

From: MARK TRAMO <[REDACTED]>

To: Jeffrey Epstein <jeevacation@gmail.com>

Subject: Re: To JEE - Music Mind & Brain Syllabus

Date: Fri, 28 Sep 2018 18:58:43 +0000

Attachments: Jouandet89JCogN.pdf; Tramo95JCogN.pdf; Tramo98Neurol.pdf

Interesting - there are several different methodological routes one could take to address the question of cerebral and genetic similarities in composers:

- in vivo brain morphometry

- measurement of the volume and surface area of the cerebral cortex and any other structure or substructure of interest (e.g., medial geniculate body; frontal lobe), gyral-sulcal patterns ("brainprints" - please see attached), density of white matter tracts, and other measures - with very high-Tesla magnets and in some brain regions, intralaminar myelomorphology can be discerned.

- this approach has not been applied to composers; measurements in musicians have shown above-average mid-sagittal surface area of the anterior corpus callosum (this may be interpreted as plasticity fostered by the bimanual demands of instrument performance) and above-average surface area of the left posterior superior temporal gyrus (planum temporale) in musicians with "perfect pitch" - the critical period for acquisition via music lessons and relative pitch training is between approx 4-7 yrs

- functional brain imaging (fMRI, PET)

- there are a handful of studies that measured indices of brain metabolism during improvisation by jazz musicians and rappers (!), but none on successful composers. Because of the experimental set-up (composer lying with head perfectly still in a claustrophobia-provoking, ridiculously loud tube), these types of studies are inherently flawed. That said, they are feasible, and two studies have shown the interesting result that anterior frontal cortex metabolism *decreases* during improvisation - this may be interpreted as evidence that *disinhibition* of subcortical and other cortical activity (as well as excitation) is part of the creative process

- ligand-binding PET

- does preferred music evoke greater endogenous dopamine, endorphin, and cannabinoid release in the basal forebrain and cortex in composers than it does in other listeners? [11C]-raclopride and [11C]-carfentanil binding in the basal forebrain can be used to get at this.

- EEG with high-density electrodes and mathematically-based analyses of regional brain electrical activity (e.g., principal components analysis)

- this has the advantage that it can be done reasonably non-invasively (unlike fMRI) *while* a composer is composing. This method has been used to look at group brain activity in a saxophone ensemble. How to interpret the data is not straightforward but, as was the case with fMRI, advances might be made by starting with stimulus paradigms (e.g. click- and tone-evoked auditory evoked potentials) where one knows what results to expect, then applying the analysis methods to more complex paradigms

- genetic studies

- genotyping can be done in composers and first degree relatives. What markers are similar in both composers who are related and composers who are not related? What markers are different composers and their relatives who are not composers? Markers can include cell surface proteins (e.g., like the ABO blood typing system) as well as genes

- genealogical studies

- the softest of these methods, but possibly one with high yield. What to Vivaldi, Bach, Mozart, Beethoven, Brahms, Stravinsky, Lennon, and McCartney have in common? Their fathers were musicians.

On Fri, Sep 28, 2018 at 10:01 AM J <jeevacation@gmail.com> wrote:

Twins No not interesting to how they perceive i want to know of similarities in composing

On Fri, Sep 28, 2018 at 12:33 PM MARK TRAMO <[REDACTED]> wrote:

Hi Jeffrey - Fantastic! May I send you a proposal?

Your idea about reverse engineering echoes something Nobel Laureate David Hubel, my thesis advisor and a founding board member of The Institute for Music & Brain Science, once said to me:

"Music is what's interesting about the auditory system."

