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Wandering Minds: An Artistic and Scientific Exploration of Attention and Consciousness

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Abstract: ***The relation between art and science is not new. It dates back to prehistoric era. The paper attempts to explore the relation between art and science and tries to look at one of the important phenomena of science i.e. Mind –Wandering from an artistic point of view. Mind-wandering is a very banal activity of human mind. It tends to occur during driving, reading and in other activities where vigilance is low. In these situations, people do not remember what happened in the surrounding environment as they are pre-occupied with their thoughts. Hence, the attention decouples from the external environment to the internal train of thoughts. The art work depicts the consequence on external environment when the attention shifts from external environment to the internal thoughts. The mind is engaged in wandering about half of its waking time. In extreme cases mind-wandering concludes to neurological disorders, such as depression. On the other hand, it helps in decision making, creativity which is the beneficial nature of it. Is mind wandering a blockage or a new vision? The paper explores the concept of mind wandering, and through artistic exploration it aims to investigate its positive side as well as negative part, thus raising the question to viewer about the direction of their thoughts.***

Keywords: Art & Science, Mind-wandering, Artistic Exploration

I. INTRODUCTION

Art and science are both about observation and interpretation. By connecting to art through conversations and projects, scientists gain new tools to visualize natural phenomena and communicate its complexities. Art, a visual object or experience consciously created through an expression of skill or imagination. The term *art* encompasses diverse media such as painting, sculpture, printmaking, drawing, decorative arts, photography, and installation. The various visual arts exist within a continuum that ranges from purely aesthetic purposes at one end to purely utilitarian purposes at the other [1].

Science and art have a long-standing relationship as both are based on observation and interpretation. Today, the relationship between art and science in our society is more complex: Although artists and scientists are both driven to observe and create, they largely reside in different cultural spheres—sometimes brought together serendipitously, other times intentionally. It is impossible to generalize relationships between art and science since neither is fully defined nor homogenous category [2].

During the Renaissance, the Italian polymath Leonardo Da Vinci was simultaneously a painter, sculptor, engineer, botanist, and scientist. Indeed, the term "Renaissance man" would come to be synonymous with a person with many talents and knowledge. The separation of art and science into different cultures in the West took place during the 19th century, which incidentally or consequently coincides with coining of the term "scientist" in the mid-1800s. Both disciplines share their origins in the representation and interpretation of nature, but, over time, their methodologies diverged, and the scientific school of thought became largely driven by specialization and hypothesis-based inquiries [2]. Art, in turn, developed its own schools and methods, from classical art, which tended to observe and imitate nature, to branches of impressionism, cubism, and expressionism. Nonetheless, there are many places of convergence between the two, both in the past and today.

During the Renaissance, sketches of plants, animals, human anatomy, and stars done *in lieu* of cameras were not just beautiful pieces of art, but also forms that required extraordinary technique and skill in order to communicate their observations. Beyond these pieces is an idea that is central to both art and science: the primacy of observation and interpretation. As Peter W. Parshall and David Landau write in *The Renaissance Print*: "Accurate visual representation was more than just a technical accomplishment. It was a highly specialized form of observation… Making illustrations was a way of checking facts, and by mid-century it was being supported by other means as well [2]. Public and private botanical gardens were being planted, and collections of dried specimens were being assembled into herbaria. In such a climate the illustrated herbal was bound to become the standard point of reference for scholars attempting to devise different schemes of classification"

The line that separates art and science in the modern age remains a superficial one; at the core, artists and scientists observe and interpret the world around them, though they may use different methods and expressions.

This artificial cultural divide is prevalent in our society, but some visionaries and institutions are consciously bridging it. For instance, medical schools are beginning to incorporate art into their curriculum. In fact, there is evidence that the use of art can help medical students "apply their observational and interpretive skills" and "accept the facts that ambiguity is inherent to art, life and clinical experience and there can be more than one answer to many questions" [2].

Once the need to re-establish the close connection between art and science had become apparent, other institutions began creating centres and think tanks for this purpose [2]. Two pioneering examples are the Centre for Advanced Visual Studies at MIT and Experiments in Art and Technology, a collaboration between New York artists and scientists at Bell Telephone Laboratories. This momentum benefits from a growing interest by scientific journals and magazines in publishing articles and dedicated issues that bring together art and science. The founding of the journal *Leonardo,* which publishes art and science studies, was another important step in this direction by creating a dedicated academic space for artists and scientists to collaborate and share ideas.

