

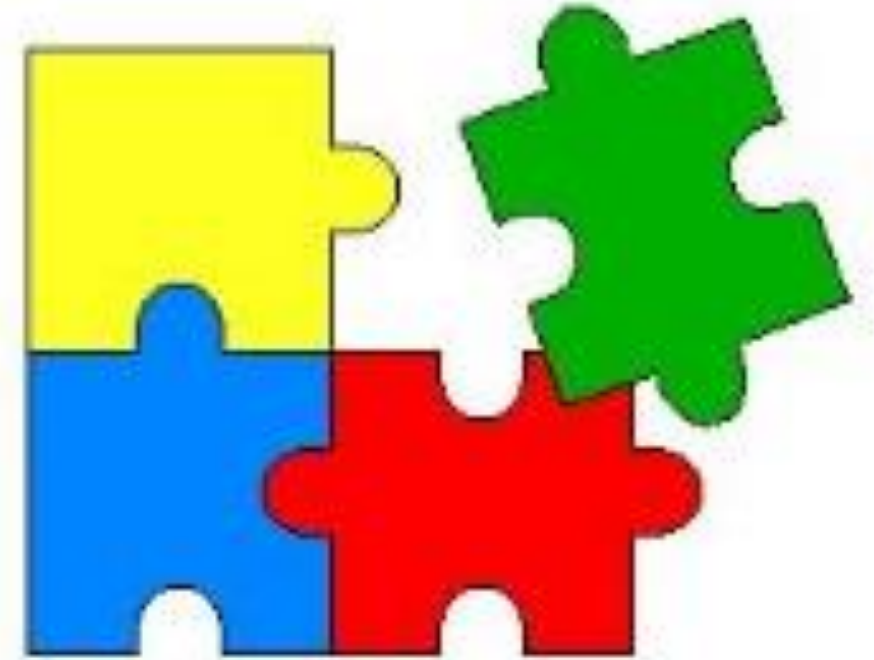
Arnold Trehub and Related
Researchers –
3D/4D Theatre in the Parietal Lobe
(excerpt from Culture of
Quaternions Presentation:
Work in Progress)

3D General Cognition Models

3D Virtual Retinoid Space with Self in Center
(Arnold Trehub, 1991, 2005)

Default 3D Multisensory Space in Parietal Lobe,
supported by thalamus
(Jerath and Crawford, 2014)

Supramodal Mental Rotation of Melody and Visual
Objects in Parietal Lobe
(Marina Korsakova-Kreyn, 2005)



3D/4D Music Cognition Research and Theories

4D Distances of Musical Keys From Each Other (Krumhansl & Kessler, 1982)

Possible 4D Nature of Melodies? (Gilles Baroin, 2011; others)

Elements: Notes, Chords, Scales.

Harmony, Shared Overtones, Law of Gravitation-like Attraction.

Dynamic Fields and Melodic Contours.

General Cognition and Music Cognition

GENERAL COGNITION -- **SPATIAL AWARENESS**, PERCEPTION, PROCESSING

- Parietal lobe has two parts: inferior (IPL) and superior (SPL).
My interpretation:
 - IPL – spatial display
 - SPL – perception of motion, coordination of action
- Multisensory, supramodal processing in parietal lobe, and perception of real and imagined (virtual) objects and perspectives -- 3D (4D)
 - Trehub (2005) - IPL (consciousness)
 - Jerath & Crawford (2014) IPL (connection to consciousness via thalamus)
 - Korsakova-Kreyn (2005) – SPL (mental rotation)
 - Daniel Wolpert (2014) – SPL (sensorimotor integration; “why do we have brains – to control motion”)
- Self at center of surrounding space (consciousness – Damasio, Trehub)

General Cognition and Music Cognition

MUSIC COGNITION – **HARMONY** SYSTEMS

-- OUR FOCUS BECAUSE OF ITS CENTRALITY TO MELODY AND MUSIC

- Notes – tonal attraction – gravity model (gives potential values to each tone for movement toward the tonic note)
- Music in the brain versus in the air:
 - Acoustics – Sound in the Air
 - Acousmatics – Sound in the Brain – **This one is our interest.**
Note: Dimensionalities of objects may be different than in acoustics.

General Cognition – Trehub Retinoid Model

Here are Arnold Trehub's views on the potential of the retinoid space in the brain to provide 4D capabilities:

“I'm not knowledgeable enough to respond to your detailed observations about music, but I must point out that all autaptic-cell activity in retinoid space is 4D because autaptic neurons have short-term memory.

