Practice, Perception, and Pollock:
Towards a Neurological Reading of Jackson Pollock’s Drip Paintings

by

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ABSTRACT

PRACTICE, PERCEPTION, AND POLLOCK:
TOWARDS A NEUROLOGICAL READING OF JACKSON POLLOCK’S DRIP PAINTINGS

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The ambiguity of Jackson Pollock’s drip paintings begs for a new interpretation of his work, and even Pollock admits, “When I am painting I am not much aware of what is taking place.” This thesis aims to present a possible explanation of the meaning of Pollock’s drip paintings specifically through the use of neuroarthistory, ecological perception, and fractal theory. The analysis presented here considers the way biography, specifically the ecological environment, imprints the brain and is transformed into a formal pattern in the work of art. Pollock’s canvases demonstrate a sustained reflection on how we see and represent the world and how neural preferences are established. In addition, this thesis also addresses how neuroscience can better illuminate our understanding of the relationship between the viewer and the work of art through embodied experience. It is not simply the eye, as Clement Greenberg argued, where vision takes place, rather it is within a complex system that extends beyond the body. Not only does this thesis provide new insights into Pollock’s art, but his work is a useful way into the debates about the emerging, complex field of a neurological approach to art.
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**Introduction**

Navigating through the Metropolitan Museum of Art’s modern art collection, the visitor is confronted with a larger than life canvas on which intricate patterns are formed with drips and splatters of paint. In a structured chronology, Jackson Pollock’s *Autumn Rhythm (Number 30)* is situated after Arshile Gorky and before Helen Frankenthaler, in the middle of 20th century modernism. Historically, art critic Harold Rosenberg called Pollock’s drip paintings “records” of events, while TIME magazine called them “chaos” (to which Pollock retorted, “No chaos damn it!”). Robert Coates, writer for the New Yorker, deemed the drips to be meaningless, meanwhile renowned critic and theorist, Clement Greenberg, categorized Pollock’s paintings as the epitome of formalism. Today, Pollock’s work is championed in the art world, his unique style is recognized internationally, and less than a year ago, *Number 4, 1951* from Pollock’s drip series fetched over forty-million (USD) at auction.¹

The numerous debates surrounding the meaning of Pollock’s art, and the lingering questions about how and why he made his drip paintings promotes a lasting interest and encourages the continued re-evaluation of his work. Pollock provides some clarity about his artistic method in the narration accompanying the famous Hans Namuth film, which documented Pollock’s painting process. His short explanation highlights areas of interest that have been investigated in the years following his death, but his commentary is vague, and it hints at the unanswered dimensions of his art. Pollock reveals:

> My home is in Springs, East Hampton, Long Island. I was born in Cody, Wyoming 39 years ago. In New York, I spent two years at the Art Students’

League with Tom Benton. He was a strong personality to react against. This was in 1929. I don’t work from drawings or colour sketches. My painting is direct. I usually paint on the floor. I enjoy working on a large canvas. I feel more at home, more at ease, in a big area. Having the canvas on the floor, I feel nearer, more a part of the painting. This way I can walk around it, work from all four sides, and be in the painting similar to the Indian Sand Painters of the West. Sometimes I use a brush, but often prefer using a stick. Sometimes I pour the paint straight out of the can. I like to use a dripping, fluid paint. I also use sand, broken glass, pebbles, string, nails, or other foreign matter. A method of painting is a natural growth out of a need. I want to express my feelings rather than illustrate them. Technique is just a means of arriving at a statement. When I am painting, I have a general notion as to what I am about. I can control the flow of the paint. There is no accident, just as there is no beginning and no end. Sometimes I lose a painting. But I have no fear of changes, of destroying the image. Because the painting has a life of its own, I try to let it live.²

While Pollock’s explanation provides an overview of his conscious influences and a step-by-step guide to his artistic technique, Pollock struggles to address what “feelings” his paintings express, and how his art develops from this inner desire to paint. He merely suggests that his paintings are alive and that he is fueling their growth. Pollock’s conscious influences have been explored in a number of biographies, in books, interviews, and films, and his innovative artistic process holds an important place in American modernism and art history. The meaning of his work has been attributed to these conscious influences, his technique, and its broader art historical context.

² *Jackson Pollock 51*, film, directed by Hans Namuth and Paul Falkenberg, 1951.
However, Pollock’s unconscious inspiration and what actually appears on the canvas seems inexplicable. His best explanation of this inspiration and what ultimately gets expressed seems to be, “When I am painting I am not much aware of what is taking place,” 3 and this romanticized notion of Pollock as a bewildering genius remains a popular ideal.

In an interview with art historian T.J. Clark on Pollock, art critic Clement Greenberg discusses this romanticized ideal, which he claims Pollock had of his own life. But Greenberg ends this interview with the statement, “He was full of [it], like everybody else.” 4 John Onians would agree with Greenberg, as he believes artists are not the best people to reflect and comment on their own work. He claims that artists say what they think the reader or critic wants to hear, and they don’t actually know what is going on in their brains. 5 Onians, a key figure in the emerging neurological approach to interpreting art, believes that the key to understanding art is through the brain.

Although there are numerous publications on Pollock and his art, a discussion of the brain adds a new dimension to the existing scholarship that has not yet been addressed. I have always been drawn to Pollock’s art for its contributions to American modernism and the way it pushes the conventions of art as well as its ambiguous meaning, and I believe that an approach stemming from neurology can clarify some of this ambiguity. As new methodologies emerge in the discipline of art history, they propose alternative interpretations of Pollock’s work and establish his relevance today. The neurological approach is no different.

3 Tate, “‘Yellow Islands’, Jackson Pollock,” http://www.tate.org.uk/art/artworks/pollock-yellow-islands-t00436.
5 John Onians, “Neuroarthistory” (presentation at the Neuroarthistory Summer School at the University of East Anglia, Norwich, UK, 27 July, 2013).
In the early 1990s, art history expanded into the field of visual and material culture, and the development of cutting-edge technologies and groundbreaking discoveries were being made in neuroscience. As these two fields begin to overlap, the development of a unique approach to studying humans and the products they create emerges that combines the science of vision and neurology with the scholarship of art history and theories of visual culture. This thesis aims to provide a possible explanation of the meaning of Pollock’s drip paintings specifically through the use of neuroarthistory, ecological perception, and fractal theory. Along the same lines, neuroscience can illuminate what happens to the viewer at the Met when confronted with *Autumn Rhythm*. Not only does neurology provide new insights into Pollock’s art, but his work is useful as a way into the debates about this emerging, complex field.

The integration of these two disciplines has not been seamless as the possibilities of neuroarthistory are still being tested and many art historians question the very potential of a relationship existing between disciplines that were previously separated in their respective institutional departments. As one of the youngest modes of inquiry within art history and visual culture, the controversial nature of a neurological approach delays its widespread acceptance. Some may not find any productive correlation between the two, and they might reject the notion that neuroscience can add a useful dimension to art historical interpretation. However, what they may not realize is that any application of neuroscientific knowledge simply aims to enhance what we already know, rather than attempting to reinvent the discipline or creating a reductionist approach to art. The neuroscientific findings regarding the properties of the brain and the principles of its functioning provide valuable information to the art historian, theorist, and critic that can validate claims that were previously only speculations as well as open up new areas of inquiry that could never have been addressed without this new knowledge. This perspective
allows for the visual world to be thought of from an alternative angle, which encourages fresh analyses to be brought forth and mutually invigorates the humanities and the sciences.

Neuroarthistorians work to justify the pertinence of a neurological approach to art and visual culture in an age when technology has allowed for a more in-depth exploration of the brain than was previously possible. A neurological approach changes the way we think about art as neurology solidifies the connection between nature and culture and presents them as interdependent, rather than antithetical to each other. However, neuroarthistory is not a language for talking about art, nor is it an off-the-shelf theory that can be applied to various artists and categories of art, which is the way many existing methodologies are used. Instead, it aims to get away from language and words for explaining things and attempts to address the unconscious aspects of art making through an investigation of the properties of the brain. This thesis, though based in neuroarthistory, does not follow any singular methodology and is not a neurological reading of Pollock’s work in detail, however it indicates some of the ways in which the cognitive sciences could be utilized to interpret Pollock’s work and our experience of it.

The thesis that follows presents a reading of Jackson Pollock’s drip paintings with a basis in neuroarthistory that incorporates theories of ecological perception, fractal geometry, and embodied experience. There are a multitude of scientific-based approaches that can continue to illuminate this area of study, however I find Pollock’s work in particular and the neuroarthistorical approach to be mutually enriching. The controversial nature of the avant-garde echoes the contentions of the neurological approach, which draws me to it and assures me that it is a critical area of inquiry.
Chapter 1: Literature Review

The Development of a Scientific Approach to Art

This thesis is a neuroarthistorical intervention on art history that broadens the study of the social context of art to include ecological and cognitive conditions. It studies biography with the intention of explaining visual preference, individual style, and specific innovations. In this way, it considers how ecology, the visual field, and individual neurology contribute to the production of works of art. Through a case study of Jackson Pollock’s drip paintings, these theories coalesce to explain the technique and visual effect of the drip. This chapter identifies significant developments within art history and visual culture that expanded the scope of visual inquiry, and it outlines the historiography of the emerging neurological approach to art.

