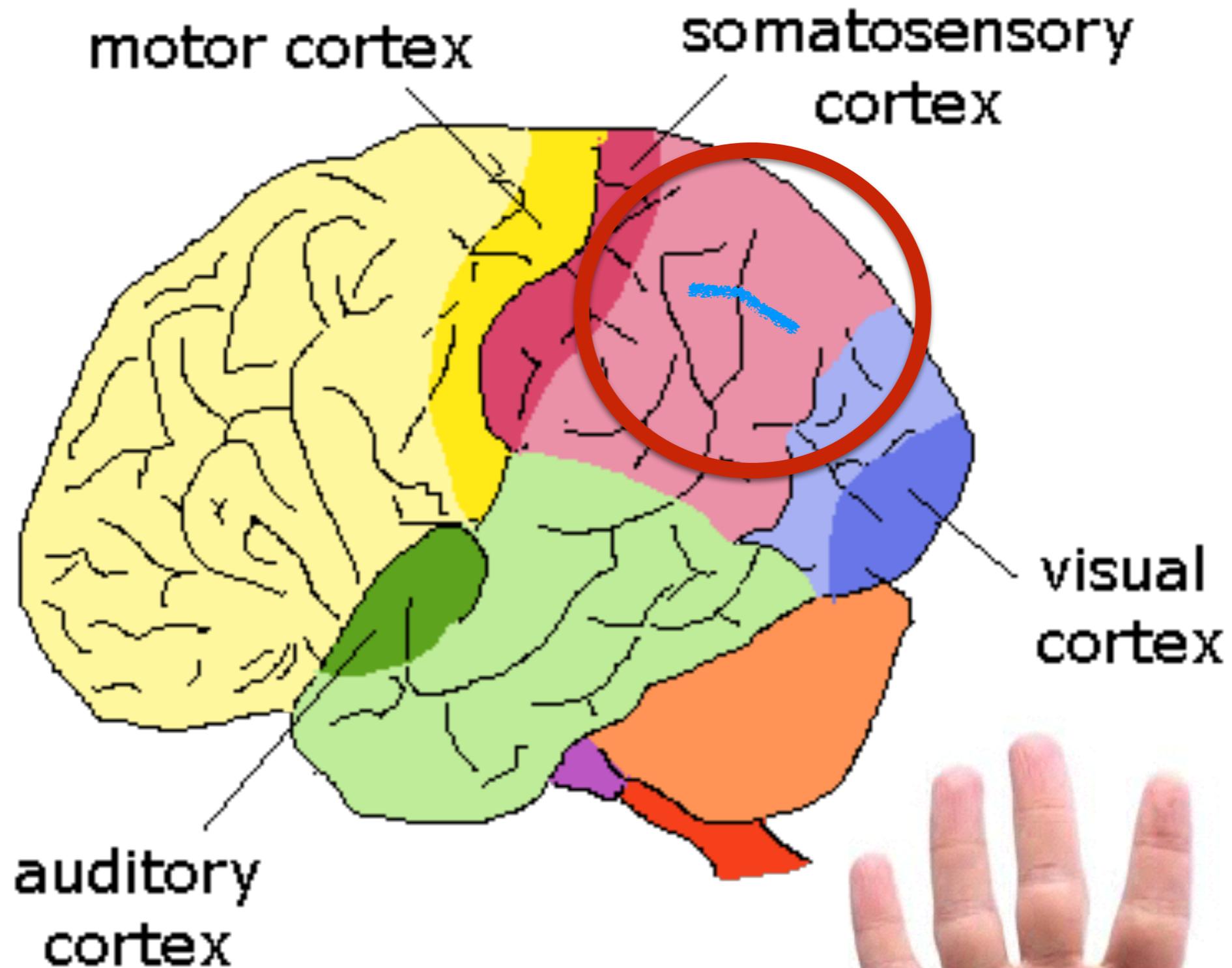
Neural Reuse



Neural Reuse

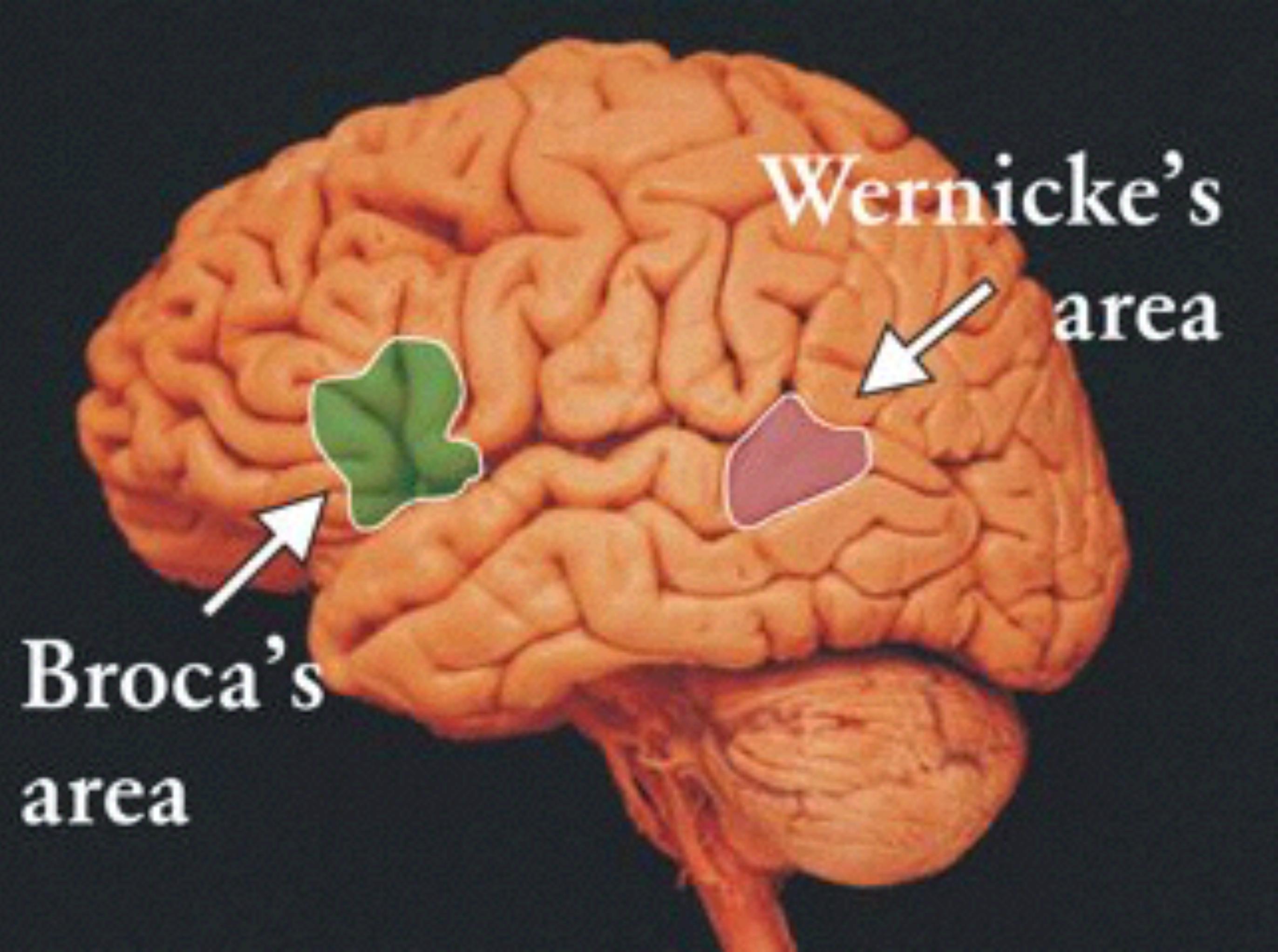


Neural Reuse



21 > 18

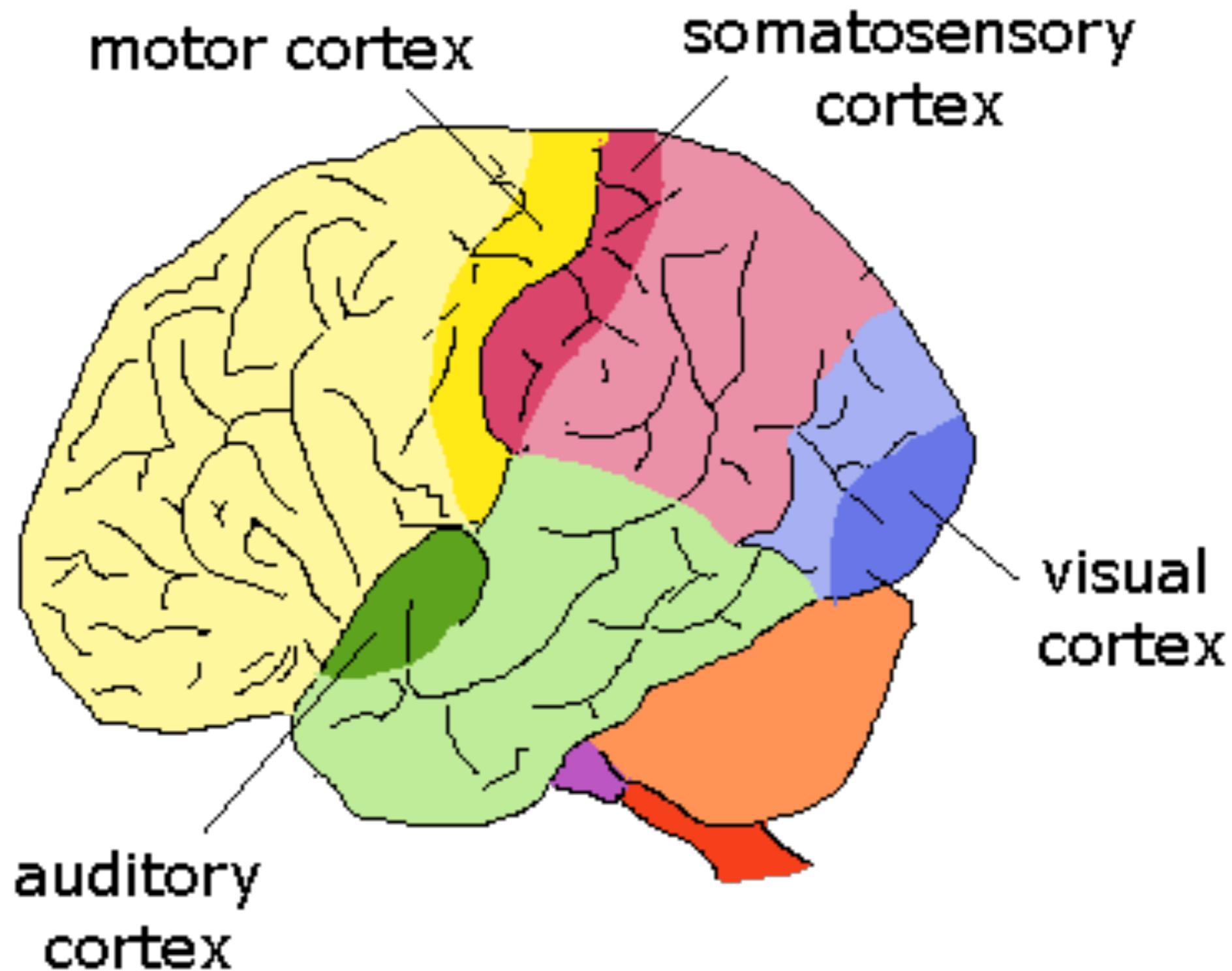




Wernicke's
area

Broca's
area

Neural Reuse



Summary of

- **The brain is a problem-solver; PPP isn't natural**
- **The brain needs blood flow**
- **Attention = personal relevance / novelty**
- **No emotion, no learning**

Summary of

Key points

- **The brain is a problem-solver; PPP isn't natural**
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Summary of



Summary of

- **Noticing allows us to construct internal tools**



Summary of

- **Noticing allows us to construct internal tools**
- **Language processing is embodied simulation**

Summary of

- **Noticing allows us to construct internal tools**
- **Language processing is embodied simulation**
- **Language exists to socialize**

