

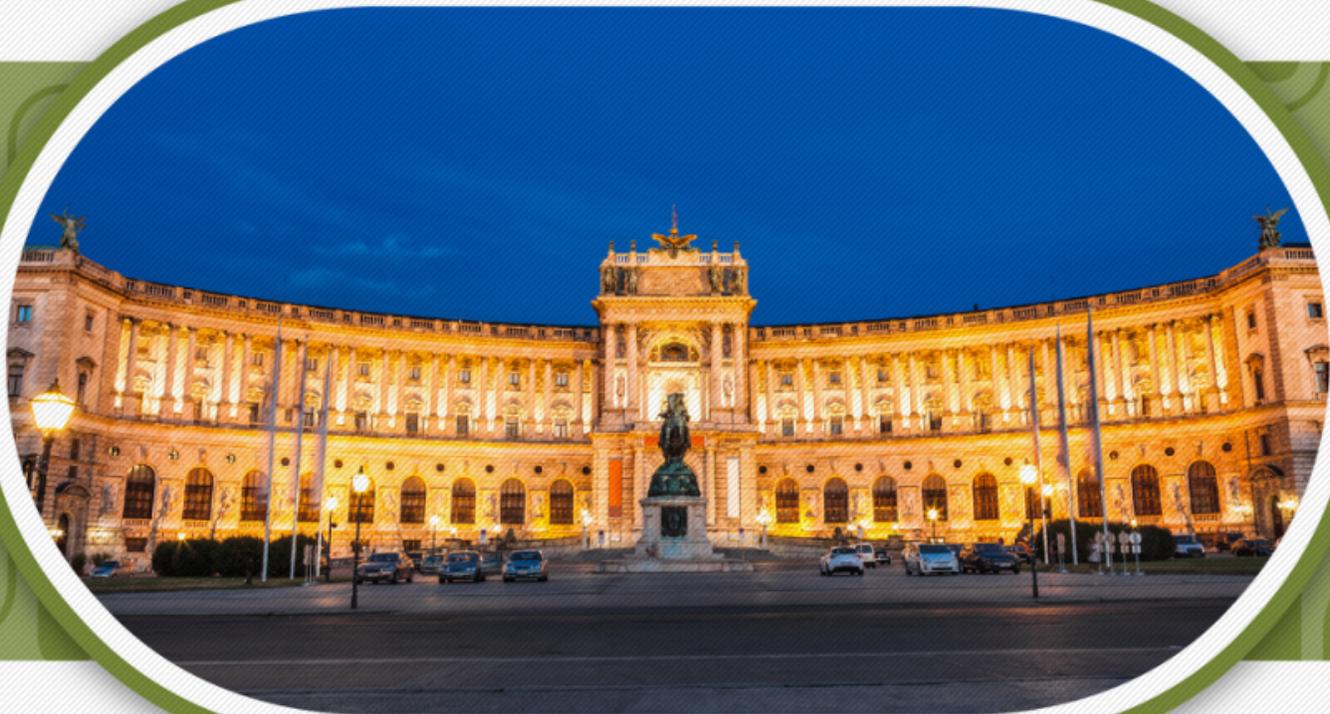
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#IBVI2018



# IB GLOBAL CONFERENCE 2018

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# Creativity & The Brain

Knowledge, Motivation, & Organizational Influencers to Improving  
Creativity in Schools