Lui Lam, co-editor of *Arts: A Science Matter*, explains the connection between the arts and the sciences with the following statement: “Arts are created by humans. To understand arts we have to understand humans.” In other words, if biological conditions shape human activity, then these same conditions impact all products created by humans. A neurological approach to art aims to understand what happens in the brain during the creative process and during the human response to art. It is concerned with explaining what drives humans, in all regions of the world and in all eras, to generate visual forms that are not simply mimetic, but which demonstrate a sustained reflection on how we see. More specific threads of inquiry include research into the functioning of the visual cortex in artists, comparing these findings to information about the brains of viewers, exploring how the brains of amateur and professional artists differ, and asking why it is that artists in a certain time or place have particular visual

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preferences. With the knowledge that human behaviour, specifically art making, is shaped by the nervous system, art historians are closing the divide between disciplines. In order to better understand this emerging area of inquiry and propose new directions for its study, its history must be charted.

The Rise of the New Art History and Visual Culture Studies

In the 19th and 20th centuries, the arts and sciences were separated from each other and were identified as their own distinct areas of study with specific methods and materials. Recently, scholars have begun to unite these disciplines in their search for a new approach to understanding the humanities, and they have used the most recent scholarship in the field of cognitive sciences to elucidate theories about the origin and nature of the arts.

With the rise of feminism and the civil rights movement in the 1960s in Britain and North America, the discipline of art history shifted its focus from connoisseurship towards a social history of art, which entailed a questioning of capitalist ideologies and the way art resists or reproduces traditional class divisions and gender roles. The traditional connoisseurship model involved the ability to distinguish between authentic works of art and frauds or copies through an evaluation of the skill involved in its creation and its provenance. This model privileged an exclusively European, object-based art history and suggested that taste was a trait that needed to

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be cultivated and was the basis for aesthetic judgment of art objects. Where this model failed was in its inability to address the production of human culture in its varying forms around the world and its lack of self-criticism. Young scholars believed that art history was too uncritical, and they re-evaluated their roles as historians and educators, disposing of the objective claims of connoisseurship in favor of a politically charged revision of methodology. The discipline saw the integration of a variety of approaches focused on the social implications of art that competed with connoisseurship. John Berger’s BBC television program *Ways of Seeing* originally aired in 1972 and is an important work in the rise of what is referred to as “the new art history” because it was one of the first examples of a challenge to conventional accounts of art history. Other art historians, such as T.J. Clark, demonstrated similar tendencies to Berger and employed a Marxist approach to art historical objects as demonstrated by his two 1973 works on French 19th century painting: *The Absolute Bourgeois: Artists and Politics in France, 1848-1851* and *The Image of the People: Gustave Courbet and the 1848 Revolution*. Scholars like Griselda Pollock and Lucy Lippard believed, like Clark, that Marxist theory could provide critical insight into the social history of art, however they saw the structure of society as determined by sexual divisions and inequalities. In Lippard’s 1980 essay “Issue and Taboo,” she proposed that there should be a relationship between Marxism and feminism in a critique of art history, and she wrote about contemporary female artists in an attempt to clarify issues of bourgeois femininity. Pollock agreed with Lippard, and in her 1982 article “Vision, Voice and Power: Feminist Art History and Marxism,” she discusses the relationship between feminist and Marxist theories and art history. In 1986, the anthology *The New Art History* edited by A.L. Rees and Frances Borzello was

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published, which attempted an overview of the new ideas in art history as understood by various
art historians. The discipline of art history began to widen and share theories and objects with
other fields such as anthropology, cultural studies, critical theory, sociology, literary studies,
philosophy, and film, communication, and media studies.

By the 1990s, with this broadening of perspectives, many scholars continued to look
outside the discipline of art history for methods and materials, and they became interested in the
emerging field of visual culture studies. While visual culture studies emerged from art history, it
is a unique field that offers insights into the nature of visual experience that art history does not.
Though the field is difficult to define due to its unsettled nature and variation amongst its own
stories of origin, generally, visual culture aims to expose the visual codes and conventions that
function as a language, mediating everyday communication and shaping social reality beyond the
perception of images. Authors Marita Sturken and Lisa Cartwright define visual culture in their
book *Practices of Looking: an Introduction to Visual Culture* as “the shared practices of a group,
community, or society through which meanings are made out of the visual, aural, and textual
world of representations and the ways that looking practices are engaged in symbolic and
communicative activities.”

In his article “Showing Seeing: A Critique of Visual Culture,” art historian W.J.T.
Mitchell offers an illustration of the scope of visual studies by identifying the range of visual
culture – the object or material - of visual studies. He states that visual culture includes:

Not just art history and aesthetics, but scientific and technical imaging, film,
television, and digital media, as well as philosophical inquires into the
epistemology of vision, semiotic studies of images and visual signs,

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psychoanalytic investigation of the scopic drive, phenomenological, physiological, and cognitive studies of the visual process, sociological studies of spectatorship and display, visual anthropology, physical optics and animal vision, and so forth and so on.\textsuperscript{12}

While visual culture is an emerging area of study that tends to evade a single definition, Mitchell affirms that the breadth of it reaches well beyond the realm of art history. Moreover, and of significance to this thesis, he suggests that visual culture studies is equally concerned with aesthetics as it is with the science of vision. Mitchell goes on, “It is not just that we see the way we do because we are social animals, but also that our social arrangements take the forms they do because we are seeing animals.”\textsuperscript{13} This investment, identified here by Mitchell, in the scientific aspect of visual and cultural constructs, has pushed scholars in the humanities to seek out new knowledge of the sciences and has allowed for subfields such as neuroaesthetics and neuroarthistory to develop.

A number of contemporary scholars working within the area of visual studies have acknowledged this shift in thinking about the interdependency of vision and cognitive studies. Some scholars have even abandoned their previous modes of thinking in favour of this new approach. Norman Bryson, a scholar well known for his writing on semiotics, admits that a neuroscientific approach to visual culture may overshadow previous approaches to the subject. In his 2003 essay “The Neural Interface,” Bryson advocates for relinquishing a semiotic approach and adopting a neurological one because it takes into consideration all aspects of daily

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\textsuperscript{13} Mitchell, 171.
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experience and is more complete. In what follows, this chapter charts how and why other scholars have reached this same conclusion. The literature review presented here outlines a history of the turn to a cognitive perspective in art history and visual culture. Though the parameters of this thesis limits an exhaustive survey, this review will construct an account of the main scholars in both art history and neurology that have laid the foundation for further investigation into new directions for visual culture. This literature review, however, is complicated by the ever-changing landscapes of both disciplines. Art history and visual culture are ever re-inventing and re-imagining themselves, and the general disagreement amongst scholars about what constitute their terms of analysis does not allow for a singular method. In a related way, the discipline of neuroscience has flourished exponentially in recent years and new discoveries about the workings of the brain are constantly replacing previous scientific knowledge. There continues to be intellectual debates surrounding the integration of these areas of study and thus, this thesis only begins to expose any truth about such a complex topic. It is therefore as much about clarifying and stating the place of a neuroscientific approach to the study of art as it is about addressing the main touchstones and tendencies in this emerging area in order to illuminate how it is a crucial field of study.

**Ernst Gombrich: Art History, Psychology, Perspective, and Vision**

While the sciences have become increasingly important to the study of art since the 1990s, scholars working before this time had already been anticipating this need to look to biology and the cognitive sciences for answers to fundamental questions about the nature and origin of art. Ernst Gombrich is one of the first humanist scholars to break away from the tradition of art

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history, and he has had a lasting influence amongst scholars in the humanities and the sciences alike.

At the beginning of Gombrich’s career as an art historian in the first half of the 20th century, the discipline of art history was primarily concerned with either the analysis of subject matter in art (iconography) or its aesthetic dimensions (stylistic analysis, judgment, and appreciation). However, Gombrich was interested in blending the field of art history with science, specifically cognitive psychology, through the study of perception and representation. This multi-faceted approach was an unconventional method of inquiry at the time. James Elkins argues in his essay, “Ten Reasons Why E.H. Gombrich Is Not Connected to Art History,” that Gombrich’s concern with cognitive psychology is one of these reasons that he could be considered as an external figure to the discipline. This radical departure from the traditional approach to art history, however, makes Gombrich a key figure in the discussion of a neurological approach to art.

In an interview with Paul Levinson, Gombrich acknowledged a long and influential friendship with Karl Popper, a philosopher and historian of science. Gombrich saw his own interest in blending art history with cognitive psychology as outside traditional aesthetics and more in line with Popper’s discussions of psychology and the history of science. Popper claimed that scientific statements and theories were methods employed to assist scholars in rationalizing, explaining, and mastering the world. Gombrich’s account of stylistic change in

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art was influenced by this notion of mastering the world put forth by Popper. Gombrich saw artistic experiments with style as comparable to scientific hypotheses. The artist creates mimetic works, Gombrich argues, by exploring his or her own mental images rather than by observing reality, and the artist modifies these images based on viewers’ reactions in order to match reality.

In addition, Gombrich studied Gestalt psychology, which addresses the visual perception of forms. Gestalt psychology proposes that a whole object is perceived before its individual parts, suggesting that the whole is functionally greater than the sum of its parts. Gestalt theory considers the interaction between the figure and ground and proposes that every act of visual perception involves the differentiation of a pattern or figure from its surroundings. Gombrich was interested in this relationship between figure and ground in the visual perception of patterns in decorative art, which he suggests is guided by an innate sense of order. He explores this topic further in his book *The Sense of Order: A Study in the Psychology of Decorative Art*, his most cognitive approach to art.