More recent institutional endeavours in Europe include the Welcome Trust and CERN. Welcome Trust has initiated multiple support programs, most notably the Welcome collection, which uses exhibitions and podcasts among other mediums to develop substantive connections between science, medicine, and art. CERN invites artists to spend time at the institution, facilitating close collaborations with scientists to understand and represent the structure of the universe. This desire of modern artists to better understand nature, life, and the universe is reminiscent of the past [2].

This paper explores the scientific phenomenon of Mind-wandering from an artistic point of view. The mind is never quiet. Thoughts occur one after the other in the conscious mind, drifting attention from external environment to more personal, imagined thoughts and concerns. According to Preiss & Cosmelli, 2017; Smallwood, 2013, mind wandering is conceptualized as a spontaneous flow of thought that is not connected to the current environment [3]. As per Smallwood & Schooler, 2006, mind wandering is when an individual's thoughts shift away from the task at hand; it is often referred to as task-unrelated thoughts [4]. Mostly, the person experiencing the wandering state is unaware of this activity which keeps the mind engaged somewhere else than in the 'here and now'. Mind-wandering has an unavoidable presence in the mundane routine of daily life.

Where does the mind travel, what does it think? What happens in the external physical environment during the wandering state? What are the factors which influence this activity and its consequences? According to scientific data, humans spend nearly half of the waking time lost in thoughts. What do they get out of it? Does it help gaining anything or does one lose oneself only? Is it a preferable state for healthy cognition? These are a few questions this paper attempts to explore artistically.

II. MIND WANDERING

According to neuro-scientific perspectives, the content of thoughts plays a significant role in determining the relation between self-generated thoughts and psychological well-being. Professor, Jerome L. Singer, known as 'the father of daydreaming' described three styles of mind-wandering aka day dreaming. First, the *positive-Constructive daydreaming*, characterized by playful, planned, wishful imagery, and creative thought, is the adaptive and beneficial nature of wandering state, helping the experiencers in decision making, problem solving, future planning, understood as a period of self-reflection, helpful in socio-emotional skills such as compassion, moral reasoning and dishabituation [5]. Secondly, the *guilty-dysphoric daydreaming*, characterized by obsessive, anguished fantasies, relating to unhappiness, negative mood, self-related contents, relating depressed and anxiety thinking patterns, ruminating about past correlated positively with neuroticism in extreme cases and lastly, the *poor-attentional control*, associated with low level of conscientiousness, the inability to concentrate on either the ongoing thought or the external task [6].

Studies show that negative mood plays an encouraging role in the bouts of mind wandering leading the attentional resources on self-generated thoughts. Dysphoric and depressed individuals exhibit greater frequencies of mind-wandering than positive mind.

Current studies in this field have revealed that mind-wandering has close ties to mood, and in particular negative or unhappy mood. Evidence suggests that mind-wandering is often more frequent in individuals who report chronic levels of unhappiness (e.g. depression) while studies also indicate that mind-wandering can increase when normal participants experience periods of experimentally induced negative mood. Often negative mood seems to lead individuals to focus or ruminate about the past.

Mind wandering can be caused due to various factors which include psychological, neurological, and situational factors. It is influenced by a combination of internal factors (like mood, personality**,** and brain function) and external circumstances (like task difficulty or boredom)**.** If the task is too boring or simple, there is likely the chance that mind starts to wander on other interesting or more important thoughts. People with higher working memory may actually mind-wander more—but more productively. Anxiety or stress can also lead mind to wander. The Default Mode Network (DMN) Activity: The DMN, a network of brain regions active during rest and self-referential thought, is strongly linked to mind-wandering.

Mind-wandering is a common everyday experience in which attention becomes disengaged from the immediate external environment and focused on internal trains of thought [7]. Mind wandering (MW) has been defined as the default mode of operation of our brain (Mason et al., 2007), and it has been associated with maladaptive consequences for health (reviewed in Mooneyham and Schooler, 2013), leading to depression, anxiety and ADHD in excessive or uncontrolled mind wandering [8]. Mind-wandering shares a number of important similarities with thinking in depression.

It has been associated with poor performance, cognitive control failure, poor effects on reading and comprehension, mood swings, impaired academic and task-related performance.

One of the foremost effects that occur during mind-wandering is the shift of attention from the external environment to more internal stream of memories, leading to a very superficial consciousness of the external environment. Occasionally people are unaware of this shift.

