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A Triple Hierarchical Neuro-Literary-Consciousness Paradigm:An Experimental Approach

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Abstract

If John Keats in the nineteenth century pronounced - 'a thing of beauty is a joy forever' SemirZeki expounds in the twenty first century – 'a thing of beauty is a ploy forever.' The journey from the simple experience of joy to the demystification of the beauteous ploy has been marvellous and insightful.The present paperdoes not aim to provide a neuronal profile of literature, instead brings together literature, neuroscience and science of consciousness to unveil hitherto unknown diversity in literary experience and its impact on human brain and consciousness.

Key words

Literature, neuroscience, science of consciousness, sublimity, Indian aesthetic tradition

A literary work is, in itself, a 'thing of beauty' whose beauty is constituted by its quality as life itself. Beauty of form is just as important in literature as truth of content. It will not be out of place to recall Aristotle's view that a literary creation is an 'imaginative recreation of reality'.

In the Indian aesthetic tradition, literature i.e. *Sahitya* denotes union of beautiful signifier and beautiful signified. In a literary creation, both the signifier and the signified are equally noble. According to Jagannath Pandit poetic delight is different from the worldly delight. It ensues from contemplation alone as poetry is a supra sensory thing. Thus, both from the Eastern as well as the Western perspectives, literature is a unique form of contemplation, no less than meditation which possesses the power to yield perfect experience of life in its fullness and vividness.

Centuries ago Longinus theorized 'sublimity' in literature as the echo of the great soul, a lofty mind, grandeur of thought, nobility in diction which corresponds well to the Indian notion of '*Satyam ,Shivam, Sundaram'*. A work of art elicits an experience 'which is emotionally intense and characterized by an exhilarating feeling of pleasure and at the same time it is loaded with a quality which is hard to describe (Funch, 178) .The reading of literature is indeed an action. It is living through metaphors which adds a new dimension to our life in the form of greater sensitivity, refinement of feelings, lofty ideals and nobility of purpose. A non-literary text also produces an impact, but a literary experience goes beyond 'definition, prediction and analysis. It comes to the perceiver not as a verifiable statement, but as an intuitive portrayal. Philosophy and literature both probe into existential and metaphysical questions. But a philosophical text deals with life in an abstract theoretical manner whereas a literary work delineates human experience, doesn't discuss it. Philosophy theorizes life, history reconstructs the past life, literature neither theorizes in abstraction nor does it replicate life as it is, it interprets life as Matthew Arnold asserted more than a century ago. Literature in general and poetry in particular– 'forms us, sustains us and delights us.'

For a long time a myriad of literary questions have been dealt in psychoanalytic terms such as Id, Ego and Super - Ego, Regression, Repression, Dreams etc. Psychologists , from time to time, have tried to probe into questions such as - how can literary reading alter our minds as also lives? When we are lost in a book how are we transported to a trance like state? Why don't we disbelieve the improbabilities literature offers us? Despite advances in psychoanalytic studies several questions remained unanswered -What in the brain triggers aesthetic experiences? How does knowledge of the basic brain mechanisms inform our understanding of these experiences? Several such 'neuro-literary' questions made literary scholars like us turn to Neuroscience.

Norman Holland (2009) employs the metaphor of 'Alp of mind' and states in a lighter vein:

> I think of neuroscience and the human sciences as like two very small miners energetically tunnelling in from opposite sides of an immense Alp. Although the neuroscientists on their side of the Alp do not listen much to sounds of digging from the humanists on the other side, some humanists, those concerned with the brain's role in the arts, listen very closely to what the neuroscientists on the other side are saying (11).

Paul B. Armstrong (2013) states:

> The brain is a peculiar, at times paradoxical, but eminently functional combination of constancy and flexibility, stability and openness to change, fixed constraints and plasticity, and these contradictory, paradoxical qualities are reflected in the workings of literature and literary interpretations in ways that can (I will argue) mutually illuminate the neurology of the brain and the experience of the art (3).