Gombrich claims this book was designed “to establish and test the theory that there exists a Sense of Order which manifests itself in all styles of design and which [he] believe[d] to be rooted in man’s biological inheritance.” Gombrich departs from traditional aesthetics, which focuses on modes of appreciation and aims to ask more fundamental questions about why humans have had the desire to create patterns and what the psychological functions of this

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19 Macey, “Gombrich,” 164.
21 Macey, “Gestalt,” 160.
pattern-making may be. Gombrich claims that organic life is organized by hierarchical structures in the internal and external environment, and that this hierarchy has survival advantages for humans. He observes that the internal environment is governed by pattern and rhythm, such as heartbeat or sense of balance, which help humans locate themselves within their environment and help with adjustment to that environment. The natural external environment is also composed of similar patterns and rhythms, such as the regular shifts between day and night or the uniformity of a grassy field. These environmental patterns, Gombrich argues, fall below the threshold of conscious perception, but any disruption to these patterns would alert one’s attention. Gombrich suggests that this sense of order is somehow encoded in neurobiology and allows the brain to recognize any deviations from the order to assist in survival. He believes that the formal characteristics of man-made products satisfy this biological demand for easy adjustment and easy arousal and are physical manifestations of this innate sense of order.

Gombrich maintained that a cognitive approach was more open than either an aesthetic history or a structuralist theory of forms, and this new method could take into account many more factors. While he addresses the psychology of perception, Gombrich does not fully acknowledge in any specificity the neurological functioning of the brain in his studies. However,

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29 Onians, Neuroarthistory, 160.
he does note that the eye is not a passive instrument, suggesting that perception requires innate abilities as well as acquired experience.30

Michael Baxandall: Art History and the “Period Eye”

Michael Baxandall, an art historian and student of Gombrich, adopted this cognitive approach to understanding art, but where Gombrich was interested in psychology and perspective, Baxandall was interested in the role of the eye in actively producing art and in the act of perception. His history of art, therefore, introduced the discipline to neurobiology.

In his essay “Fixation and Distraction: the nail in Braque’s Violin and Pitcher,” Baxandall takes up the topic of visual attention, which also interested Gombrich. Baxandall’s discussion of attention focuses on “the viewing eye” in art, which he explains has a centralized acuity in the fovea that decreases towards the periphery. He claims that the viewing eye can scan an image and redirect this acuity to various areas, however one is still able to pay attention to something in the periphery. Baxandall brings in empirical evidence to support his claims regarding the viewing eye, citing studies on vision and perception published in Quarterly Journal of Experimental Psychology, Vision Research, Scientific American, Perception and Psychophysics, and Communication and Cognition.31 Baxandall also illustrates the article with scientific diagrams, images, and charts from these same journals, suggesting that scientific

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30 Onians, Neuroarthistory, 175.
studies illuminate his theories about the way the viewing eye shapes the production and reception of art. Baxandall concedes that his findings lack a complete scientific understanding of ocular fixation as they only touch on the earliest stages of attention, but he encourages the reader to look outside of his essay for a higher level of understanding of cognitive sciences. In this suggestion, Baxandall acknowledges the important role of the neurological relationship between the eye and the brain, between seeing and interpretation, in the analysis of visual images.

Baxandall’s most influential concept “the period eye” was introduced in his 1972 book *Painting and Experience in Fifteenth-Century Italy* and is neurology-based. Within the context of 15th century Italy, the Quattrocentro, Baxandall suggests that the common visual experiences of the Quattrocento people influenced their pictorial style and visual preferences. Baxandall has a strong understanding of the physiology of the eye, as indicated in the introduction to chapter two:

> An object reflects a pattern of light on to the eye. The light enters the eye through the pupil, is gathered by the lens, and thrown on the screen at the back of the eye, the retina. On the retina is a network of nerve fibres, which pass the light through a system of cells to several million receptors, the cones. The cones are sensitive both to light and to colour, and they respond by carrying information about light and colour to the brain.\(^{32}\)

This passage confirms Baxandall’s familiarity with the inner workings of the eye, and he explains that the brain is the area of the body that allows for individuality to form out of unique experiences. It is through the brain that visual perception and the processing of visual data received from the eye varies with an individual’s own skills of interpretation, which Baxandall

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\(^{32}\) Baxandall, *Painting and Experience*, 29.
calls one’s “cognitive style” or perception. However, Baxandall explains that this variance is culturally determined through common visual experiences. Baxandall suggests that the visual skills of a viewer are likely those that are highly regarded in society, and the artist, as a member of the same society, would have similar visual skills and would thus be able to please the viewer by employing these skills in the creation of a work. Therefore, one’s cognitive style is informed by individual and cultural experiences.

Baxandall illustrates how 15th century activities shaped the pictorial style of the time. For example, Quattrocento people learned how to read the movements of figures depicted in paintings through their observation of the movements of priests, and they could read relationships between figures within paintings through their observation of re-enactments of religious dramatic arts in churches and on the streets. Baxandall also identifies other acts, such as dancing, as permitting insight into understanding painters’ figural groupings within paintings. Baxandall believes that it was through common visual experiences such as these that the Quattrocento viewer could interpret meaning through visual patterns.

Another method that Quattrocento painters used to engage their audiences was to encourage an analysis of forms within their paintings. These gauging skills were taught in the secondary education in the lay schools that most Quattrocento boys attended from the age of ten or eleven. Painters knew that the literate public would have the same education and would use their skills to interpret the forms in paintings as individual volumes and shapes. Additionally, Quattrocento education put a strong emphasis on commercial arithmetic and most of the public

33 Baxandall, Painting and Experience, 29-30.
34 Baxandall, Painting and Experience, 40.
35 Baxandall, Painting and Experience, 64-65, 71.
36 Baxandall, Painting and Experience, 77.
37 Baxandall, Painting and Experience, 86-87.
38 Baxandall, Painting and Experience, 87.
had a strong comprehension of proportion, a knowledge that painters relied on in their depiction of human bodies.\textsuperscript{39} In the 15\textsuperscript{th} century, mathematical skills were valued and were a significant part of the Quattrocento people’s learned skill set, and their familiarity with these practices lent sensitivity to paintings that employed similar processes.\textsuperscript{40}

In the final pages of \textit{Painting and Experience in Fifteenth-Century Italy}, Baxandall states:

A society develops its distinctive skills and habits, which have a visual aspect, since the visual sense is the main organ of experience, and these visual skills and habits become part of the medium of the painter: correspondingly, a pictorial style gives access to the visual skills and habits and, through these, to the distinctive social experience.\textsuperscript{41}

In other words, the social practices and conventions of a certain time and place may refine the perception of the pictures that are produced in the same time and location. Baxandall also infers that a painting may suggest to its viewing audience, in any time or place, the visual skills and habits of the society in which it was produced. Baxandall recognizes the study of paintings as a helpful method of learning more about visuality in a certain place and time.\textsuperscript{42} While Baxandall recognizes that the brain plays a role in individual perception, the above passage indicates that he gives priority to visual knowledge, broadly speaking, and that this knowledge is cultivated through the eye specifically. For Baxandall, visual knowledge is the seat of cultural specificity.

\textsuperscript{39} Baxandall, \textit{Painting and Experience}, 99.
\textsuperscript{40} Baxandall, \textit{Painting and Experience}, 101.
\textsuperscript{41} Baxandall, \textit{Painting and Experience}, 152.
\textsuperscript{42} Baxandall, \textit{Painting and Experience}, 152.
However, more recent research in the cognitive sciences indicates a more complex function between the eye, vision, and art.

**Semir Zeki: Neurobiology and Art**

Semir Zeki is the first neurobiologist to apply recent neurological research to the study of art. Zeki posits that the lack of discussion about the links between art and the brain until the late 1990s is due to the long-standing assumption that seeing happens in the eye, rather than in the brain. For Baxandall, the eye primarily shapes vision, but for Zeki, the brain is the seeing organ in the human body. While the retina of the eye is able to obtain visual information from the world, seeing is a passive process, and the retina cannot understand what is seen, though the cerebral cortex can. Within the cerebral cortex lies the primary visual cortex (referred to as V1), where the retina connects to the brain and is the localization of vision in the brain. With this knowledge of vision, Zeki aims to lay the foundation for a biological approach to aesthetic experience, or what he calls “neuro-esthetics.” He believes that a neurobiological approach to art is the only one that is satisfactory because all human activity is a product of the brain and is therefore subject to its laws.

In his book *Inner Vision: An Exploration of Art and the Brain*, Zeki explains how neural functioning influences the perception and creation of art. He states that the function of the visual brain is to acquire knowledge about the world through the enduring and constant properties of

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43 Onians, *Neuroarthistory*, 189.
44 Semir Zeki, “Artistic Creativity and the Brain,” *Science* 293 (2001): 51; However, this is not to suggest that all artistic activity can be reduced to brain functions. As this thesis will show, artistic production and reception occurs in the interplay between neurological perception, environmental conditions, and the act of representation is all its specificity. Brain function is therefore only one facet of a broader circuit of human action, perception, and cultural interpretation.
objects and to disregard any information reaching the brain that is not stable, such as distance, viewing point, and illumination conditions. These stable properties can also be referred to as the environment’s invariant properties – a term used by James J. Gibson that will be discussed further in the following chapter. Similar to the function of the brain, Zeki notes that the function of art is to represent this invariant information about the world. According to Zeki, art obeys the same laws as the visual brain and is simply an extension of its regular functioning. Both art and the brain allow humans to acquire knowledge about the visual world. Zeki states, “In order to represent the real world, the brain (or the artist) must discount (‘sacrifice’) a great deal of the information reaching it (or him), information which is not essential to its (or his) aims of representing the true character of objects.”

Basically, Zeki argues that the function of the brain and the function of art are nearly identical, and he suggests that to an extent, artists are neurologists without knowing it, as they aim to exploit the function of the visual brain.

The Cubists, according to Zeki, are an example of a group of artists that experimented with the representation of constant properties of the world and failed. For the Cubists, one light source and one perspective in an image solidifies a particular moment and in order to represent things in the world as experienced, these features must be adapted in a work of art. The Cubists were interested in depicting the visual world on canvas from various angles at once, with changing lighting conditions, and differing perspectives - the way that it was experienced. Zeki suggests that a Cubist painting appears as though the artist walked around the subject and synthesized their various impressions onto one canvas, which creates a “simultaneous vision.”

