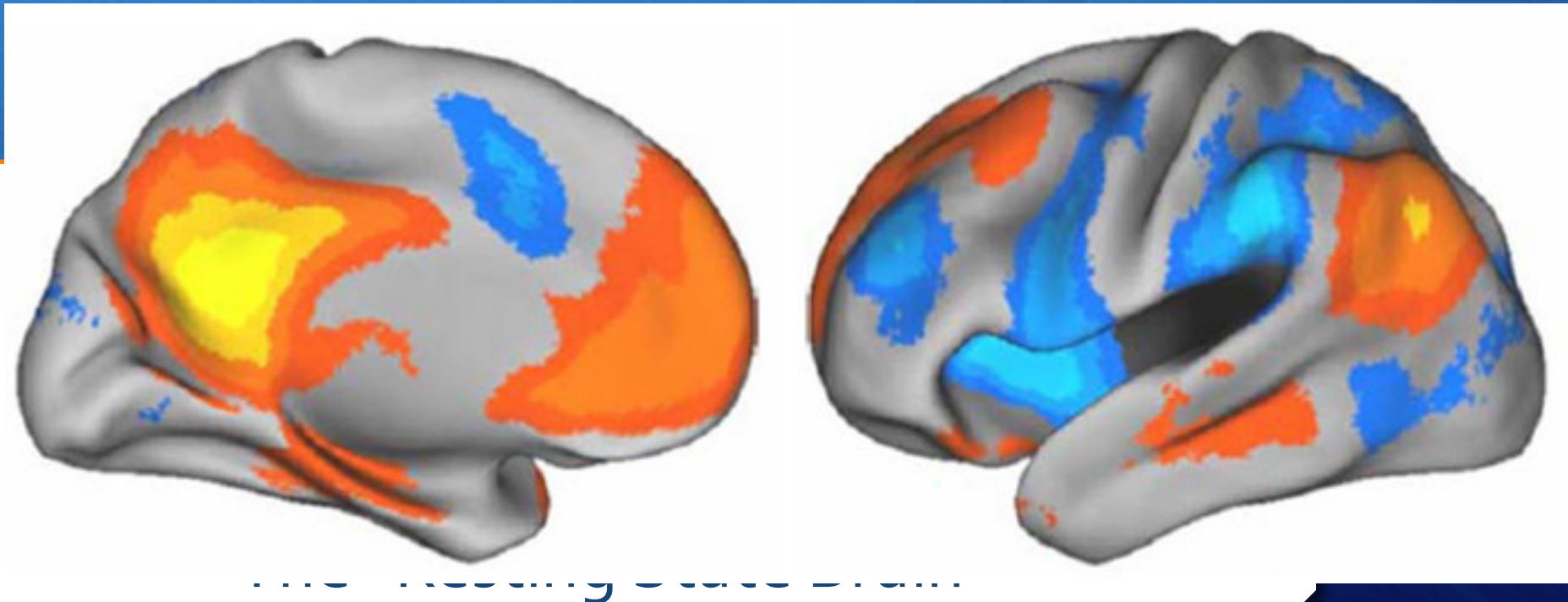


# The Default Mode Network (DMN) AKA The “Resting State” Brain Is this the unconscious? (Orange areas)



DMN shows how individual incorporates family, community, multicultural, and environmental context

# Developmental Counseling and Therapy: Neural Substrates of Emotional Processes



Piagetian stages: Sensorimotor, Concrete, Formal, Post-Formal

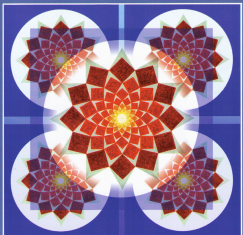
Department of Psychiatry,  
University of Arizona

Richard D. Lane, MD, PhD

Department of Psychiatry,  
University of Arizona

Dr. Lane developed these same concepts and treatment methods about the same time as Allen did and we published independently