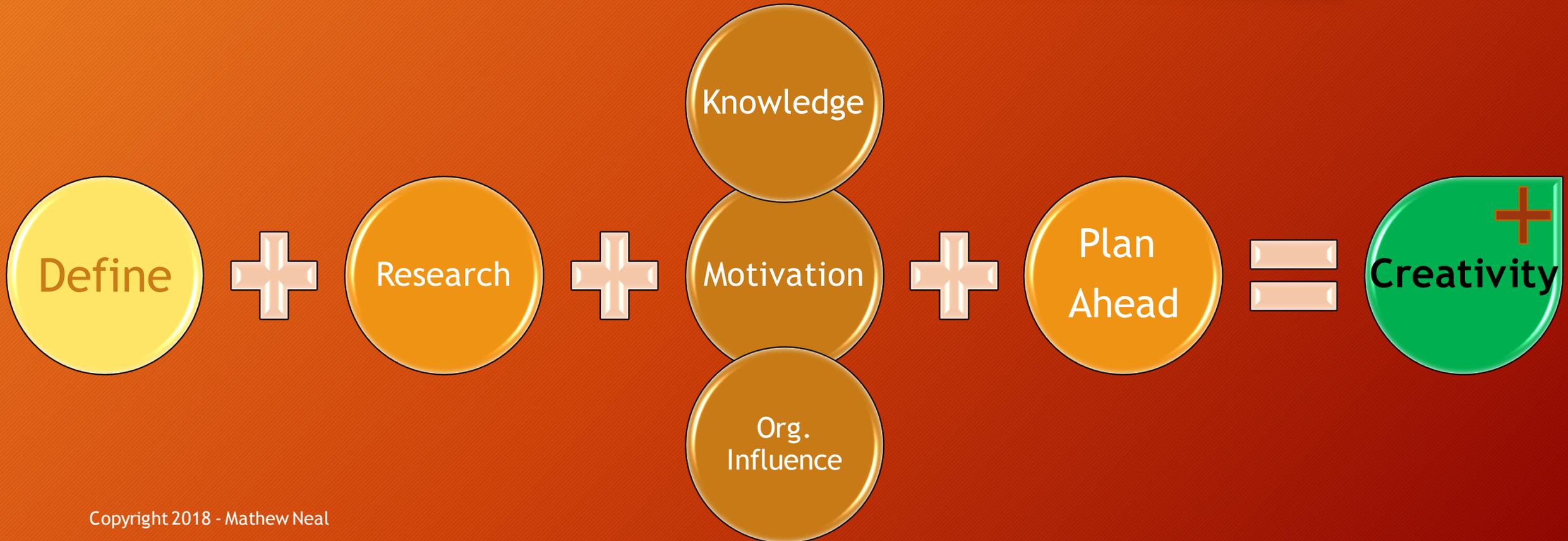
Dr. Mathew Neal  
Superintendent  
American Creativity Academy  
Kuwait

# Creativity

What is it??

What does it mean to you??

# Today We Will...





# Creativity

- 1.the state or quality of being creative.
- 2.the ability to transcend traditional ideas, rules, patterns, relationships, or the like, and to create meaningful new ideas, forms, methods, interpretations, originality, progressiveness, or imagination
- 3.the process by which one utilizes creative ability.

# Creativity Background

## Greeks + Romans

Adherence to a set of Rules in Art (G) defined as “techne”. Pre cursor to “technology”

Romans pushed visual arts to “sharing” and “inspiration” concepts

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## Medieval Christianity

God’s act of creating from nothing, reducing man’s ability to create.

Poetry revoked as not exceptional, craft and not creativity

## Renaissance

Give voice to a sense of freedom of expression

# Creativity Background- 17th-century Polish poet *M. Sarbiewski*

Applied “creativity” for the first time but only to poetry. For over a century and a half, the idea of *human* creativity met with resistance, because the term “creation” was reserved for creation “from nothing.”



“Creative people realize their visions over time, and through dedicated, protracted struggle” *Ed Catmull, President of Pixar and Disney Animation*

Do you think this is true??

Can you really influence creativity??

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# Driving the brain towards creativity and intelligence: A network control theory analysis. Kenett, et al. 2018 *Neuropsychologia*