III. ARTISTIC EXPLORATION

A. Absence in Presence (Photographic Study)

Mind-wandering and the decoupling of attention

Every day, we all experience our minds wandering away from our current activity as our attention is drawn to our private thoughts and feelings. According to Klinger, 1999, based on our own experiences mind-wandering involves a withdrawal of attention from the current ‘‘here and now’’ and a redirection towards our current concerns. The lack of attentional supervision of the primary task during mind-wandering implies that attention is decoupled from the primary task. The fact that during mind-wandering our attention is decoupled from the task indicates that our representations of the task environment will be less detailed than during periods of time when our attention is focused on the task. Evidence supports the suggestion that mind-wandering involves a superficial representation of the current environment [9].

Fig. 1. Absence in Presence

Based on above, the author/artist attempts to represent the effect on the external environment in an artistic way. The first exploration is through photographs, known as 'Absence in Presence' which explores the relation between real and fantasy, raising the question of dislocation of attention. When the mind is in state of wandering, the thoughts drift from the external situation, meandering through unknown paths; shifting *'attention'* from the current external environment to a more internal stream of consciousness. The process is associated with reduced cognitive analysis of the external environment. The work explores the impact on the physical space due to the sudden shift from actual to fancy.

The real becomes insignificant, the person is present in the space but absent at the same time. The photographs have been taken at a time that obscures the reality and gives an unclear image, representing the shift from external environmental to somewhere else.

B. The Two Possible Trails (Installation)

Positive Trail: Greek Meander pattern representing constructive daydreaming

The complex nature of the mind-wandering phenomena demands that we adopt a more nuanced view of self-generated thought and this is especially important for relating the concept to psychological wellbeing. In addition to the context with which self-generated thought occurs, an additional element of mind-wandering that is likely to be important to consider is the content underlying the experience [10]. Profiles of thought content often vary widely across individuals, and this variability must be taken into consideration before making general conclusions about the adaptive nature of self-generated thought. While some forms of thought content are linked to maladaptive outcomes including psychological distress and unhappiness, other forms highlight the adaptive nature of the experience.

Evidence supporting an unconstructive view of self-generated thought comes from studies by Killings worth and Gilbert, 2010, linking the mind-wandering state to unhappiness and by Smallwood and O'Connor, 2011, mind wandering about the past to negative mood [11]. Of clinical relevance, repetitive thoughts focused on negative, self-related content represent core features of depressive rumination—a style of thinking elevated in individuals with depression and anxiety as per Nolen-Hoeksema, 2000 and Watkins, 2008 [12].

According to Raes et al., 2005 and Williams et al., 2007, depressed and suicidal individuals also exhibit over general memories and future thoughts with fewer episodic details [13]. Collectively, these findings foster the sentiment that self-generated thoughts are maladaptive because they impede happiness and reduce psychological well-being. However, these findings stand in stark contrast to a growing number of studies revealing that in non-clinical populations, self-generated thought is characterized by content of a far more adaptive and constructive nature [10] [11]. The finding that self-generated thought is highly self-relevant is consistent with the notion that such thoughts provide a means to focus on and solve one's current concerns [14]. On a related note, self-generated thoughts also facilitate insight and creative problem solving by Baird et al., 2012, and in contrast to depressed patients they are often positive in valence by Killings worth and Gilbert, 2010 and marked by a moderate amount of visual imagery by Delamillieure et al., 2010 [14]. Importantly, the temporal dynamics of self-generated thought also speaks to its adaptive potential. A majority of individuals' thoughts are spent engaged in mental time-travel, particularly oriented toward the future and in pursuit of future goals. From an evolutionary perspective, prospection allows us to simulate plausible outcomes to alternative future events, including the emotional states of ourselves and other people in response to such events as per Gilbert and Wilson, 2007. In this way self-generated thought is an adaptive process that helps us select the optimal course of action, prepare for upcoming events, and achieve our upcoming goals [14].

The relationship between the content of self-generated thought and mood may be even more complex. Recent work exploring the temporal dynamics of the link between the content of self-generated thought, and mood demonstrate that the relationship may have a complex temporal relationship. Using time lag analysis, Ruby et al. (under revision) demonstrated that the occurrence of past related off task thought while participants performed as implenon-demanding task was associated with subsequent reports of negative mood [14]. By contrast, self-generated thought focused on the future was associated with a subsequent more positive mood. Similarly, Franklin et al. (in submission) demonstrated that in daily life when self-generated thoughts are rated as more interesting, mood was more positive. These findings suggest that the content of self-generated thought is important in determining its consequence on subsequent mood [14].