DEVELOPMENTAL COUNSELING  
AND THERAPY  
Promoting Wellness Over the Lifespan



Allen Ivey / Mary Ivey / Jane Myers / Thomas Sweeney

# Neural Substrates of Emotion

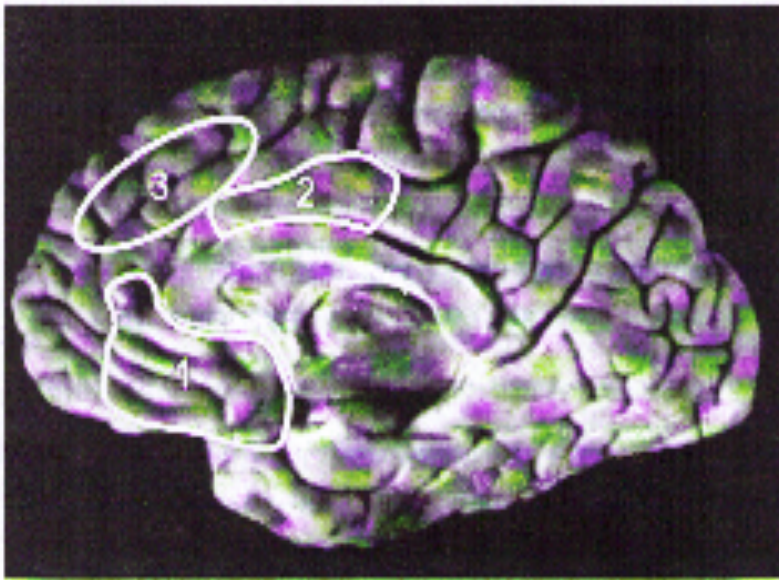


Figure 2. Structures on the medial surface of the frontal lobe that participate in 1) background feelings, 2) attention to feelings and 3) reflective awareness of feelings.

## 1. Background feelings

Sensorimotor-ACC, mPFC  
without conscious awareness

## 2. Attention to feelings

Concrete-dACC

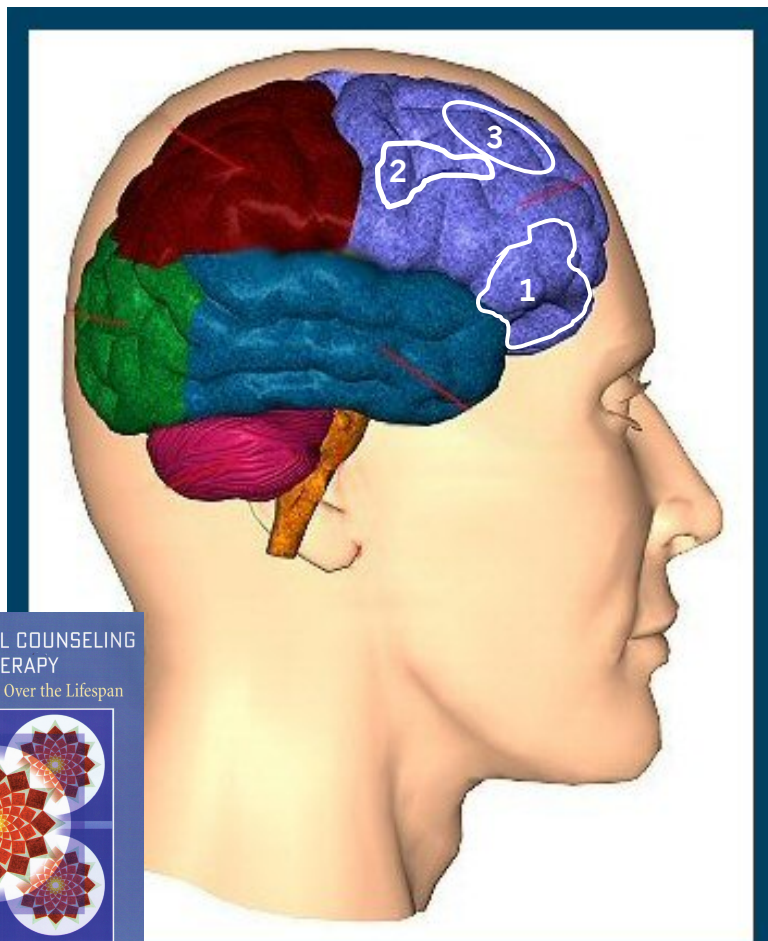
## 3. Reflective awareness

Rostral ACC, vACC, mPFC

## 4. (Dialectic/systemic)

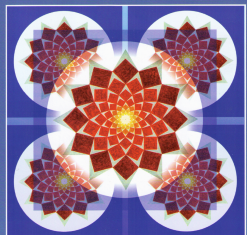


# Different Areas of Frontal Lobe Activated by each DCT Style Processing Style



1. Background feelings  
[primarily sensorimotor]
2. Attention to feelings  
[concrete]
3. Reflective awareness  
[formal & dialectic/systemic]

DEVELOPMENTAL COUNSELING  
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Allen Ivey / Mary Ivey / Jane Myers / Thomas Sweeney

Richard D. Lane, M.D., Ph.D.,

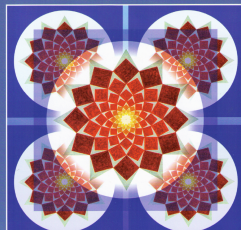
Presented here by permission



# Developmental Counseling and Therapy (DCT) – see handout

- ▲ Concrete and formal theories work primarily with the executive TAP. Critical for emotional regulation
- ▲ Sensorimotor easiest access for basic emotions and for bringing out unconscious default experience
- ▲ Dialectic/systemic draws on “maps” in the DMN
- ▲ Multiple perspective approach likely to reach deeper into the client’s experiential world
- ▲ See handout on basic questions