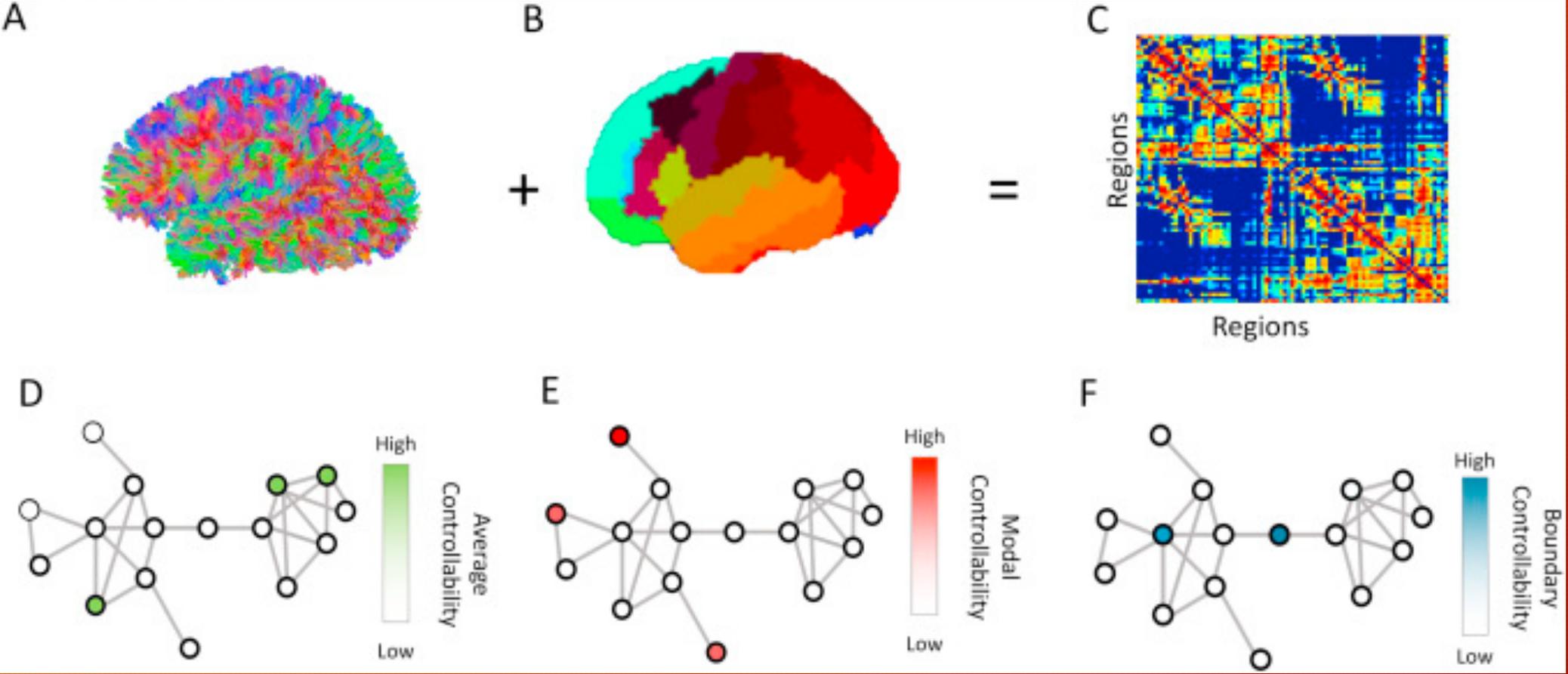
- High-level cognitive constructs, such as creativity and intelligence, entail complex and multiple processes, including cognitive control processes.
- Neurocognitive research highlight dynamic interaction across neural network systems/ role of cognitive control processes in guiding such a dynamic interaction.
- Computational network control theory (NCT)
- Patterns of inter-region activity propagated along the structure of an underlying network
- The strength of this approach is its ability to characterize the potential role of each brain region in regulating whole-brain network function based on its anatomical fingerprint