The magical three pound mass of jelly like fats and tissues made the famous American poetess Emily Dickinson write in amazement:

The Brain - is wider than the sky-
For -put them side by side-
The one the other will contain
With ease -and You- beside-
The Brain is deeper than the sea-
For- hold them- Blue to Blue-
The one the other will absorb-
And Sponges- Buckets-do-

A Brief Tour of Human Brain

The Human brain is made up of one hundred billion nerve cells of neurons which form the basic structure and functional units of the nervous system. Each neuron makes something like one thousand to ten thousand contacts with other neurons and these points of contact are called synapses. It is here that exchange of information occurs. The brain has two mirror image halves, called the cerebral hemispheres, the cerebral cortex resembles a walnut sitting on top of a stalk, called the brain stem. Each hemisphere is divided into four lobes: frontal, the parietal lobe, the occipital lobe and the temporal lobe. The occipital lobe is concerned with vision. The temporal lobe is concerned with hearing, emotions and certain aspects of visual perception. The parietal lobes of the brain- at the sides of the head- are concerned with creating a three dimensional representation. The frontal lobes are concerned with some very enigmatic aspects of the human mind and human behaviour such as moral sense, wisdom, ambition and other activities of the mind. This is perhaps the most mysterious of all. Julie Kane , a poet well versed in neuroscience , draws on experimental literature and shows that mostly literary devices are processed in the right hemisphere.(2004). Of course she clarifies that the right

hemisphere can only express its special poetic or literary meanings when it is combined with such left hemisphere abilities as perceiving the words, decoding the grammar, and assigning to a text the plain sense.

Neuroaesthetics: Convergence of Neuroscience and Aesthetics

The study of aesthetic experience and brain mechanism found a new platform with the emergence of a new discipline called Neuroaesthetics which marked the convergence of neuroscience and empirical aesthetics. Neuroaesthetics is both descriptive and experimental, with qualitative observations and quantitative tests of hypotheses, aimed at advancing our understanding of how humans process beauty and art. Neuroaesthetic questions cut across the traditional cognitive neuroscience, such as perception, emotion, semantics, attention, and decision-making. The term aesthetics is broadly used to encompass the perception, production, and response to art, as well as interactions with objects and scenes that evoke an intense feeling, often of pleasure.

Anjan Chaterjee (2010) states:

> The term Neuro-aesthetics is used broadly as a domain that has something to do with properties of the brain as it engages in aesthetics (53).

According to Semir Zeki (2016):

> Neuroaesthetics does not ask the question of what is beauty, but only the brain mechanism that engages with the experience of beauty.(*The Hindu*)

The first step in a neuroaesthetic enquiry, according to Zeki, is 'to define the function of the brain and that of art. Many functions can be ascribed to both. One overall function, common to both, makes the function of art an extension of

the function of the brain: the acquisition of knowledge, an activity in which the brain is ceaselessly engaged (*The Hindu*).'

Jason Holt explains:

> The stakes, then, are far greater than what natural curiosity there might be, and should be, in the "mere" neurological profile of art. If psychological/aesthetic accounts are the most promising among competing theories of art, then the contribution of neuroaesthetics will be absolutely crucial in discovering the underlying nature of aesthetic experience and in finally uncovering the nature of art itself(2).

Although many of the claims of Neuroaesthetics are contested, philosophers and art theorists are using insights from Neuroaesthetics to develop novel theories about why art is ubiquitous in every human culture.

A Bird's Eye View of the Recent Research Endeavours in Neuroaesthetics

In an attempt to discover how and where imagination occurs researchers at Dartmouth college performed experiments using functional MRI on 15 subjects. (Alexander Schlegel, Peter J. Kohler et.al. 2013) Unlike other studies that looked at different parts of the brain in isolation, the new Dartmouth study demonstrated how it's not just the "right brain" that is responsible for creative thought. Rather, the human brain is interconnected. They showed 11 different brain areas activated. Researchers at the University of Exeter have concluded after experiments using fMRI that in response to any written material "reading network" of brain regions are activated. Emotionally charged writing activated areas of the brain which are known to respond to music, predominantly on the right side. When participants read one

of their favourite passages of poetry, regions of the brain associated with memory were stimulated more strongly than "reading areas." (Adam Zeman et.al. 2014) Participants received resting-state functional magnetic resonance imaging scans on 19 consecutive days. Days after the reading, significant increases in connectivity were centered on hubs in the left angular/supramarginal gyri and right posterior temporal gyri. Long-term changes in connectivity, which persisted for several days after the reading, were observed in bilateral somatosensory cortex. A group of researchers at the University of Liverpool in England led by Noreen O'Sullivan, have provided some brain-based evidence for why reading is apparently of benefit to "mental health and well-being"(2015). Other research initiatives include *Neuroscience of Aesthetic Experience* (Starr, 2013), *Aesthetic Responses and Evolved Human Behaviour* (Davies, 2012), *What love and art reveal about the brain* (Zeki, 2009) and *Where art comes from and why*? (Dutton, 2009).