DEVELOPMENTAL COUNSELING  
AND THERAPY  
Promoting Wellness Over the Lifespan



Allen Ivey / Mary Ivey / Jane Myers / Thomas Sweet

# What is the Default Mode Network (DMN)?



▲ “A great deal of meaningful activity is occurring in the brain when a person is sitting back and doing nothing at all.” Marcus E. Riachle

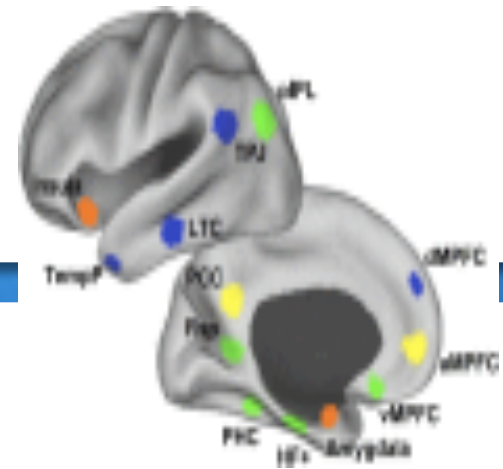
▲ DMN Activates when we are not focused on external environment.

Core areas: PCC, MPFC, IPL (inferior parietal lobule), TPJ. Also Hippocampus, MTL (med. Temp. lobe), LTC (lateral temporal cortex), and TP (temporal pole).

▲ Task positive brain (TPB), has been our focus in counseling. It is daily life, doing, feeling, behaving. Uses only **10%** of brain metabolism.

[www.visualnews.com/2011/11/04/your-brain-introduction](http://www.visualnews.com/2011/11/04/your-brain-introduction)

# Social Cognition and the DMN: Review of Literature



- ▲ MPFC--Social understanding of others
- ▲ vMPFC and MTL-- Emotional engagement
- ▲ Anterior MPFC, posterior ACC and ACC--Self/other distinctions
- ▲ Dorsal MPFC and TPJ--Understanding others mental states
- ▲ PCC--all four tasks
- ▲ *Large brains require more computational tasks*

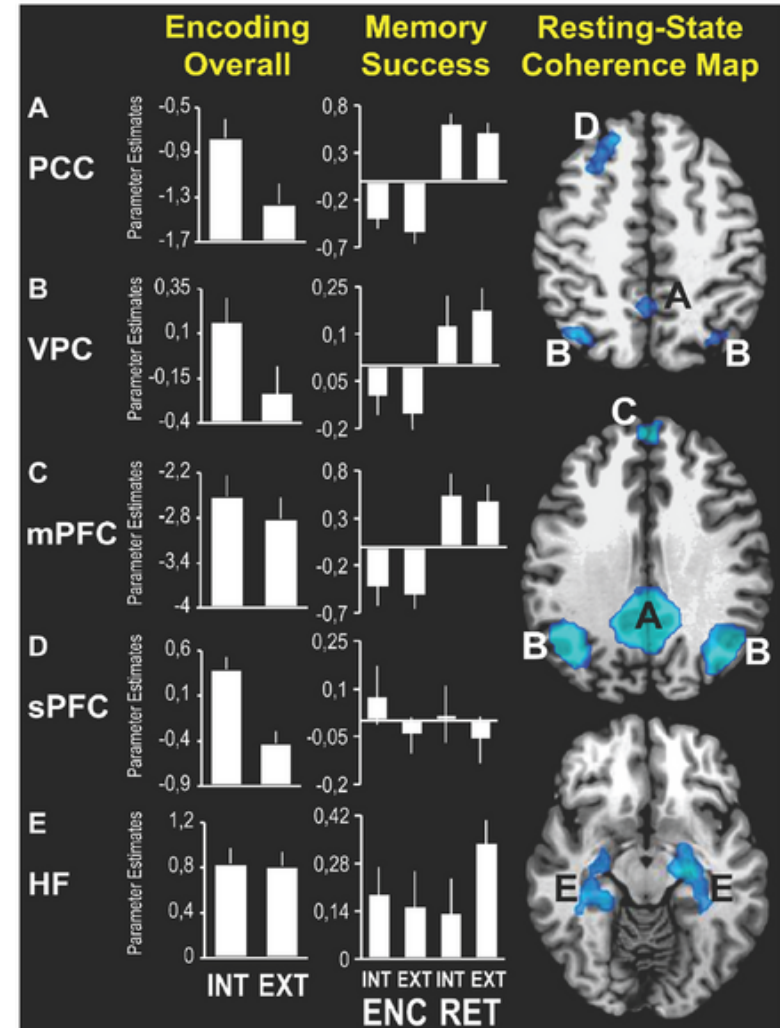
Li, W., Liu, C. (2014) The DMN and social understanding of others"  
What do brain connectivity studies tell us? Frontiers of Human Neuroscience.