Focussing on the content of thoughts, the work explores the possibilities of trails in the conscious mind. The trails are the metaphorical representation of states of wandering mind associated with positive and negative mood/states. Referring to Singer's *Positive Constructive Daydreaming*, the beneficial nature of wandering, the first trail takes its inspiration from the pattern of a Greek key, made out of a continuous line, turning first inwards and then outwards, with a different exit. The state of positive constructive mind resembles with the pattern of a Greek meander/key, with thoughts meandering in and out, leading to another and hence moving forward with a different exit. The installation has been created with tiny wooden pieces and arranged in a way that gives a shape of Greek meander. Here, the artist, has tried to represent the beneficial nature of mind-wandering where the mind is engaged in wandering but it leads to somewhere representing Singer's Positive Constructive Day-Dreaming.

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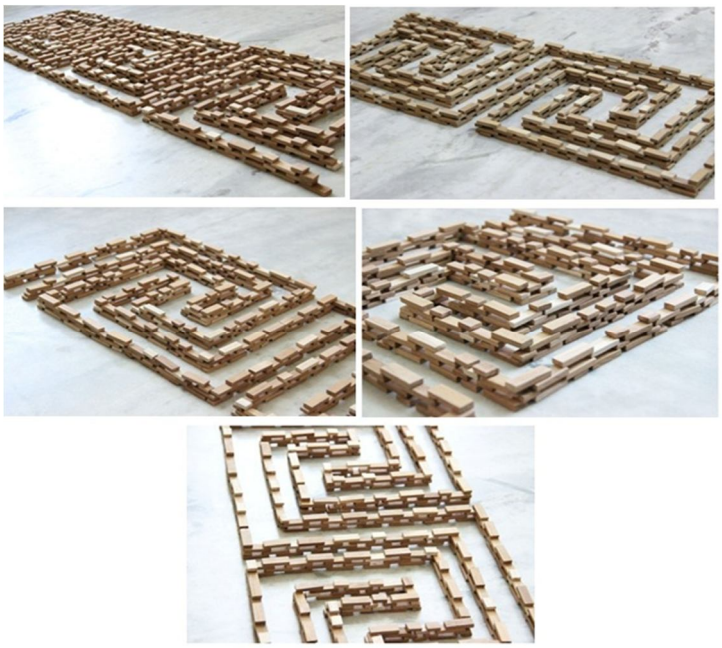

Fig. 2. Installation 1

Negative Trail: Chakravyuh metaphor illustrating mental entrapment and ruminative loops

The second trail, the *guilty-dysphoric daydreaming* seeks its route from the formation of Chakravyuh (an Indian labyrinth), used in the battle described in Hindu epic *Mahabharata*, where Chakravyuh was designed by Dronacharya to capture the enemy, Abhimanyu. The formation was designed like a spinning wheel, with soldiers on both sides and more following them at a distance, drawing up seven circles and culminating in the middle where the captured person does not have chance to either move further or get back. The second state associated with, self-related contents, relating depressed and anxiety thinking patterns, ruminating about past leading to negative mood, correlating positively with neuroticism in extreme cases, is very like the formation of Chakravyuh where one can get trapped into the Chakravyuh (Labyrinth) of thoughts, leading to nowhere, thus resulting in low mood, depression and other neurological disorders

Fig. 3. Installation 2

IV. CONCLUSION

Mind wandering is ubiquitous to the human experience and may be the brain's default process. This paper carries out an artistic and scientific exploration of mind-wandering. By interweaving insights from neuroscience and psychology with visual and conceptual artworks, the paper investigates how the disconnection of attention influences our perception, mood, and interaction with the external environment. Secondly, the twofold nature of mind-wandering appears undoubtedly: while it holds Singer's positive day-dreaming that is the adaptive potential nature in fostering creativity, problem-solving, future planning, emotional processing and decision making. On the other hand, it is guilty dysphoric day-dreaming, which leads to maladaptive outcomes such as rumination, depression. Thus, reminding viewers/participants to introspect their own thinking trail. What path are they weaving for themselves? Does it lead to the destination or lash them in a Chakravyuh from where coming out is not easy? Through artistic expressions such as the photographic work *Absence in Presence, the role of attention has been investigated* and the installation *The Two Possible Trails*, serves as metaphors: the *Greek Meander* becomes a symbol of constructive cognition, illustrating how wandering thoughts can trace new paths toward growth and insight, while the *Chakravyuh* embodies mental entrapment, capturing the repeated and confining nature of depressive rumination. Art & Science has been continuously serving to the society and hope to continue to provide its services in future with its awe-inspiring works by collaborating both the disciplines.