## The parietal lobe : carries out specific functions.

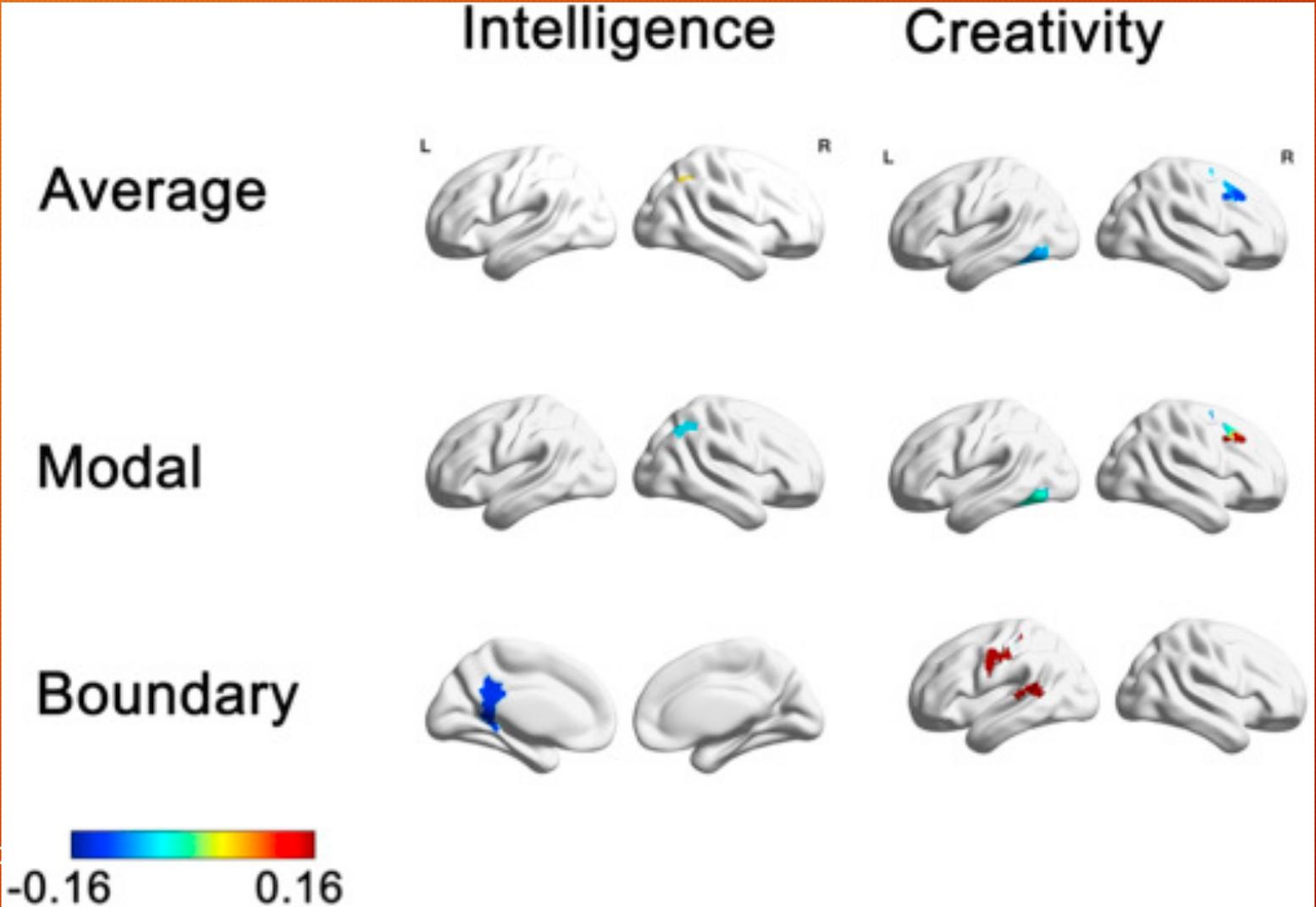
- Must be able to process sensory information within seconds. Stores information such as taste, temperature and touch.
- Is an integration and center for processing
- Humans would not be able to feel sensations of touch, if the parietal lobe was damaged.



# Computational network control theory (NCT) :



# Computational network control theory (NCT) :



# Driving the Brain, Kenett, et al. 2018

Creativity is related to the ability to “drive” the brain system into difficult to reach states by the right dorsolateral prefrontal cortex (inferior frontal junction) and higher integration abilities in sensorimotor areas.

Different facets of creativity—fluency, flexibility, and originality—relate to generally similar but not identical network controllability processes.

“There is a sweet-spot between the known and the unknown where originality happens; the key is to be able to ‘linger’ there without panicking” *Ed Catmull, President of Pixar and Disney Animation*

# What does brain research currently say about creativity?

In the past decade, there has been a large increase in neurocognitive research on creativity, attempting to identify the main brain regions that contribute to **creativity** (Dietrich and Kanso, 2010; Gonen-Yaacovi et al., 2013; Jung et al., 2013; Shen et al., 2017; Wu et al., 2015; Yoruk and Runco, 2014).

What does brain research currently say about creativity?

Creativity is a Multistage process, involving dynamic interactions between bottom-up, automatic processes involved during idea generation; and top-down, executive control processes mainly involved during idea evaluation. (Barr et al., 2014; Beaty et al., 2016; Chrysikou, 2018; Sowden et al., 2014).

What does brain research currently say about creativity?

New theories attribute a key role to cognitive control processes in guiding creative novelty seeking and response retrieval, selection, and evaluation

(Chrysikou, 2018).

## What does brain research currently say about creativity

Similarly, the neural processes related to reasoning and intelligence demand cognitive control processes, required for fluent manipulation of complex information (Hearne et al., 2015, 2016; Jung and Haier, 2007).