And, "Music teaches us about how the brain works"

I've said to my Harvard and UCLA students at the start of every course (including just last night!) ever since you and your colleagues built the Mind Brain & Behavior Interfaculty Initiative with President Neil Rudenstine and Provost Harvey Fineberg and made my Music Mind & Brain course possible 22 yrs ago

Some ideas I am developing in my book that relate to those in your email:

- the universality, innateness, and aesthetics of music reflect that the human brain operates as biology's most powerful pattern recognition machine

- the acoustic and perceptual features of music that is easily apprehended and globally preferred (time and rhythm, periodicities and harmony) reflect the human brain's natural, automatic, irresistible, effortless, and unconscious desire to make order out of chaos - i.e., to "de-entropize" and, a la Kant, organize and systematize what we experience with its own, biologically-programmed intuitions and categories which make sense of all the data that constantly floods in through our senses. Galileo's physiological account of why some combinations of tones sound consonant and others dissonant emphasizes the order and simplicity of harmonic motion and overlapping periodicities in eardrum vibrations

- something we've discussed over Skype several months back: we develop through experience an internal model of the external world - early in life, we try to fit that model to what we experience in the external world; later in life, we try to change the external world to fit our internal model. As we listen to music flow over time, we have an internal model, derived from implicit knowledge about statistical regularities in the music of our culture, that drives expectations about where the music is going and, ultimately, how well it fits our internal model and satisfies our expectations, such that we experience the limerence of a good fit many times in just a few minutes

- contrasts in music are amenable to and easily apprehended in terms of binary opposition

- music (whether a sonata or song) recapitulates the trajectory of our lives each and every day: the sun rises and we start out home in bed in repose, then we get out of bed to take on and conquer the challenges of the day that evoke tension minute-to-minute, second-to-second, then we return home to relax and, ultimately, return to our repose after the sun sets. This "tension-relaxation schema" applies to all types of art that unfold over time: novels, theater, movies, music (Richard Dreyfuss liked this concept in particular)

- music taps into the same neural system - the auditory nervous system - that is nature's gateway for communication in humans and all mammals

- also, there are data on melody perception by monozygotic twins that tap into genetics, and the relatively recent discovery of "Congenital Amusia" in a Canadian family has intensified interest in the genetics of

music



FYI - Several years back I and Institute board chairman Bob Freeman (former long-time director of the Eastman School of Music) were guests on Robert Kuhn's PBS TV show, "Closer To Truth." The topic was Creativity!

Yours,
Mark

On Fri, Sep 28, 2018 at 4:30 AM J <jeevacation@gmail.com> wrote:

id like to fund Reverse engineering of music. . . does its production give one a window on the creative mechanism. . . are rythms a reflection off underyiing operatin system. are they genetic.? are complex harmonies an indicator of internal complexity etc.

On Thu, Sep 27, 2018 at 3:21 PM MARK TRAMO <> wrote:

Hi Jeffrey -

Syllabus attached here for you - today is Day 1 of the new academic year here at UCLA. Hope you find it interesting - heartfelt thanks for making all this possible over the years. I hope the back is doing better and passing far beyond that red line near my old Cornell dorm room - please let me know how you're doing and if there's anything I can do to help with that.

Yours,
Mark

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Mark Jude Tramo, MD PhD
Dept of Integrative Biology & Physiology, UCLA School of Letters & Science
Dept of Neurology, David Geffen School of Medicine at UCLA
Dept of Musicology, UCLA Herb Alpert School of Music

Director, The Institute for Music & Brain Science
Co-Director, University of California Multi-Campus Music Research Initiative (UC MERCI)
<http://www.BrainMusic.org>
<http://merci.ucsd.edu>



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Mark Jude Tramo, MD PhD
Dept of Integrative Biology & Physiology, UCLA School of Letters & Science
Dept of Neurology, David Geffen School of Medicine at UCLA
Dept of Musicology, UCLA Herb Alpert School of Music

Director, The Institute for Music & Brain Science
Co-Director, University of California Multi-Campus Music Research Initiative (UC MERCI)
<http://www.BrainMusic.org>
<http://merci.ucsd.edu>

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Mark Jude Tramo, MD PhD
Dept of Integrative Biology & Physiology, UCLA School of Letters & Science
Dept of Neurology, David Geffen School of Medicine at UCLA
Dept of Musicology, UCLA Herb Alpert School of Music

Director, The Institute for Music & Brain Science
Co-Director, University of California Multi-Campus Music Research Initiative (UC MERCI)
<http://www.BrainMusic.org>
<http://merci.ucsd.edu>

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