## fMRI Results.

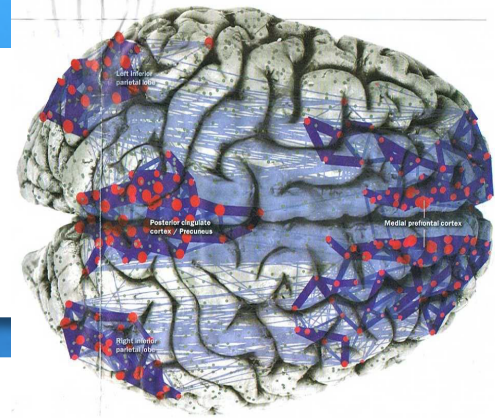
Hippocampus  
decouples from DMN  
while encoding  
memory

We still don't know  
how data gets into  
DMN



Huijbers W, Pennartz CMA, Cabeza R, Daselaar SM (2011) The Hippocampus Is Coupled with the Default Network during Memory Retrieval but Not during Memory Encoding. PLoS ONE 6(4): e17463. doi:10.1371/journal.pone.0017463  
<http://www.plosone.org/article/info:doi/10.1371/journal.pone.0017463>

# The PCC posterior cingulate cortex and the DMN—Two Way Action



- ▲ Back part of the ACC “...the PCC is one of the most metabolically active regions during rest AND in conscious thought.” Retains its character even in activated states.
- ▲ “...the default mode network was not significantly different between and eyes closed and an eyes-open state”
- ▲ Apparent functions—cognitive regulation, pain, episodic memory, ability to change to meet new environmental conditions, ability to understand others.
- ▲ Is this a window to input to the DMN?

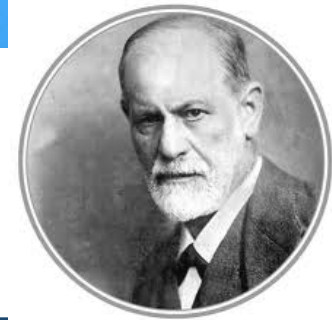
Leach (2012) Journal of Neuroscience

# What's going on in the default state? (Awake and Sleeping)



- ▲ Connecting thalamus activates multiple brain networks
- ▲ Unconscious thought, introspection, mind wandering, mapping, organization
- ▲ Key to decision making, long-term memory
- ▲ fMRI evidence: Freud's consolidation of "day's residue"
- ▲ In emergency works with amygdala





## Research Evidence: Nature of Activity in The Default Mode Network (DMN)

- ▲ Hyperconnectivity and activity in ADHD and schizophrenics and 1st-degree relatives (Whitfield-Gabriele, et al, 2009)
- ▲ Disruption in Alzheimer's (Gracias, 2004)
- ▲ Depression—runaway rumination (Whitfield/Ford 2012)

# DMN, ADHD, Neurofeedback

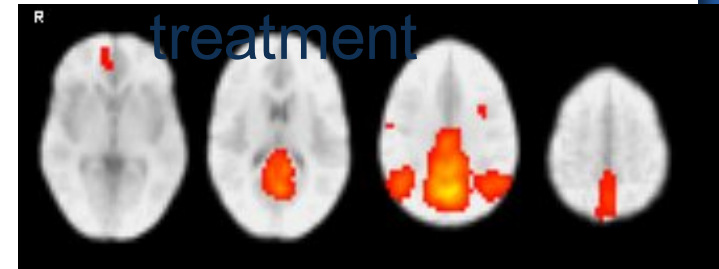
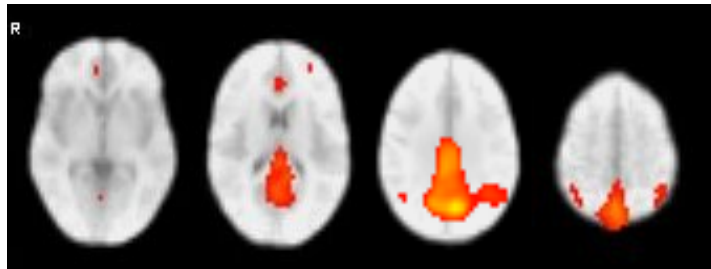
Lori-Russell Chapin



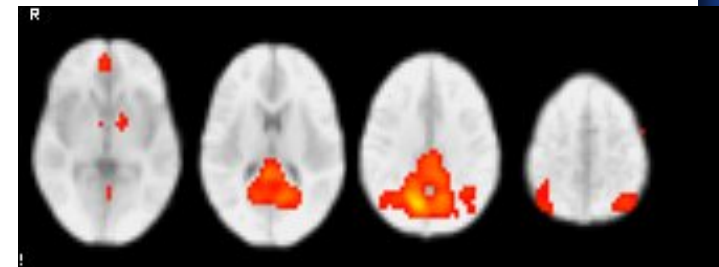
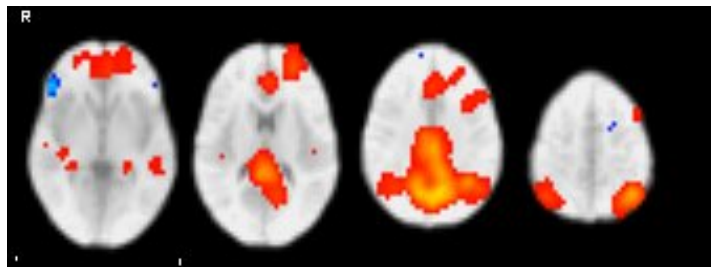
Pre-treatment

Post-treatment

Control Group



Experimental Group



Excess prefrontal activity decreased  
DMN is consolidated.