# So what did Kennett et. al. 2018 Discover?

Applied a state-of-the-art computational approach—network control theory—to quantitatively examine how different *control strategies* in specific brain regions relate to creativity and intelligence.

These efforts have related the generation process in creativity to the Default Mode Network (DMN) and the evaluation process in creativity to the Executive Control Network (ECN); Beaty et al., 2016).

# What is the Executive Control Network?

The ECN is a set of prefrontal and posterior parietal regions that are engaged during cognitive tasks that require externally-directed attention, such as working memory, relational integration, response inhibition, and task-set switching (Zabelina and Andrews-Hanna, 2016).

# What is the Default Mode Network?

The DMN is a set of midline and inferior parietal regions that activate in the absence of most external task demands (Andrews-Hanna et al., 2014). The DMN is associated with cognitive processes that require internally-directed or self-generated thought, including mind-wandering, future thinking, semantic memory, and mental simulation (Andrews-Hanna et al., 2014; Zabelina and Andrews-Hanna, 2016).

# Where is Creativity or Creative processing found.. DCN or ECN??

Recent studies have found that ECN and DMN networks cooperate in tasks that require evaluation of internal information, such as autobiographical future memory planning, emotion regulation, and mind wandering (Christoff et al., 2009; Gerlach et al., 2014; Ochsner et al., 2012; Spreng et al., 2014).

Beaty et al., show DMN and ECN cooperation at later stages of the creative task, which they interpret as the ECN executing evaluation processes on ideas generated by the DMN during earlier stages of the task (Beaty et al., 2015).

Such a dynamic role for the ECN is consistent with a theory on **the role of the prefrontal cortex as a filtering mechanism, contingent on task demands and context** (Chrysikou et al., 2014).

# So what's next?

Kenett, et al. 2018

Taken together, the results highlight the different control processes involved in intelligence and creativity. Researchers found that **intelligence was related to a heightened ability to drive the brain into easy-to-reach states** and fluid spread of information within contextual association regions (e.g., IPL and RSC).

**Creativity however was related to a heightened ability to drive the brain into difficult to reach states**, with effects largely localized within regions that connect between bottom-up and top-down processes (e.g., IFJ) and to integration/segregation processes in sensorimotor areas.

# So how does this play out in the classroom?

Neuroimaging studies have demonstrated how simulation plays a central role in conceptual representations (Binder, 2016; Binder and Desai, 2011; Binder et al., 2009).

In divergent thinking tasks, the canonical measure of creative ability, participants are required to simulate and manipulate concepts in order to generate novel, alternative, or uncommon uses to them (Runco and Acar, 2012).

In a recent study, Matheson et al. (2017) examine multivariate voxel pattern activation when participants generate common and uncommon tool uses to concrete tools.

The authors found higher left fusiform activation when participants were required to generate uncommon responses, possibly reflecting a deeper retrieval process over visual features of objects. (Kenett, et al. 2018)