Literature and Human Brain: An Experimental Study Using Magneto encephalography(MEG)

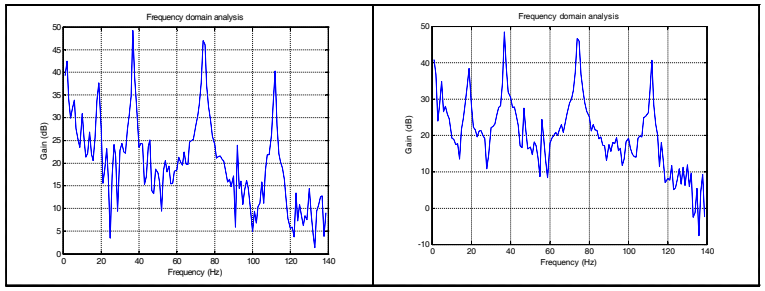
MEG experiment in process in DEI's Magnetically Shielded Room(MSR)

The present experiment in Neuroaesthetics has been conducted using Magnetoencephalography (MEG) installed at the Centre for Consciousness Studies, Dayalbagh Educational Institute (deemed University), Agra. The experimental study is propelled by the belief that literature employs a different kind of visualization from that of music, dance and painting. At the outset, a research question was formulated: "Do all literary compositions stimulate the brain in a similar fashion and perform the ideal function of 'forming, sustaining and delighting us?" A hypothetical hierarchical paradigm of literary experience and consciousness levels was designed for experiments , placing 'literature of senses' at the lowest rung resulting in material consciousness , 'literature of intellect' at the middle rung corresponding to cognitive consciousness, ,'literature of the spirit' at the highest resulting in spiritual consciousness.

The experiment was conducted on six participants. Participants were given a variety of texts /excerpts from both the Eastern and Western literatures to test the diversified nature of literary experience and its impact. During the reading activity of the selected texts, magnetic fields generated by the neuronal activity of the brains of all six participants were measured through Magnetoencephalography (MEG).

In the first phase of the experiment, what we termed "literature of senses", the participants were made to read Nobel Laureate William Butler Yeats's famous poem "Leda and the Swan" based on the Greek myth of how the beautiful girl Leda was robbed off her chastity by Zeus in the form of a Swan. The measured frequency recorded during the reading activity is shown below in the graph**:**

Fourier Plot for 'Literature of Senses'

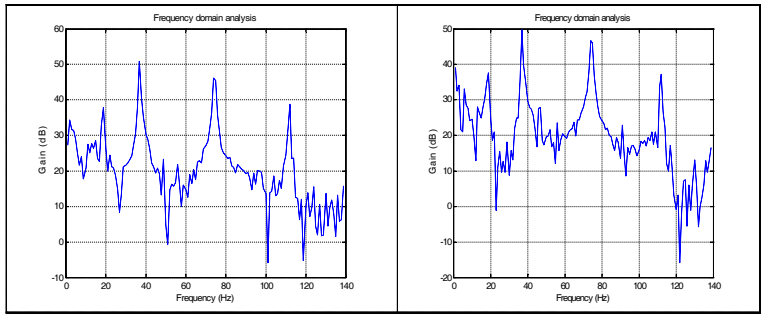


Literature of the Senses : Pronounced frequencies during the reading of Yeats's Poem

	3 Hz	4.5 Hz	45 Hz	76 Hz	108 Hz	126 Hz	Energy
Average gain in decibels	42.2891	30.1213	25.258	46.1232	16.12	5.896	9.8431

In the second phase of the experiment , what we termed "literature of the intellect", they were made to read the British political thinker and writer Edmund Burke's famous prose / speeches. As the participants were reading his information packed prose passages, the frequency level was measured which is given below :

Fourier Plot for 'Literature of Senses'

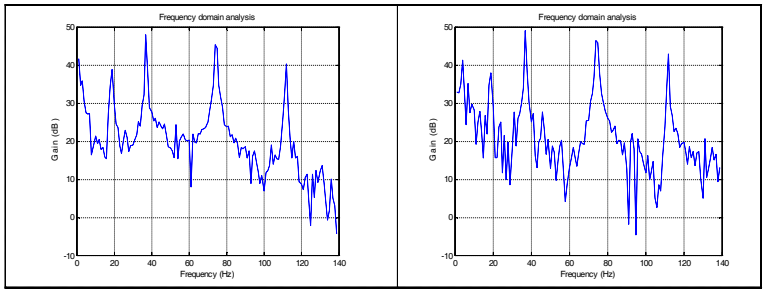


Literature of the Senses : Pronounced frequencies during the reading of Yeats's Poem

	3 Hz	4.5 Hz	45 Hz	76 Hz	108 Hz	126 Hz	Energy
Average gain in decibels	33.4371	28.7583	26.8362	46.1589	22.1216	7.0122	9.8431

In the third phase of the experiment, what we here term "Literature of the Spirit" they read the mystic and devotional verses of Eastern Bhakti Poets and Radhasoami Saints. The frequency levels are shown in the graph.