This means that there is always some degree of temporal binding of events that are "now" happening and events that happened before "now". The temporal span of such binding probably varies as a function of diffuse activation/arousal.

The temporal envelope of autaptic-cell excitation and decay defines our extended present. This enables us to understand sentences and tunes.”

Via email

General Cognition – Trehub Retinoid Model

- Two key assumptions of the retinoid model are:
 - (1) visually induced neuronal excitation patterns can be spatially translated over arrays of spatiotopically organized neurons, and
 - (2) excitation patterns can be **held in short-term memory within the retinoids** by means of self-synapsing neurons called autaptic cells.
- I made these assumptions originally because they provided the theoretical grounding for a brain mechanism capable of processing visual images in 3D space very efficiently and because they seemed physiologically plausible (Trehub, 1977, 1978, 1991).
- More recent experimental results provide direct neurophysiological evidence supporting these assumptions.

Arnold Trehub: Space, Self, and the Theater of Consciousness (2005)

General Cognition – Trehub Retinoid Model

General observations:

- This hypothesized brain system has structural and dynamic properties enabling it to register and appropriately integrate disparate foveal stimuli into a perspectival, egocentric representation of an extended 3D world scene including a neuronally tokened locus of the self which, in this theory, is the neuronal origin of retinoid space.
- As an integral part of the larger neuro-cognitive model, the retinoid system is able to perform many other useful perceptual and higher cognitive functions. In this paper, I draw on the hypothesized properties of this system to argue that **neuronal activity within the retinoid structure constitutes the phenomenal content of consciousness and the unique sense of self** that each of us experiences.

ResearchGate.net

Where I Met Arnold Trehub and Many Others

- Free, minimal requirements
- Paper repository
- Lively question discussion groups
- 5 million members
- Heavily international
- Internal messaging is available between members

General Cognition – Jerath & Crawford

Parietal/Thalamus Model

Jerath, R. and Crawford, M. W. (2014). Neural correlates of visuospatial consciousness in 3D default space: Insights from contralateral neglect syndrome. [Consciousness and Cognition](#), 28, 81–93.

Summary:

- We propose that the thalamus is a central hub for consciousness.
- We use insights from contralateral neglect to explore this model of consciousness.
- The thalamus may reimage visual and non-visual information in a 3D default space.
- 3D default space consists of visual and other sensory information and body schema.

General Cognition – Jerath & Crawford

Parietal/Thalamus Model

One of the most compelling questions still unanswered in neuroscience is how consciousness arises.

In this article, we examine visual processing, the parietal lobe, and contralateral neglect syndrome as a window into consciousness and how the brain functions as the mind and we introduce a mechanism for the processing of visual information and its role in consciousness.

We propose that consciousness arises from integration of information from throughout the body and brain by the thalamus and that the thalamus reimages visual and other sensory information from throughout the cortex in a default three-dimensional space in the mind.

We further suggest that the thalamus generates a dynamic default three-dimensional space by integrating processed information from corticothalamic feedback loops, creating an infrastructure that may form the basis of our consciousness. Further experimental evidence is needed to examine and support this hypothesis, the role of the thalamus, and to further elucidate the mechanism of consciousness.

General Cognition – Korsakova-Kreyn

3D/Parietal/Supramodal Model Based on Mental Rotation

- The parietal lobes interpret sensory information and are concerned with the ability to carry out and understand spatial relationships. It was found that the right superior parietal lobe plays an essential role in mental rotation (Harris & Miniussi, 2003; Alivastos, 1992). There is neurophysiological evidence that lesions to the right parietal lobe impair mental rotation abilities (Passini et al, 2000) and that the superior parietal region seems to play a “major role in the multiple spatial representations of visual objects” Jordan et al (2001).
- **I hypothesize that perhaps the brain reads both music and spatial information as a signal-distribution within system of reference notwithstanding the modality of the signal. Recent imaging studies suggest that the parietal lobe is an integral part of a neural lateral prefrontal–parietal cortices circuit that is critical in cognition.**

The Thalamus and Its Interconnections with the Parietal Lobe, Supramodal 3D Space, and the Prefrontal Cortex

Thalamus provides Flow Path for Music
(Jaschke)

“This door is the *thalamus*, which in a musical context is initially filtering out or rather channeling certain information, before it is cerebrally processed.”