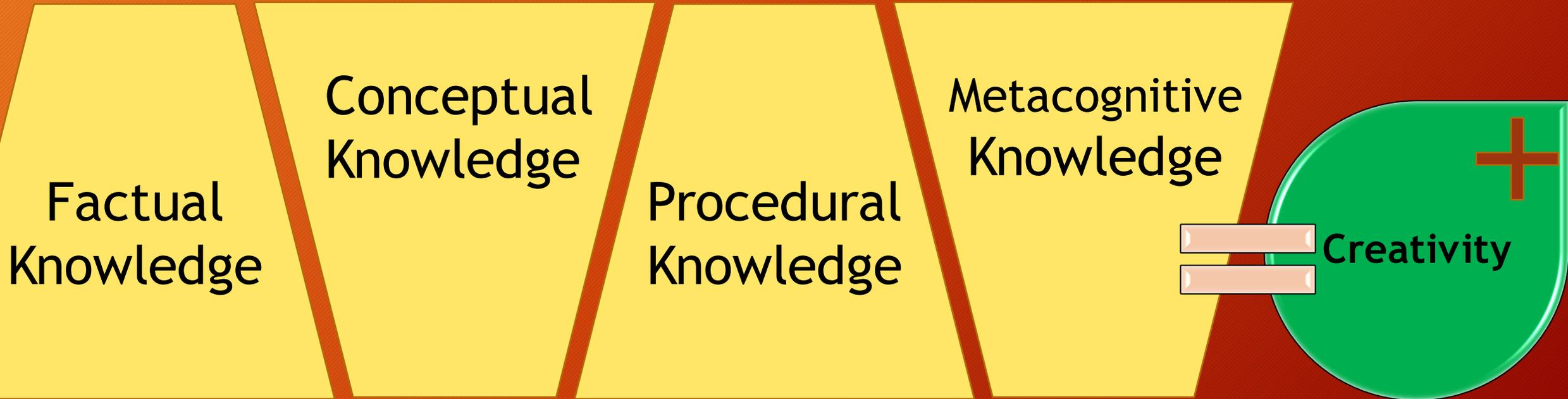
## Citation for Research

**Kenett, Y. N., Medaglia, J. D., Beaty, R. E., Chen, Q., Betzel, R. F., Thompson-Schill, S. L., & Qiu, J. (2018). Driving the brain towards creativity and intelligence: A network control theory analysis. *Neuropsychologia*.**

**So how do we move schools and students towards more Creative practices?**

# Increase Knowledge on Creativity.

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# Increase Knowledge.

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- Employees must also be capable of transferring newly-obtained knowledge to the classroom, which leads to personal and organizational success (Alexander, Schallert, & Reynolds, 2009; Mayer, 2011).
- Professional development managers must help employees understand the value in mentally arranging information into simple structures to show how the data can be used in the context of the overall class or project (Krathwohl, 2002; Mayer, 2011; Rueda, 2011).

# Increase Motivation in Creative Practices

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**Set Goals:**  
Motivation establishes a *roadmap* of sorts, describing where a person starts, but also articulates how a person continues and even finishes a task (Rueda, 2011).

# Increase Motivation in Creative Practices

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Natural drive alone is not sufficient to provide consistent results for teachers to attain highly preferred outcomes.

Teachers must adopt external motivators such as institutional motivation and social accountability in order to sustain the motivational influence. Mayer (2011)



# Increase Motivation in Creative Practices

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Beyond innate motivation and external motivators...

Teachers must mentally attach or “decide” on a direction of quality improvement at a specific moment of commitment in order to accomplish new learning for their own intellectual benefit and for the benefit of their students (Schunk, Pintich, and Meece; 2009).

The efficient and effective alignment of work processes and the resource allocation



*Increase* Organizational Influences  
Supporting Creativity

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Organizations must model certain characteristics to obtain the highest levels of organizational performance (Clark & Estes, 2008).



*Increase* Organizational Influences  
Supporting Creativity

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High functioning organizations helps teams believe that other members will maintain the skills needed to facilitate the work. Balancing individual initiative and global collaboration of team feedback, motivation, and maintain access to expert skills (Clark & Estes, 2008).