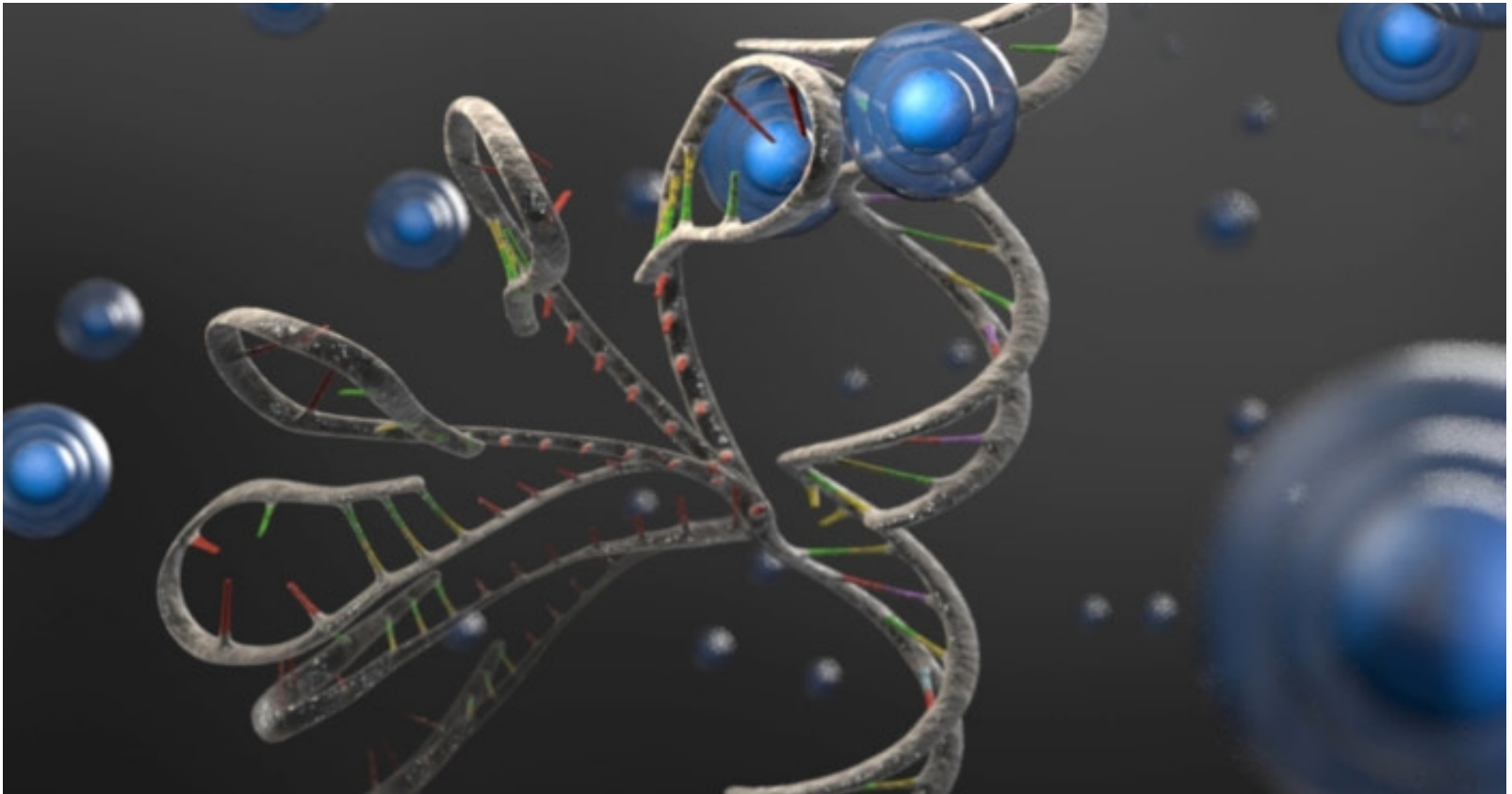
## Neurofeedback led to improved classroom behavior