Fourier Plot for Literature of the Spirit



Literature of the Spirit: Pronounced frequencies during the reading of mystic verses

	3 Hz	4.5 Hz	45 Hz	76 Hz	108 Hz	126 Hz	Energ
Average gain in decibels	41.8973	34.8822	27.6925	47.2912	42.1679	18.7288	9.8431

Conclusion

Triple Hierarchical Neuro-Literary-Consciousness Paradigm: Eastern Saints' Perspective

Type of Literature Levels	Obtained Frequency	Level of Consciousness
Literature of the Senses	4 Hz to 76 Hz	Material Consciousness
Literature of the Intellect	76 Hz to 90 Hz	Cognitive Consciousness
Literature of the Spirit	76 Hz to 108 Hz	Spiritual Consciousness

The frequency levels between 4 Hz to 76 Hz with associated functions of sensations, emotions, concentration were relatively more prominent during the reading activity in the first phase i.e. 'literature of senses'. These literary works abound in vivid descriptions but relatively lack intellectual and spiritual depth. Hence give rise to the lowest level of consciousness -physical or material consciousness.

The frequency levels between 76 Hz to 90 Hz associated with functions of cognition, unifying thought processes, different perceptions during the reading activity in the second phase i.e. 'literature of the intellect' were relatively more prominent which correspond to cognitive consciousness.

During the reading activity of the mystic poems and devotional lyrics of the Eastern Saints, the frequency levels between 76 Hz to 108 Hz with the associated functions of self -awareness, higher levels of insight and information relatively became more prominent along with other lower frequencies. The resulting frequencies validated the hypothesis formulated in the beginning of the experiment that the reading of devotional or mystic literary discourses results in experiencing a heightened level of consciousness which in the Eastern idiom is termed 'spiritual consciousness.'

The research hypothesis was formulated keeping in view the impact of various literary texts on the three basic elements of the human system- body, mind and spirit. From the Eastern perspective, the expression 'body' designates the physical , 'mind' denotes intellectual and 'spirit' stands for the spiritual. Within the Eastern philosophical framework, the spirit entity occupies the supreme importance and body i.e. the physical the lowest. Though physical is not negated completely, it's the immortal spirit which is considered the most vital. Eastern Radhasoami Philosophy describes the three levels of consciousness as follows:

> The triad of consciousness of the grand macro/micro cosmology ranges from the ephemeral physical / material reality of science of outer experience at the tertiary level, through the semi-abstract cognitive science of outer- inner experience at the secondary level, to the eternal abstract spiritual science of ultimate inner experience at the primary level. (Satsangi,8)

The three levels of consciousness are further elucidated:

> We can gain consciousness at multiple levels, i.e. we can gain various shades of truth. All perceptions are reality, however, there are various levels of reality. Relativity Theory of Einstein refers to this relative nature of reality...we have the physical reality of perception of the outer world as an experience, then we have the cognitive reality of perception by the mind which is having communion both with the outer world as well as the inner world being the middle level mediator, and then finally we have the most abstract entity of spirit forces which only communicate with the mind directly , not with the body.(Satsangi,11)

The present experimental study didn't aim to identify the stimulated parts of brain during diverse literary readings,

rather the endeavour was to examine the impact of literary reading on the brain and further in heightening the consciousness level.

The following observation of Benjamin Funch (2013) resonates what we have tried to demonstrate through the experimental study:

> An aesthetic experience transcends the ordinary experience of everyday life...The presence of the spiritual self during an aesthetic experience is the optimal experience of one's own identity (180).

Notes

[1]The authors are extremely grateful to Rev. Prof. P.S. Satsangi, Chairman Advisory Committee on Education, Dayalbagh Educational Institutions for His guidance in conceptualizing and executing the experiments.

[2]Magnetoencephalography (MEG) is a non-invasive technique for investigating human brain activity. It allows the measurement of ongoing brain activity on a millisecond-by-millisecond basis, and it shows where in the brain activity is produced. MEG has advantages over both fMRI and EEG. The technologies complement each other, but only MEG provides timing as well as spatial information about brain activity. fMRI signals reflect brain activity indirectly, MEG signals are obtained directly from neuronal electrical activity.

[3]The preliminary results of the above experiments in Neuroaesthetics were presented at Annual Conference "The Science of Consciousness" organized by The Centre for Consciousness Studies, University of Arizona, USA in April 2016.

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