However, while Zeki claims that Cubism was an interesting experimental period, in terms of

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neurology, Cubism’s search for constancies was a failure. This failure, which is a fundamental misunderstanding of the intention of art, is due to the fact that the synthesis of various views on a single plane became unrecognizable and could no longer communicate knowledge about the world the way the brain does, which for Zeki is the primary function of art.

It is only since the 1970s that there has been a significant amount of work done on understanding the functioning of the visual brain, and currently, only some of the most basic functions can be explained. However, Zeki uses this knowledge to explain how the visual brain is able to process modern art. Within the primary visual cortex, there are different visual areas that surround it and interpret specific types of information. These areas include the motion centre (V5), the colour centre (V4), and other areas that process such elements as form, faces, facial expressions, and body language. The cells in these areas are highly specialized and help to extract key information from the visual field. For example, some cells may require that its receptive field be stimulated with something as specific as a blue circle in order to respond, while others may only respond to lines of a certain orientation. These specialized areas in the visual brain are also the main attributes found in modern art, which emphasizes simplification.

Zeki notes that this strong relationship between modern art and the single cell physiology of the visual brain is exemplified by the work of artists such as Wassily Kandinsky, Barnett Newman, Robert Motherwell, and Ad Reinhardt, amongst others, who emphasized the line in order to reduce complex forms to their essential qualities, or in neurological terms, to determine the essence of form as represented in the brain. Zeki claims that the cells in the visual brain that respond to the work of the above-mentioned artists make aesthetic experience possible. If these cells did not respond to this kind of visual stimulus, then this type of art would not exist because

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art must obey the laws of the brain. For example, Zeki notes that art created with ultra-violet light does not exist because the cells in the brain do not respond to this type of light.

Another example of modern art that stimulates specific cells in the brain is kinetic art, which de-emphasizes form and colour in order to emphasize motion. The cells in area V5 in the brain are motion-selective and are indifferent to such characteristics as colour and form. According to Zeki, Alexander Calder is an important artist who isolated motion by de-emphasizing colour and form. Calder limited himself to the use of black and white in his famous mobiles because he thought that colour would “confuse” the mobiles. Neurologically, Zeki confirms that with the introduction of colour, Calder would have increased the activity in V4, while reducing the activity in V5. By focusing on these specific aspects of the visual field, Calder was able to stimulate very specific cells in the visual brain and artistically experiment with its physiological properties.

Zeki concludes that while the practice of looking at art as a product of the brain through an understanding of its basic functions can be discussed, there is not yet enough knowledge about the complex functions of the brain to understand aesthetic experience. He recognizes that neurobiology is constantly growing and that there is still only a partial understanding of the brain. However, he believes that only aesthetic theories that are based on a biological foundation could be complete or profound. This argument assumes that taste or preference is located in the process of perception and not in the objective qualities of the work much like Immanuel Kant’s theory of beauty originally suggested.

Although Zeki plays an important role in the development of a neurological approach to art as the first neuroscientist to consider the cultural consequences of neurological systems, he

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49 Zeki, “Artistic Creativity and the Brain,” 51.
reduces the “function” of art to the “function” of the brain. Otherwise put, it reduces art to a singular function in the first place. Additionally, Zeki favors modern art for its stimulation of single cells in different areas of the visual field and mimetic art, which constructs a representational space that imitates the way one naturally experiences the visual world. He leaves no room for interpreting works that suggest a fantastical world, such as Surrealism or experimental art that is concerned with exploring the variant properties of the world. He would likely deem these movements to be failures as he deems Cubism since they do not imitate the function of the visual brain. So, what do these artworks do? According to the analysis presented in the following chapter, these artworks identify visual patterns in the environment, but not necessarily all of the meaningful properties of objects. Zeki introduces the concept of the visual brain and relates this to the way specific shapes, colours, and textures operate within the visual brain, however he does not take into account the complex ways that art represents the world and how it impacts our perception. While Zeki struggles to explain aesthetic experience, John Onians tries to explain why some viewers prefer certain works of art over others or why some artists opt for a particular style using neuroscience.

**John Onians: World Art Studies and Neuroarthistory**

Onians, also a student of Gombrich, recognizes that most, if not all, theories of art history are unable to explain the visceral response to art and do not address why humans make art in different geographic areas around the globe. He believes art historians take for granted that art is something natural and he aims to understand why humans do it – a question that has never been posed in art history. In 1976, the first series of Reith Lectures were broadcast on BBC and featured neurobiologist Colin Blakemore, which motivated Onians to begin considering
neurobiology as a useful method of inquiry for art history. Onians began writing about some of the latest discoveries in neurobiology in his article “The Origins of Art History,” which appeared in the journal *Art History* in 1977. By the 1990s, Onians was becoming more literate in the field of neuroscience, and during this time, discoveries continued in the field, allowing Onians to say things he could not have said previously.

In 1992, at the University of East Anglia, where Onians worked, the School of Art History and Music was renamed the School of World Art Studies and Museology. This change redefined the department’s goals to lessen the focus on western art in order to foster a more complete understanding of art-making in all cultures. The disciplinary boundaries of the school expanded to include art history, anthropology, archaeology, cultural studies, and a number of other disciplines. The study of art now needed to take into account all the art ever made anywhere on the globe in the last 40,000 years. World Art Studies allowed scholars to re-evaluate their approaches to the study of art, and for Onians, this meant reviewing all cultural objects. In 2004, Onians completed a preliminary overview of human cultural production in his book *The Atlas of World Art*, which addressed art as a worldwide and trans-historical phenomenon. Onians believes that World Art Studies allows for a more scientifically oriented study of art and one that is comparatively less understood.

In his essay “A Natural Anthropology of Art,” Onians imagines himself as an outsider of planet Earth in order to attempt to objectively conceptualize the fundamental questions that need to be asked in order to explain human art production. He maintains that there are two key components to understanding the phenomenon of art: the objects produced and the objects’

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producers. To gain a better understanding of the producers of cultural objects, Onians suggests that one must investigate their makeup through an examination of their biology, evolution, genetics, and the links between the eye and the hand through the brain.\textsuperscript{51} Biology is the common link between different artists of different time periods and geographical locations.\textsuperscript{52} By approaching the study of art through neurobiology, he aims to understand what drives humans to make art.

The main contribution neuroscience makes to this perspective is the ability to help reveal the unconscious mental formation of the individual. Onians coined the term “neuroarthistory” to indicate an approach that aims to understand how individual experiences that shape the neural networks in the brain inform one’s visual preferences and can be used to explain the production and reception of art. Onians uses neuroscientific knowledge to address the fundamental questions regarding the human drive to create visual images and objects that uniquely reflect on the operations of perception. In his book, \textit{Neuroarthistory: from Aristotle and Pliny to Baxandall and Zeki}, Onians summarizes the existing framework of writing about art and science with a specific emphasis on neurology. Indeed, he could be considered one of the first scholars to consolidate the field of neuroarthistory and to define its genealogy. He identifies Gombrich, Baxandall, and Zeki as the three authors that have immediately come before him in a long line of scholars he refers to as “neuroarthistorians,” and in the 21\textsuperscript{st} century, neuroarthistory has emerged as a new approach to the study of art.


\textsuperscript{52} Although biology is a common link, human biology is continually evolving as it responds and adapts to the environment. Thus, making biological claims about art is not to suggest a reductive interpretation of world art, rather to chart historical changes in conjunction with biological ones.
Onians identifies two phenomena that have been uncovered through neuroscience, which have allowed him to develop the field of neuroarthistory: neural mirroring and neural plasticity. Neural mirroring is the ability to learn motor, social, and interpersonal skills strictly through observation. Onians explains that when one observes someone else making a movement, his or her neurons in the motor cortex are activated, even though he or she may not be making the same movement. This process is an important part of learning and understanding the intentions behind actions and behaviours, and in terms of art, it helps with understanding how the movements of an artist may be influenced by the movements of others he or she has observed. For example, Onians attributes the earliest representational paintings from the Chauvet cave in the Ardèche in southern France to neural plasticity and neural mirroring. Onians suggests that these cave paintings cave can be attributed to the activation of mirror neurons. He claims that humans looked to animals in envy of their tools (such as sharp teeth and claws), so when the cave dwellers observed bear claw marks and paw prints on the walls of the caves it may have activated their mirror neurons and provoked them to imitate what they saw. In this example, Onians suggests that mirroring may have been the initial trigger for human mark making.

Neural plasticity is the brain’s ability to restructure itself in response to experience. The brain is composed of 100 billion neurons that are constantly changing, and connections between neurons are continually being restructured in response to experience. These connections between neurons can be formed and fall away. Neural plasticity accounts for individual preferences and skills, and in terms of visual experience, each time someone looks at something, neural plasticity allows for new connections to be formed and improves one’s ability to see that

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54 Onians, Neuroarthistory, 3.
object. For Onians, the experiential knowledge that one obtains during their life through unique, individual experiences shapes visual preferences for certain objects and aesthetics. Onians suggests that if it is known what a certain person, either an artist or viewer of art, looked at repeatedly, then one can better infer how their aesthetic preferences were informed. Onians argues, as the first artists to represent natural life, the humans who created the representations in the Chauvet cave had superior experiential knowledge of natural forms because they observed the animals the depicted directly. Neighbouring the caves is a land passage over a river, which Onians postulates was a bridge for migrating animals that would have allowed those living in the caves to observe more animals, more often than any other human group in the history of the world. This frequent observation of animals primed their neural equipment for seeing such animals and when confronted with niches in the cave walls, memories of the migrating animals over the land bridge may have been triggered, which prompted the depictions of animals found in the caves. As humans began studying representations of natural forms, Onians suggests that degradation of the neural networks occurred, as there was no longer exclusive observation of the natural world since attention was paid to other visual phenomena. Thus, later representations, according to Onians, such as those found in the Lascaux caves, are less realistic than those in the Chauvet cave.