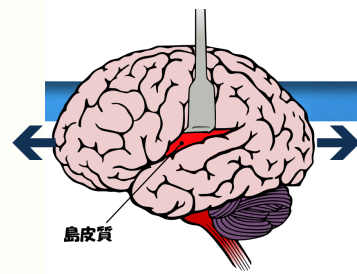
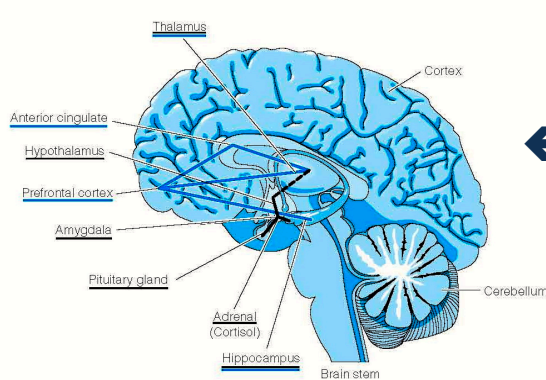
- ▲ Decreased excess frontal lobe activity in resting state
- ▲ Decreased high beta and high theta activity
- ▲ Consolidated and activated DMN
- ▲ ADHD is not only a pre-frontal cortex disorder
- ▲ Alternative to meds for ADHD



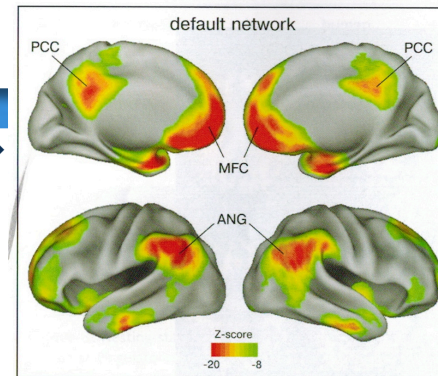
A fantasy of the Default Mode Network in Operation:  
Molecules both separate and changing in relationship



# Handout: Switching Between the Task Positive Attentional System and Default Mode Network



**Insula connects to switching station thalamus**



Posterior cingulate cortex, Medial frontal cortex, Angular gyrus  
+  
Sup. frontal cortex  
Hippocampus, Thalamus

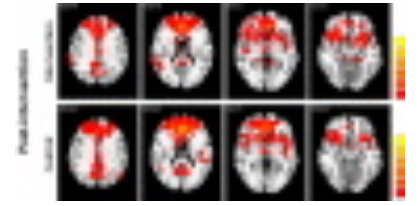
**Stimulus oriented thought (SOT)**  
**TAP + Limbic HPA**  
**External cognitive/emotional map of self and environment**

**\*Stimulus independent thought (SIT)**  
**\*Sustained information processing**  
**\*Mind wandering (Resting State)**  
**\*Alert to danger, novelty**  
**\*Dream area, days residue**  
**HIGHLY ORGANIZED, HIGH METABOLISM**

Major Functions of DMN (Integrated internal and external representations of our experience)  
Spontaneous cognition—introspective processes, improved by meditation, past events and imagined future events, retrieval from long-term memory, mental images, suspension of goal-directed tasks.

**Connects with amygdala for instant action**

# Multimodal intervention in older adults improves resting-state functional connectivity between the medial prefrontal cortex and medial temporal lobe



Li R, Zhu X, Yin S, Niu Y, Zheng Z, Huang X, Wang B, Li J.  
Front Aging Neurosci. 2014

- ▲ 6-week mnemonic and executive functioning training—mental images, associations, homework, EF three games on tablets of inhibition, switching, and updating
- ▲ Group counseling—life history review, focus on positive experiences, sense of self (career/family/health)
- ▲ Tai Chi—one hour three times weekly 6 weeks
- ▲ Improved cognitive performance with greater connectivity: neuropsych tests, social support, subjective well-being, and physical vitality

Li R, Zhu X, Yin S, Niu Y, Zheng Z, Huang X, Wang B, Li J.  
Front Aging Neurosci.  
2014