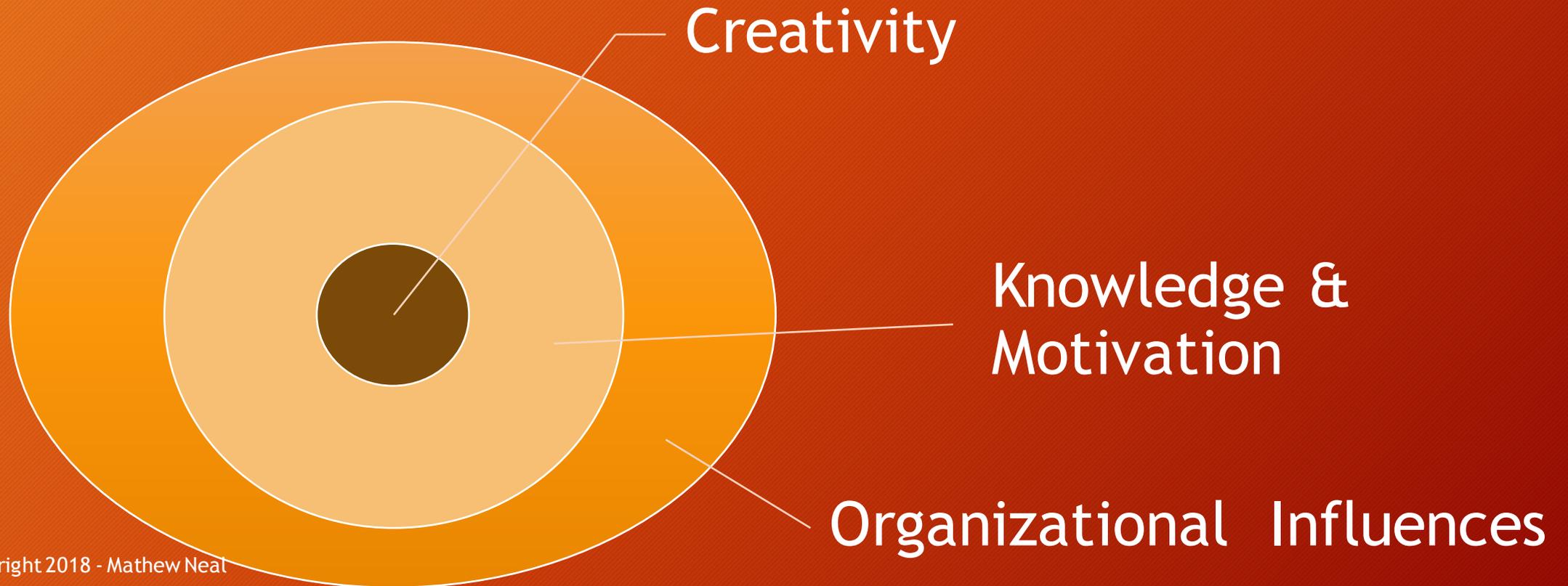


*Increase* Organizational Influences  
Supporting Creativity

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# Knowledge. Motivation. Organizational Infl.

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**So how do I do this in my school?**

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# 10 Attributes of Leaders of Creativity

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1. Educate on Creativity, what is it?
  - Challenge the status quo. (K)



# 10 Attributes of Leaders of Creativity

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2. Create space for Creativity to occur (M)

- Be ok with “messy”
- Be ok with “failure”

# 10 Attributes of Leaders of Creativity

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3. Try hard never to say no, just say  
“go slow” (M)



# 10 Attributes of Leaders of Creativity

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4. Ask “why do we do it this way? A lot.. (0)



# 10 Attributes of Leaders of Creativity

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5. Be ok with “trials”, “pilot project”, Interim as a concept (0)

# 10 Attributes of Leaders of Creativity

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6. Creativity is not mutually exclusive (0)

- Not limited to Art class
- Set expectations for all



# 10 Attributes of Leaders of Creativity

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7. Allow Autonomy.  
Require Accountability  
to the agreed norms.  
(M)

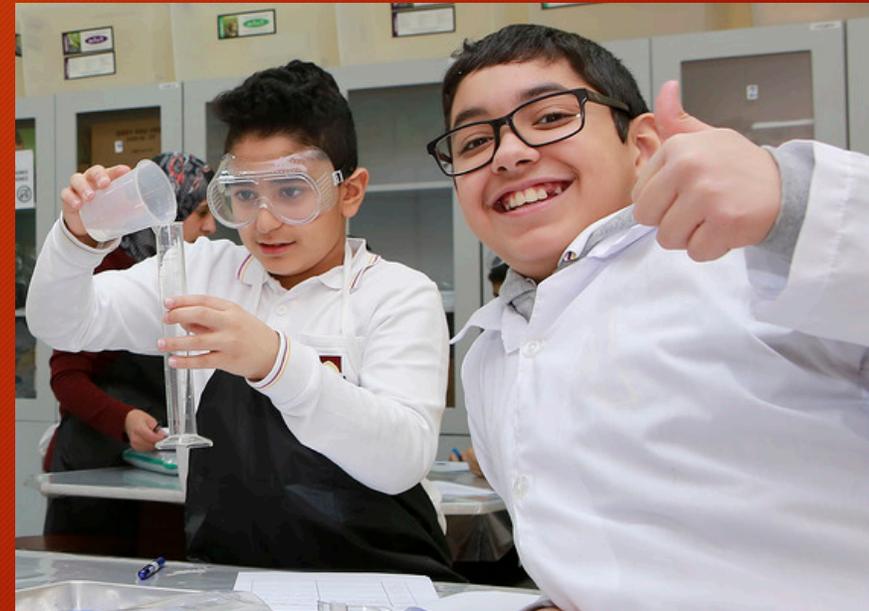


# 10 Attributes of Leaders of Creativity

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8. Establish  
wider  
tolerance for  
ambiguity (K)