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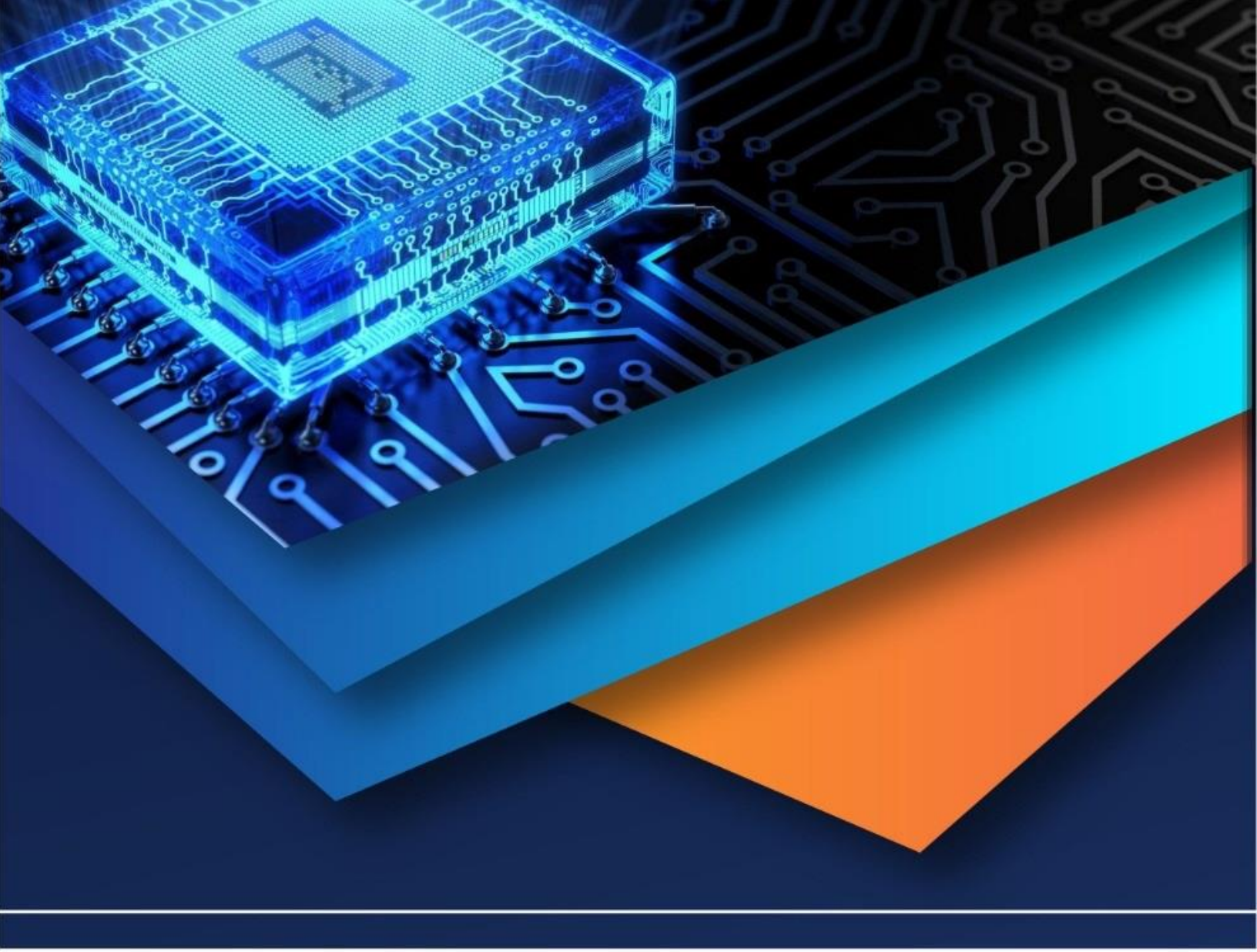

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