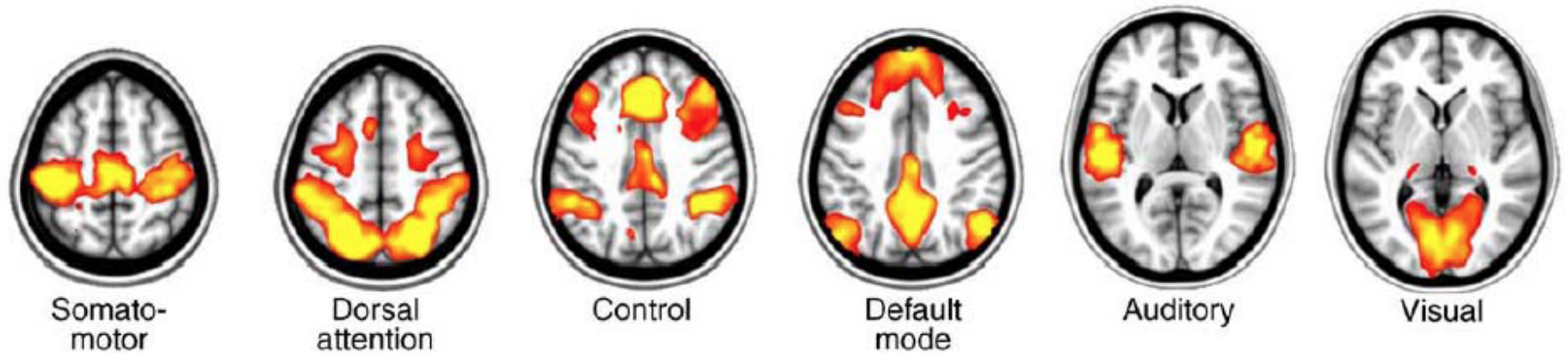
# Meditation and DMN



- ▲ Functional activity increased in Posterior cingulate (PCC), dorsal anterior cingulate, and dorsolateral prefrontal cortices
- ▲ Areas related to self-referential activity and self-monitoring
- ▲ Connectivity stays after baseline
- ▲ Decreased mind wandering
- ▲ Loving/kindness meditation decreases amygdala activity
- ▲ Increase in grey matter
- ▲ Increased functional connectivity between the posterior cingulate cortex and bilateral medial prefrontal cortex and left hippocampus compared to controls. In addition, MBSR participants had trends of less bilateral hippocampal volume atrophy than control participants.

# Other Resting State Networks

Emotional regulation control center is TAP executive



*TRENDS in Cognitive Sciences*

Always more complex as neuroscience moves along.

Recently, personality disorders activate different resting states (Gonçalves, et al)

# The Default Mode Network (DMN): Key to conscious and unconscious experience

“In summary, the DMN may provide integrated internal representations of the outside world and our organism. These are the central function of conscious experience, offering advantages for survival, planning, decision-making, and behavioral control in response to external demands.

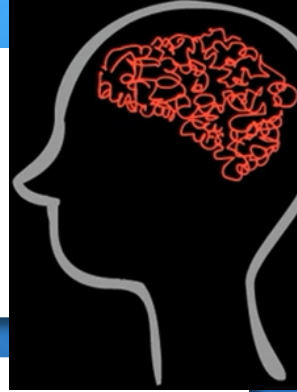
“The DMN may generate representations of the ‘self’ by memory and prospection, providing continuity of experience over time.”

**+ CRITICAL TO EMOTIONAL  
REGULATION**



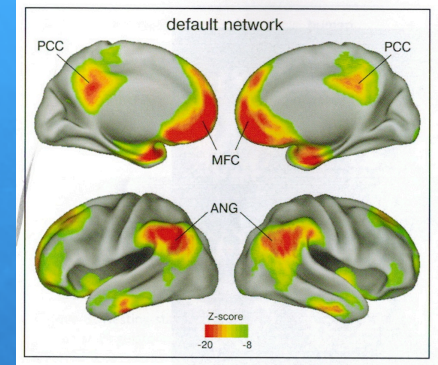
Mantinia, D., & Vanduffel, V. (2012). EMERGING ROLES OF THE BRAIN'S DEFAULT NETWORK. *The Neuroscientist*, 19, 78-87.

# So what? Is the DMN useful in therapy process?



- ▲ Helps us reevaluate emotion and cognition relationship.
- ▲ Central research issue leads to practice changes
- ▲ Reawakens relevance of Freud, Jung, Reich, etc.
- ▲ Emotional regulation: “calming,” balance, and life meaning likely key therapeutic actions.
- ▲ (The TLC paradigm: Meditation, exercise, sleep, etc. Find positives and strengths, logotherapy, new approaches to dynamic psychotherapy, neurofeedback.)





# BIG FIVE Personality Traits, Default Mode Network & Brain Structures

Óscar Gonçalves, EdD, PhD

Professor, **Northeastern University** and Chairperson of  
New Integrative Program

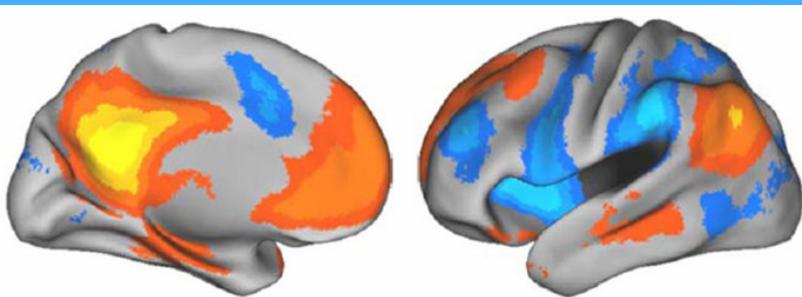




# The BIG FIVE Personality Traits

Rate Yourself on 5-Point Scale

Introverted	1	2	3	4	5	Extraverted
Neuroticism	1	2	3	4	5	"Normality?"
Disagreeable	1	2	3	4	5	Agreeable
Disorganized	1	2	3	4	5	Conscientious
Closed Minded	1	2	3	4	5	Openness