In his essay, “The Role of Experiential Knowledge in the Ultimate Design Studio: The Brain,” Onians applies his neuroarthistorical theories to a case study of Gerard Caris’ pentagon

57 John Onians, “Neuroarthistory” (graduate lecture presented at the University of Guelph, Guelph, ON, February 25, 2013).
artwork. Onians proposes that Caris’ experience as a project manager of the construction of horn antenna created a neural preference for particular geometric shapes. According to Onians, Caris’ neural preferences, which had been unconsciously formed, fuelled the production of his geometric art. Onians builds on this neuroarthistorical project in his next two books, which will complete his neuroarthistory trilogy. His second book of the series will use a neuroarthistorical approach in the study of European art, and the third book will provide a broader transhistorical examination of world art.

Onians concludes that one important advantage of a neurological approach to interpreting art is that it treats all humans as equals, regardless of class, age, and race, based on the fact that the principles organizing the formation of neural networks are the same within the same species. Additionally, neurology also takes into account more factors than were ever previously possible because the formation and decay of the neurons in the brain are influenced by every sensory experience, every emotion that someone has felt, every action they have performed, and every exposure and experience they have had, which goes well beyond the limits of previous approaches.

Onians concludes *Neuroarthistory* by suggesting, “It would be strange if this sudden burst of new knowledge about the relation between art and the brain did not allow for a myriad of new insights into why humans have, for thirty thousand years, made and responded to art, and why they have done so in so many different ways at different times and places.”

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60 Onians, “A Natural Anthropology of Art,” 263.
Barbara Maria Stafford: Echo-Objects

Barbara Maria Stafford, an art historian with a neuroscience background and a student of Gombrich, also believes that the relationship between art and science is an important area of inquiry that needs to be addressed. Following the historical changes that took place since the 1970s inside and outside research institutions, she observed that there were competing theories within the humanities that left art history unequipped to handle the interdisciplinary topic of consciousness. Since then, she has re-evaluated major threads of art history within her own work based on recent developments within the neurosciences that have allowed for new ways of thinking about consciousness and visual production. She suggests that there is a lack of a cross-disciplinary inquiry about the emergence of subjectivity, and she recognizes that this is likely due to the expansive divide that can be found between the humanities and sciences. For Stafford, the study of mental representation and the concept of the image-making self are important concepts for humanists to focus on in order to understand its implications for cultural production.

The sciences and the arts are heavily reliant on each other for understanding the world, and Stafford advocates for both disciplines to investigate each other’s work to inform their practices. On the interdependence of the humanities and the sciences, Stafford states, “I attempt to show that they are, in fact, mutually illuminating. Not only can cultural material provide scientists and philosophers with new and different ways of thinking about cognitive problems, but scientific evidence can invigorate historical studies.”

The fundamental question that Stafford believes both disciplines want to answer is: “how does the coordinated pattern of

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63 Stafford, “Towards a Cognitive Image History.”
neuronal activity serve various biological and cultural functions?" Currently, Stafford is working towards establishing a laboratory/studio-based PhD program at SUNY Buffalo that brings together neuroscientific, humanities, and social science based imaging. Though it is a monumental challenge to try to bridge the gap dividing these disciplines, Stafford sees this division as a complex, but necessary area of investigation.

In her book *Echo Objects: The Cognitive Work of Images*, Stafford draws on Zeki’s concept of neuroaesthetics, however, she goes beyond Zeki’s understanding of visual perception and deals with consciousness, incorporating a variety of approaches including philosophy, aesthetics, cognitive science, evolutionary biology, mathematics, and the natural sciences. While this book is a complex web of theories from various disciplines, its goal is a passionate plea for a mutually beneficial collaboration between the sciences and humanities.

*Echo Objects* is composed of six essays, the first of which examines the relationship between forms in the external world and our embodied experience of these forms - suggesting that they should be thought of as interconnected. Similar to Gombrich, Stafford argues that shapes and forms encountered in daily life are tied to internal biological mechanisms. She notes that object recognition is an important process in perception, memory, and consciousness, and that pre-linguistic symbols create a common ground between humans of different places and times. Through an analogy between the Romantics and modern neuroscientists, both of whom

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65 Stafford, “Towards a Cognitive Image History.”
have made attempts to understand how the brain generates reality, Stafford argues that the external world we encounter is always the inner world too.\textsuperscript{69}

In “Compressive Compositions,” the second chapter, Stafford discusses how the brain can make sense of contradictory pieces of information. For example, she indicates that complex emblems combine objects and meanings from different backgrounds, and that there is a struggle to try to comprehend such symbols. However, the brain has a capacity to compact information and an innate drive to make sense of this information, which aids in the interpretation of such complex images.\textsuperscript{70}

Leaving behind language, Stafford employs mimesis and neurology, specifically research on mirror neurons in visual contexts, to understand other minds in the third chapter. Mirror neurons and the role of empathy and simulated emotion permit insight into other people’s minds – a function that Stafford deems important in our self-regulating homeostatic system. The aim of this essay is to explain cognition by clarifying the relationship between others, the external world, and ourselves. Stafford uses specific examples, such as Joseph Wright’s painting \textit{A Philosopher Giving a Lecture on the Orrery}, to demonstrate that when attention is paid to this painting, the viewer’s mirror neurons are activated, permitting an understanding of the range of emotions depicted on the canvas as well as an understanding of the intentions behind the represented movements and actions.\textsuperscript{71} Here, Stafford argues that mimetic art is validated through the discovery of mirror neurons because of the important role they play in cognition and emotion. Additionally, mirror neurons, according to Stafford, can scientifically account for echo objects - the reflections of the mind in the world, the world in the mind, of science in art, and art

\textsuperscript{69} Stafford, \textit{Echo Objects}, 25.
\textsuperscript{70} Stafford, \textit{Echo Objects}, 72.
\textsuperscript{71} Stafford, \textit{Echo Objects}, 86.
in science. These “echo objects” are images in both the world and the mind, which continually reflect each other without a specific origin. She says, “There appears to be an echoic relationship between the carpentered outer world of edges and our staked-out mind-brain.”72 The connection between mirror neurons, embodied experience, and aesthetics is further addressed by David Freedberg and Vittorio Gallese and will be discussed in chapter three.

“Primal Visions,” the fourth chapter, deals with neurological research on altered mental states, including hallucination, meditation, and drug use. Stafford suggests that these altered mental states are connected to early cave art, which she claims are images of awakening human consciousness.73 Essentially, Stafford argues that the images found in the Paleolithic caves are echoic images of the “cave in mind” and reveal to us the depths of unconsciousness or what can be seen even when our eyes are closed.74 The fifth chapter explores mental representations of the external world, and the final chapter deals with automatic behavior.

Although this summary of Echo Objects is simplified and does not address the full complexity of Stafford arguments, her attempt to bring aesthetic notions into debates in the cognitive sciences is evident. Stafford’s claim that forms, or echo objects, reveal what is usually hidden in their continual reflection between the world and the mind is carried forwards along with her passion to unite the sciences and the humanities. Stafford’s concept of the “echo object” resonates with fractal theories of Jackson Pollock’s work, and this thesis will draw from both to show the interrelationship between his drip paintings and his studio environment in the second chapter.

72 Stafford, Echo Objects, 109.
73 Stafford, Echo Objects, 106.
74 Stafford, Echo Objects, 120.
Conclusion

Though this literature review is brief, it provides a general overview of the historiography of a neurological approach to art. From the perspective of three art historians, a neuroscientist with an interest in art, and a scholar with a strong understanding of the recent knowledge in both disciplines, each of these authors open up the field of visual culture and about cultural ways of seeing. Visual culture needs biology to explore this new direction of study. This review creates a context for the study that is to follow. The next chapter furthers this neurological approach to art by combining ecological perception and fractal theory to chart a brief neurobiography of Jackson Pollock as a way to account for his innovation of the drip technique.
Chapter 2: Pollock’s Artistic Practice

Neuroarthistory, Fractal Theory, and Ecological Perception

This chapter proposes an analysis of Jackson Pollock’s drip paintings, which have been championed for their major contributions to abstract expressionism - the movement that situated New York as the centre of the avant-garde in the postwar era. This analysis is based in neuroarthistory and provides a new perspective on American modernism and revisits biography and formalism as methods of art historical inquiry. More precisely, it considers the way biography imprints the brain and is transformed into a formal pattern in the work of art. To understand the impact of experience on neural and aesthetic preferences, the most important aspect of Pollock’s life to be addressed is his ecological environment. He moved between urban and rural environments, and this chapter focuses on the dramatic change that occurred in his painting technique as a result of his relocation. This chapter brings together neuroarthistory, ecological perception, and fractal theory to provide new insight into the nature of Pollock’s drip paintings. An assessment of the shift in Pollock’s technique through these theories will allow for a new reading of his drip paintings. This insight provides an alternative understanding of the development of modernism as it took root in the United States and as Clement Greenberg and others have theorized it. Additionally, this analysis reevaluates the location of vision and perception in the relationship between the viewer and the work of art.

Jackson Pollock punctuates the middle of the 20th century in nearly every comprehensive art history textbook. It is rare, if not impossible, to find a modern art history text in which Pollock does not appear. He is often regarded as one of the key artists in American art history, and in 1949, at the height of Pollock’s career, LIFE magazine speculated that Pollock might be
“the greatest living painter in the United States.”