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# 10 Attributes of Leaders of Creativity

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## 9. Spiral Ideas (0)



# 10 Attributes of Leaders of Creativity

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10. Invest in Student  
creativity not adult  
“wants” (M)



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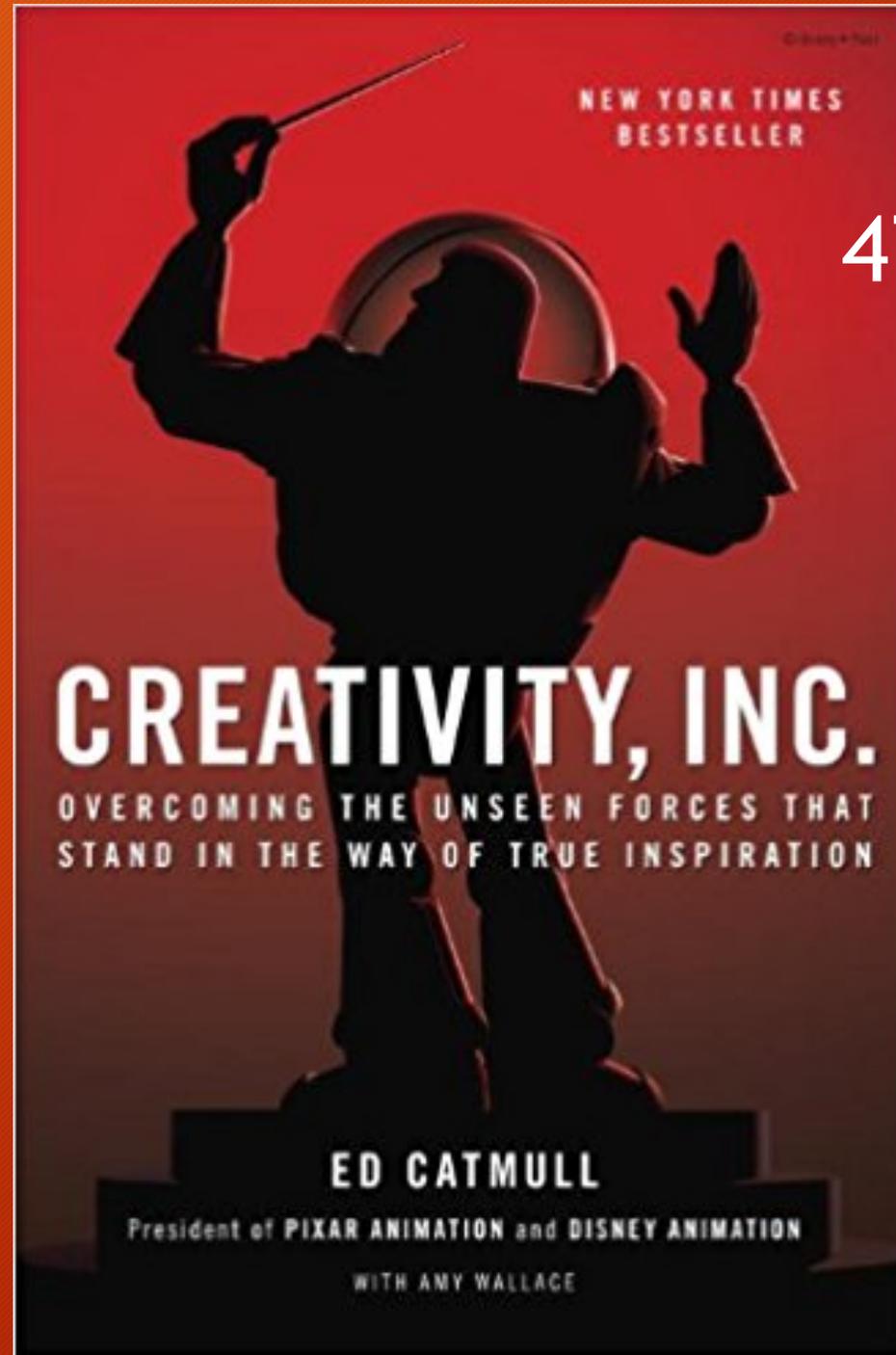
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