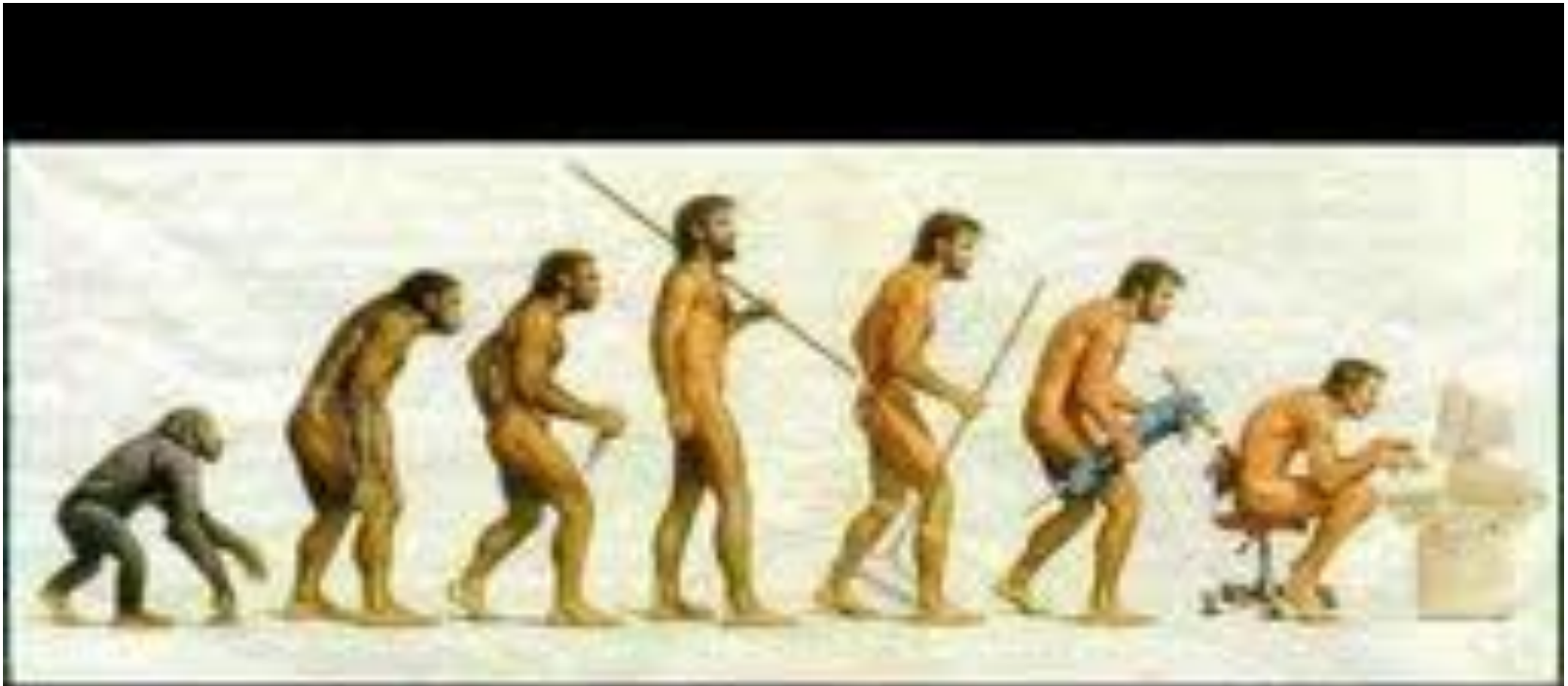


# Brain Areas and the BIG FIVE Personality Styles

- ▲ Extraversion larger in medial PFC (self-referential) less gray matter density
- ▲ Neuroticism: Medial temporal lobe (long-term semantic (facts) and episodic (events) memory)
- ▲ Agreeableness: Superior temporal sulcus (determination of others' emotions) –less gray matter density
- ▲ Conscientiousness: Middle frontal gyrus (attention/working memory)
- ▲ Openness/intellect: Inferior parietal lobe (language, math, emotional perception, interpretation)

DeYoung, C. et al (2010). Testing predictions from personality neuroscience: Brain structure and the Big Five. *Psych. Sci.* 21, 820-828  
Coutinho J., Sampaio A., Ferreira, M., Soares J. M, **Gonçalves O.F.** (2013) Brain Correlates of Pro-Social Personality Traits: A Voxel-Based Morphometry Study. *Brain Imaging and Behavior*, 7, 293–299.

# Have we really progressed?



[allenivey@gmail.com](mailto:allenivey@gmail.com) [mary.b.ivey@gmail.com](mailto:mary.b.ivey@gmail.com)



# How stressed out cells stop protein synthesis

[http://www.youtube.com/watch?v=41\\_Ne5mS2ls](http://www.youtube.com/watch?v=41_Ne5mS2ls)



[http://www.youtube.com/watch?v=41\\_](http://www.youtube.com/watch?v=41_Ne5mS2ls)

[Ne5mS2ls](#)

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[http://www.youtube.com/watch?v=41\\_Ne5mS2ls](http://www.youtube.com/watch?v=41_Ne5mS2ls)