Today, nearly 60 years after his death, he is still regarded as one of the most prominent figures in non-figurative American art as his revolutionary drip painting technique remains an inexplicable visual experience. Many art historians, critics, and theorists have written on Pollock, and this thesis provides a re-reading of his work based in a neuroarthistorical approach. This analysis intends to be additive: it expands on what has already been said, allowing history to be seen through the lens of biology. In order to provide this alternative reading of Pollock, this chapter will begin by reviewing his position in American art history.

**Pollock in American Art History: Rethinking the Methods of Social Context and Biography**

During his career, Pollock’s work was praised by American art critic Clement Greenberg who considered it to be the epitome of formalism because of Pollock’s ability to refer to the medium of painting and address pure form. Pollock’s art has been thoroughly analyzed through a formalist lens, and it has been discussed in numerous texts through various methodologies. However, a current art historical discussion of Pollock approaches his work through the lens of social art history, which establishes the social and political context of the postwar period to explain Pollock’s emergence as a key figure in the discussion of modernism. Pollock currently holds an important role in the development of American modernism and the relocation of the avant-garde to New York in the mid-20th century primarily because of his innovative technique of abandoning the easel and dripping paint with tools other than the paintbrush onto a canvas laid on the floor.

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Following the Second World War, there was an artistic shift as the trauma of war left artists struggling to comprehend the social relevance of art. Previously, the centre of Western art had been Paris, where abstraction had become the language of the avant-garde. However, the avant-garde was exiled during the Nazi occupation, which suspended the lively artistic world that had fed the modernist project in Europe. Landscape art suffered as the European terrain was overturned, and figurative art was disavowed because of its associations with propaganda and totalitarian regimes. Existentialism lingered and many artists left Europe for America, which was thriving economically as it recovered more quickly than Europe after the war. Among those seeking refuge in America were abstract artists and Surrealists. Social art historians tend to believe that American Abstract Expressionism builds upon and reacts to its predecessors and colleagues, specifically the European Surrealists.\footnote{David Hopkins, \textit{After Modern Art: 1945-2000} (New York: Oxford University Press, 2000), 8-10.}

Surrealism rejected logic and reason and aimed to harness the irrational unconscious using techniques such as free association, automatism, and dream analysis. Abstract Expressionists drew from the European Surrealists who had settled in New York, and they made attempts at “pure art” through experimentation with these Surrealist techniques. Pollock’s drip painting technique drew on Surrealist characteristics, and his canvases suggest an abandonment of reason and rationality, as they become arenas in which the consequences of an unplanned event are recorded.\footnote{Harold Rosenberg, “The American Action Painters,” \textit{Art News} 51.8 (1952): 22-23, 48-50.} However, Pollock took the idea of automatism further when he removed the canvas from its stretcher and laid the material flat on the floor, allowing him to move freely around all four sides of the canvas dripping paint from various tools. This drip technique challenged the conventions of painting and questioned traditional assumptions about painterly
tools. Within this context in the middle of the 20th century, Jackson Pollock emerged at the forefront of the American Abstract Expressionist movement.

Although the Abstract Expressionists were never a formal collective, only labeled as a group by critics, other artists in New York including Arshile Gorky, Willem de Kooning, Barnett Newman, Robert Motherwell, Ad Reinhardt, and Mark Rothko looked to European modernism as a source for inspiration on moving towards abstraction as a way of personal expression. For example, the work of European artists Pablo Picasso, Henri Matisse, and Wassily Kandinsky offered new ideas for representation to the so-called Abstract Expressionists, however American Abstraction was unique in its own rights and was doing something original.78 With no uniting manifesto, the style of the Abstract Expressionists was not necessarily consistent, however as a group, critics understood them to be making a statement about freedom from the object and emphasizing the act of painting.79

The common assumption that a genealogy of Pollock’s work can be traced to Surrealist interests suggests a coherent narrative of modernism, as it moved from Paris to New York, as well as a system of progression and stylistic evolution within art. By contrast, John Onians claims that style in art does not necessarily have a sequential nature. Rather, the development of formal styles is shaped by the links between visual experience and the conditions of making art at a certain time and in a certain place.80 That is to say, Onians proposes a different understanding of “context,” emphasizing those conditions which impact neurological development and the process of representation. This rethinking of the context of artistic practice parallels methodological developments in the study of visual culture. For example, Marita

78 Rosenberg, 22.
79 Rosenberg, 23.
Sturken and Lisa Cartwright’s chapter “Realism and Perspective: From Renaissance Painting to Digital Media” in *Practices of Looking: an introduction to visual culture* analyzes Pollock’s drip paintings from a socio-scientific approach, which attempts to theorize paradigms of looking and how we make meaning from all types of visual objects, whether art or non-art objects. This recasting of art into a broader visual culture both poses challenges and opportunities to understand art in general and Pollock’s work in particular. Although Pollock’s work has been discussed through many lenses, including socio-scientific approaches, it has never been discussed in terms of neurology. Using the model of neuroarthistory, which utilizes biography as a starting point for inquiry and introducing the ecological environment as a sensorial precondition and predilection for the patterns of drip painting, an account of Pollock’s contributions to modernism and to a broader notion of the perceptual experience and visual culture can be undertaken.

Biography and neurology are interwoven areas of study. An awareness of an individual’s neurology can only be comprehended with the details of the individual’s life experiences since neural connections are restructured in response to these experiences. Moreover, neuroarthistory seeks an explanation for the cognitive development of an artist’s individual preferences and skills, the key to which is available in biographical documents. A re-evaluation of an artist’s biography from a neurological perspective allows for connections to be made between patterns in an artist’s visual experiences and the formal qualities of his or her artwork.

First, the details of an artist’s biography must be examined in order to better reconstruct and theorize the visual experiences and influences he or she might have had. However, this is not simply a matter of recounting a personal history. To look at an artist’s biography through the lens

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81 Sturken and Cartwright, 141-182.
of neurology involves building a visual catalogue from which the artist was drawing upon and experimenting from; a set of visually charged sights and experiences that informed stylistic and iconographic development. In this way, a neurological approach seeks a formal connectivity between the visual catalogue and a body of artworks. It is important to address this methodological issue with Pollock in particular because his biography has become almost mythic through his infamous alcoholism, international art world fame, record-breaking art market sales, and Ed Harris’ recent Hollywood revival of Jackson Pollock. The use of biography to explain neurological inscription, which is constituted by the ecological environment and its formal patterns, is quite different than its previous function as a way to attempt to explain the evolution of style.

Often considered one of the first art history texts, Giorgio Vasari’s Lives of the Most Excellent Italian Painters, Sculptors, and Architects, from Cimabue to Our Times, originally published in 1550, initiated the biographical model as a method of historical investigation for outlining progress in art. The book detailed the biographies of Florentine artists and profiled the evolution of the artist through birth, growth, and decline in an attempt to explain through linear narrative the Florentine development of mimesis in art. George Bull, translator of a selection of writings from the second edition of Lives, introduces Vasari as a captivating storyteller who uses the work of art as a platform for a story. This story not only narrates the artist’s life, but it explains how the work of art came into being as a key moment in that story, which suggests that the artwork is an extension of the artist’s life. Art critic Harold Rosenberg maintained this method put forth by Vasari and in 1952, four hundred years later, he argued in his essay “The

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82 Pollock, DVD, directed by Ed Harris (Culver City, CA: Sony Pictures Classic, 2000).
83 Preziosi, 21-30.
American Action Painters” that painting and the artist’s biography are inseparable.\textsuperscript{85} Although biographical context remained a popular method of inquiry amongst art historians for centuries, the biographical model has become problematic as a tool for art historical critique.\textsuperscript{86}

Before proceeding further with this critique of biography, the usage of this term must first be clarified. Here, biography specifically refers to its use as an art historical methodology, rather than the life experiences of a person. Furthermore, biography still survives as a successful literary and film genre and accounts for the biographies and biopics that continue to appear on a range of artists (and other prominent figures) as well as in the format of catalogue raisonnés. Biography still proves fruitful to the study of art history, however, for this analysis, the areas of critical weakness must first be identified in order to proceed with a profitable use of the method.

While the study of an individual’s life can be a starting point for an art historical investigation, it privileges the individual and often disregards the broader context of a work. Biographical research methods can illuminate the historical and social contexts in which the individual negotiates their identities, and this method might explain how an artist discovered his or her passion for painting or rose to fame, but it does not focus on what is unique about the artist and why he or she can generate an original “vision” for art.

In 1967, Roland Barthes addressed the role of the author in relation to the work of art in his essay “The Death of the Author.” Although Barthes specifically addresses literature in this essay, his criticisms have been extended to other forms of art. Barthes attacked the biographical method of inquiry in which the explanation of a work is sought exclusively in the man or woman

\textsuperscript{85} Rosenberg, 23.
who produced it, which offers a very limited interpretation of the work. While it can be important to consider the author in the interpretation of a work, the author is not the most important element required. For Barthes, with the death of the author comes the birth of the reader, who becomes central to the critical interpretation and political production of the meaning of a work of art. He insists that the reader or viewer must interpret the work over and above the identity of the author because the author (artist) is formed out of the same society and is not necessarily conscious of the potential meanings of the work. Every work of art is the product of historical and social convention, which means that the content of a work is generated by a context that is always in flux. The art historian charts historical changes through works of art, and the work is therefore not simply an extension of the artist. Moreover, this thesis suggests that works of art are generated as a consequence of the ecological environment and the neurological particularity of the artist.