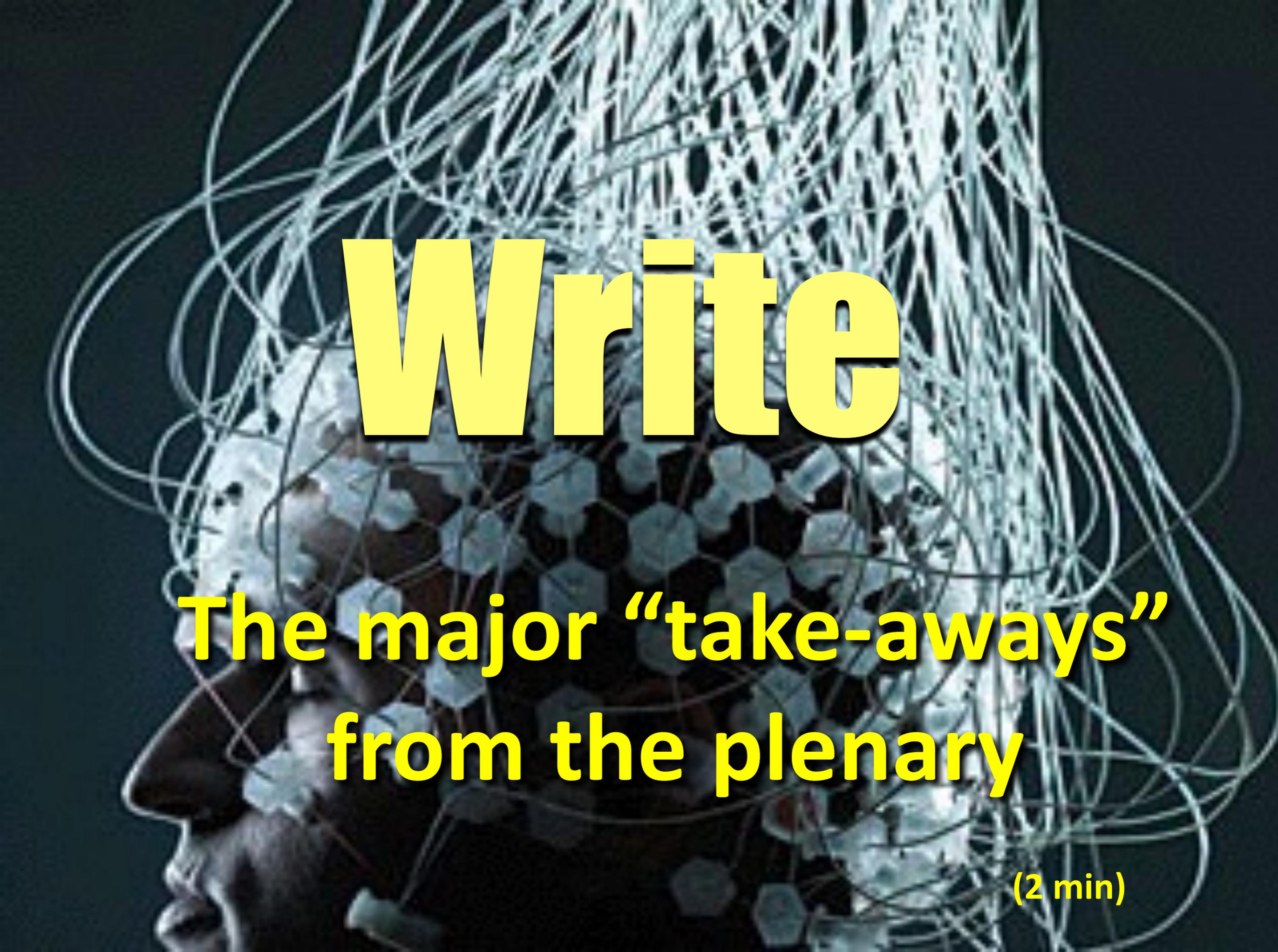
Summary of

- **Noticing allows us to construct internal tools**
- **Language processing is embodied simulation**
- **Language exists to socialize**
- **Regression should be expected**

Summary of

Key points

- **Noticing allows us to construct internal tools**
- **Language processing is embodied simulation**
- **Language exists to socialize**
- **Regression should be expected**



Write

The major “take-aways”
from the plenary

(2 min)

What Neuroscience Tells Us about Language Teaching

Robert Murphy & Curtis Kelly

FAB-EFL.COM