In the early 1970s, the first social art historians, such as T.J. Clark and Griselda Pollock, became interested in analyzing the relationship between art and socio-political life in modern society and leaving behind the outdated model of biography. Since the 1980s, biography has been discounted as a form of critical art historical inquiry. With the rise of neurology and ecology, however, biography can be revived as a means of investigating the broader significance of a particular work in relation to an artist’s visual environment. Biography can be probed for the neurological and ecological context in which the work of art was created.

The story of Pollock’s life and how the moment of the drip technique came into being are addressed in numerous biographical texts on Pollock. These texts shall be examined with an aim 

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88 Barthes, 145.
of excavating their relevance to reconstructing a visual catalogue. A unique biography on Pollock was captured in 1950 when photographer Hans Namuth visited Pollock in his studio and documented his painting process through photography and film. Namuth’s photographs are biographical illustrations of Pollock’s life and his film is a narration of the process of the drip technique. But how can this crucial moment be reconsidered from the perspective of neurology?

Building a Neurobiography: Between John Onians and James J. Gibson

Neuroarthistory proposes that the work of art stems from the specificity of the artist’s unique experiences, specifically their visual and non-verbal ones, which shape his or her neural preferences, and that emphases, patterns of focus and distortion, and types of formal attributes in the work originate from these neuronal patterns. Thus, the individual’s visual experiences are not immediately revealed in personal narratives. A neuroarthistorical approach investigates how an artist was trained to see through the conditions that shaped his or her perceptual experiences.

Onians proposes the usefulness of a “neurobiography,” which he consults as an initial resource to establish a set of visual conditions that inform an analysis of artworks.\(^{89}\) With the knowledge that the individual’s particular neural equipment informs artistic choices, Onians studies the visual and non-verbal experiences of an artist. This information is extracted from an artist’s biography, but it requires the retrieval of different kinds of information: the ecological environment, the kinds of visual patterns that surrounded the artist, and the synchrony between the environment and the formal attributes of the artwork.\(^{90}\) For his forthcoming book, *European...*

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\(^{89}\) Onians, “Neuroarthistory,” Guelph.

\(^{90}\) To clarify, the ecological environment refers to the specific relationship between the organism (artist) and his or her physical surroundings, which is distinguished from the environment as simply the setting or conditions in which behaviour can occur. Both “ecological environment” and “environment” are used in this paper, however they should not be thought of as synonymous.
Art: A Neuroarthistory, the second book in the Neuroarthistory trilogy, Onians is writing the biography of each selected artist or group of artists in neural terms, rather than autobiographies the artists would tell about themselves, which simply offer a linear narrative of an individual’s experiences.\(^9\) Through neurobiography, Onians looks for a pattern between an artist’s visual experiences and the formal characteristics of their artistic practice.

Onians posits that postwar art cannot be fully explained using existing theories of art history and that neuroarthistory may be able to provide an explanation for this movement that other approaches cannot. The most common characteristic in the work of American postwar abstract artists is an all-over composition that encompasses large canvases, which Onians calls “relatively monotonous surfaces” or “meaningless compositions.”\(^9\) As a group, Onians suggests, the abstract expressionists must have all been looking at something that allowed them to arrive at similar visual conclusions. Onians observes that during the depression, the dust bowl was a major concern in rural American life, and that postwar American artists all likely experienced, or learned about the severe dust storms.\(^3\) Additionally, Onians acknowledges that the wide circulation of photographs of the dust bowl in such publications as Time magazine, Life magazine, newspapers, and other print media would have created a repetitive visual experience for these artists that would have unconsciously formed visual preferences for this aesthetic (figure 1).\(^4\) Onians recognized a formal connection between the all-encompassing dustbowl that swept across America and the canvases covered in paint from edge to edge created by postwar artists in America. In addition, Onians claims it is possible that the tension of assessing

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92 John Onians, “Art and the Brain: How the Neuroscientist Can Help the Art Historian” (public talk at the University of Guelph, Guelph, ON, February 26, 2013).
93 Onians, “Art and the Brain.”
94 Onians, “Art and the Brain.”
expansive fields in terms of their potential for generating profitable crop harvests may have prompted a similar tension when the artist was confronted with a large, blank canvas and considering it for its fertility and potential to generate form, which may have inspired the all-over aesthetic.95


In an informal discussion with Jasper Johns, Onians proposed this idea of the dust bowl as a possible influence for postwar abstraction, and Johns speculatively agreed that this explanation was plausible, however there is no way of validating Onians’ claim.96 While the formal connections between the photographs of dust-covered prairies and Johns’ paintings, such as *White Flag* (figure 2), are vague and hypothetical, Onians recognizes an important area of

95 Onians, “Art and the Brain.”
96 Onians, “Art and the Brain.”
connectivity to be further investigated that was first identified by psychologist James J. Gibson: the relation between the ecological environment and a work of art.


Gibson addresses the importance of the environment, both natural and artificial, to visual perception, and in his book, *The Ecological Approach to Visual Perception*, he proposed a new theory for addressing the relationship between vision and cognition. Gibson’s unique approach to visual perception examines the relationship between the animal and its environment. Gibson challenges accepted theories in physics, optics, anatomy, and physiology that take for granted laboratory experiments on the eye, which do not replicate the way one naturally experiences the environment.\(^\text{97}\) In *The Ecological Approach to Visual Perception*, Gibson analyzes all aspects of the environment, which is the information that can be perceived in and through the context of that environment. He assesses ecological optics, the information in light that can activate the

visual system, and the process of perception, which involves the extraction of invariant information derived from that optic array.

Gibson rejects the generally accepted notion of the retina as a camera that captures snapshots of the environment, and he argues that the viewer is constantly moving about its environment, therefore the flow of information reaching the eye is always changing, never stagnant like a photograph.\textsuperscript{98} Gibson sees the animal and its environment as inseparable terms that cannot exist without each other as the animal perceives of and behaves in relationship to the environment.\textsuperscript{99} In contrast to contemporary theories, such as those described by Semir Zeki, that claim the brain is the seeing organ in the body, Gibson disregards this concept, and proposes that the brain is only a part of the visual system, which includes eyes in a head on a body within the environment with a brain as the central organ of this system.\textsuperscript{100}

Another important dichotomy that Gibson acknowledges is the relationship between permanence and change. Both the environment and the information reaching the eye about that environment are permanent in some regards and changing in others.\textsuperscript{101} In the same way that Zeki explains that the brain acquires knowledge about the world through the constancies in the environment, Gibson states that the sense of permanence that underlies the change, or the persisting features of the environment, are its “invariants.”\textsuperscript{102} However, in contrast to Zeki, Gibson rejects the idea that we perceive colour, form, location, space, time, and motion in isolation from each other, and Gibson asserts that places, attached objects, and substances are the

\textsuperscript{98} Gibson, 62.
\textsuperscript{99} Gibson, 8.
\textsuperscript{100} Gibson, 205.
\textsuperscript{101} Gibson, 13.
\textsuperscript{102} Gibson, 13.
main components of perception because they are able to offer affordances to the animal in its environment.\textsuperscript{103}

In the last section of his book, Gibson addresses the ecological approach to the perception of pictures. He identifies a picture as a record that stores information for future viewers.\textsuperscript{104} This information is something that the creator of the image has noticed in his or her environment and considers valuable for other viewers to notice. Even when a picture is an image of fantasy or fiction, the information conveyed in the picture is simply the invariants that have been noticed in the environment as a part of learning how to perceive visually.\textsuperscript{105} In other words, the artist marks the surface in a way to display invariants in the environment and record an awareness of something perceived.\textsuperscript{106}

Gibson’s theories ground the study of vision within the environment. Taking into consideration Gibson’s approach to ecological perception and depiction alongside Onians’ use of biography, it is worthwhile to examine an artist’s biography specifically in terms of the visual environment to better comprehend how their neural preferences were informed and how invariants in the environment can be unconsciously translated into their art.

The tortured genius and struggling artist is a stock character that tends to fascinate audiences, and the award-winning feature film \textit{Pollock} chronicles the life story of the Abstract Expressionist for the masses. While the eccentric stories about the events leading up to Jackson Pollock’s self-inflicted death are perhaps as famous as some of his work, these stories about the artist are not as important for explaining his work as the environments that shaped his neural

\textsuperscript{103} Gibson, 240.  
\textsuperscript{104} Gibson, 274.  
\textsuperscript{105} Gibson, 274.  
\textsuperscript{106} Gibson, 279.
system. With the availability of biographies and features on Pollock’s life and work, one can approach these documents from a neuroarthistorical perspective to learn what he looked at repeatedly and how his neural preferences, and therefore artistic choices, were informed. The focus of this neurobiography is to outline specific environments in which Pollock lived that informed his paintings.

**Fractal Theory and Pollock’s Studio**

The countryside is a recurring landscape in Pollock’s life, first surrounding him as a child and then again during the most productive period of his career when he developed his innovative drip technique. At the age of one, Pollock’s family moved from Cody, Wyoming to Arizona, then to Chico, California where Pollock’s father planned to cultivate an eighteen-acre orchard of fruit trees. From an early age, Pollock was exposed to natural landscapes and became accustomed to the idea of the land as an important resource. His father became a land surveyor when farming proved unsuccessful, and in the summer of 1927, he arranged for Pollock and his brother to live and work with a land surveying crew near the Grand Canyon (figure 3). This process of learning to look at the landscape and analyze its characteristics would have shaped Pollock’s neural preferences for the natural environment at a young age.

Pollock moved to New York City in 1930, where he lived for 15 years. During this time, both biomorphic forms and abstract geometric elements characterized Pollock’s output of

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107 The intense interest in the life of Jackson Pollock exemplifies the dominant sexist narrative in art history, which reserved attributing greatness and genius exclusively for the male artist, as originally argued by Linda Nochlin in her article “Why Have There Been No Great Women Artists?” *ARTnews* (January 1971): 22-39.


109 Karmel, “Pollock Chronology.”
paintings. The interplay between figuration and abstraction has a particular resonance with the urban environment, and New York City in particular, where large crowds and tall skyscrapers surrounded the artist. The tradition of figuration in art and explorations of geometric form infiltrated most artists’ work of the time and constitute a modernist “period eye” as the common visual experience of the urban environment influenced pictorial style and visual preference. However, in Rosalind Krauss’ chapter “Reading Jackson Pollock, Abstractly” in The Origin of the Avant-Garde and Other Modernist Myths, she challenges the assumption that the move to abstraction is a modernist progression. Krauss believes that the idea of a single causality in the explanation of a shift in style is a problematic area for art historians that must be addressed, and she argues specifically that Pollock’s style cannot be equated with a modernist progression.\textsuperscript{110}

Nevertheless, the deep connection between the environment of creation and the work of art may explain the figurative and geometric elements in Pollock’s early work.

For example, figurative and geometric features of the cityscape characterize Pollock’s *Naked Man with Knife* (1938-1940) (figure 4). The figures in this painting are so interwoven that it is difficult to distinguish where one figure ends and the next figure begins - a common optical illusion Pollock would have experienced on the streets of New York City, the world’s most populated city, as large crowds become masses of moving bodies and limbs. Other artists in New York City, such as Willem de Kooning, were also experimenting with biomorphic forms in their abstractions that played with distortion and perspective.

While living in New York City, Pollock witnessed first-hand the most significant architectural achievements of the time: the construction of the Chrysler Building in 1930 and the Empire State Building in 1931. These buildings were designed in the Art Deco style; a style influenced by the industrialization of modernism and the rise of technology, and they were characterized by streamlined design. The figures in Pollock’s paintings at the time are constructed from geometric shapes with hard edges and forms that echo the urban landscape. For example, *Male and Female* (1942) (figure 5) is a work characterized by contrasting forms of straight and curvy lines, geometric and organic shapes, which, based on the title, is interpreted to
represent masculine and feminine qualities. However, when *Male and Female* is compared to the Chrysler Building (figure 6), elements of modern architecture are evident. The curved and straight lines in the spire of the Chrysler Building are echoed throughout *Male and Female*. Moreover, the triangular shapes down the middle of the canvas and along the bottom edge resemble the ornamentation along the crown of the Chrysler Building.

Figure 7, a photograph of the Empire State Building under construction in 1931, reveals the underlying structure of the building. The frame is constructed with large beams, and in *Male and Female*, two solid black lines provide the structural support for the layered forms within the painting much like these metal beams that create the skeleton of skyscrapers. These distinctive
vertical elements are prominent in *Male and Female*, and are elements Pollock continued to include in his drip paintings by consistently painting an anchor layer of dark vertical lines as his first marks on the canvas.


The urban experience had always been an integral aspect of modernism. For example, the German Expressionists, like Ernst Ludwig Kirchner were preoccupied with this notion and explored images of corruption and alienation in Berlin in the early 20th century. However, New York City was even denser and was the epitome of American modernism at the time. New York also had a distinctive spatial dimension that many cities in Europe in the early 20th century did not have: the skyscraper. In 1925, Georgia O’Keeffe began exploring these sights in New York
City and painted skyscrapers that appeared to loom over the viewer and portray an ominous sense of industrialization. O’Keefe’s *City Night* (figure 8) has the distinctive vertical elements of skyscrapers, which are also prominent in Pollock’s work. Both *Naked Man with Knife* and *Male and Female* amongst other paintings Pollock produced while in New York City have a vertical orientation that mirrors the vertical nature of the skyscraper. In comparison, Pollock’s drip paintings created in the open countryside have a horizontal orientation that mimics the sense of ground and space in the natural landscape.

![Pollock-Krasner House](image)


Pollock’s painting style changed dramatically following his move with Lee Krasner to Long Island in 1945 where he returned to the countryside. The couple purchased a home on one and a quarter acres of land overlooking Accabonac Creek in The Springs, East Hampton, now
the Pollock-Krasner House and Study Centre.111 The lot in East Hampton has two main buildings, a farmhouse (figure 9) and a barn (figure 10), which Pollock used as his studio. However, before he began using the barn as his studio, Pollock moved it from its original location behind the house to an area where he could have a direct view of the creek, making nature more visible from both inside and outside the barn.112 Figure 11, a satellite image of the property, reveals a sense of the environment that surrounds these two buildings. Although the trees are much larger today than they would have been sixty years ago, this satellite image provides information about the invariants in the layout of the

environment that have persisted. In a New York Times article that appeared online in the Great Homes and Destinations section, Ellen Maguire describes some of these environmental features in detail:

Towering silver maples and a sprawling cherry tree shelter the two-story former farmhouse that Pollock and Krasner bought…Behind the house, the lawn slopes gently to dense, tawny salt marshes where blue herons wade and wheeling osprey hunt for fish. Cedar groves at the horizon soften a moody eastern sky, and the silence yields to birdsong and the rustling of red foxes in the heavy brush.\footnote{Ellen Maguire, “At Jackson Pollock’s Hamptons House, a Life in Spatters,” New York Times (July 14, 2006): http://www.nytimes.com/2006/07/14/realestate/greathomes/14trip.html?pagewanted=all&_r=2&."}
This description of the Pollock-Krasner property provides potential visitors with an idea of what they may experience during their visit and what Pollock might have observed on a daily basis.

Between 1947 and 1952, when Pollock was painting in his barn studio, he made his most well known works, the drip paintings. The time following the move to East Hampton and before Pollock returned to painting likely would have been important for the shaping of his neural networks. For survival reasons, the brain responds to new natural environments and attention is focused on learning the features of this new environment. Having moved in November of 1945 when the trees would be preparing for winter, the distinctive arboreal patterns of the surrounding forests may have had a particularly strong impact on Pollock in the first few months of living in his new home. These winter conditions may have been important for Pollock’s later artistic output as the stark contrast between the rigid shapes of the city and the organic shapes of the trees may have primed his neural networks for observing these natural shapes. The repetitive, unconscious activity of viewing the natural surroundings and the patterns within it on a daily basis ultimately informed Pollock’s neural preferences as the natural forms of the trees and landscape in East Hampton are evident in the forms found in the paintings he produced there. Pollock’s return to the countryside increased the amount of neural connections for the natural environment he had and would have primed his attentiveness and attention for particular natural forms. A photograph taken in the spring of 1949 captures the couple and their dog on the Long Island property with the skeleton of a tree before blossom (figure 12). The tree trunk forks out to the branches, which have offshoots of smaller twigs that all repeat the crooked organic shape of the trunk at finer magnifications. The tree stands as a vertical interest against the vast open horizon, and it faintly echoes the vertical elements found in Pollock’s paintings he produced in
the city. However, in contrast to the hard and direct verticals of his previous paintings, the vertical elements of Pollock’s drip paintings take on the look of a crooked, branching tree.

In comparison to *Blue Poles (Number 11)* (figure 13), the “blue poles” mimic the tree trunk and the layered patterns of coloured paint imitate the branches and twigs of the leafless tree. As Pollock continued to look at and interact with the natural environment during his time in the East Hamptons, it is possible that the abandonment of geometric shapes and figures in his work disappeared naturally with the falling away of neural connections for such objects.

In his book *Other Criteria*, renowned critic Leo Steinberg describes the Abstract Expressionists as “nature painters.”114 In saying this, Steinberg refers to the long-standing tradition of viewing the picture plane as an extension of human vision with a vertical orientation that corresponds to human posture. Steinberg points out that although Pollock created his paintings standing over his canvases placed on the studio floor, which Steinberg equates with the flatbed picture plane, Pollock’s canvases were made for upright display and are natural in this sense.115 Steinberg asserts that Pollock’s drip paintings suggest to the viewer a familiar optical experience of observing the environment and “cannot escape being read as thickets.”116 In other words, Steinberg confirms Pollock’s paintings imitate acts of vision in the orientation of his canvases as well as within the content that mimics nature. Although Pollock makes comments such as, “I want to express my feelings rather than illustrate them,”117 or he layers paint in order

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115 Steinberg, 84.
116 Steinberg, 84.
117 *Jackson Pollock* 51.
“to veil the imagery,” to remove himself from any association with his art having any narrative or literary function, Pollock seems to agree with Steinberg’s proposition that he is a nature painter. When Hans Hofmann accuses Pollock, “You do not work from nature. This is no good, you will repeat yourself. You work by heart, not from nature,” Pollock replies, “I am nature,” suggesting that he recognizes the formal connectivity between his canvases and nature. This formal connection between the natural environment and Pollock’s drip paintings has been thoroughly investigated in recent years and astounding conclusions have been drawn from Pollock’s accomplishments that further verify this connection.

In 1999, Richard P. Taylor, a physics professor and art theorist; Adam P. Micolich, a physicist; and David Jonas, a computer analyst, combined expertise to study the content of Pollock’s drip paintings. This mathematical study of Pollock’s paintings validates a link between his paintings and the visual experience of his natural environment. Interested in the unique qualities that distinguish a Jackson Pollock from other Abstract Expressionists, Taylor, Micolich, and Jonas employed the use of chaos theory and fractal geometry in their computer analysis to determine what patterns appear in Pollock’s drip paintings. This study examined paintings produced by Pollock in the late 1940s and demonstrated that the patterns in his work are fractal and that the fractal dimension in his paintings increased throughout his career. Taylor has since identified Pollock’s drip paintings as being uniquely different than other Abstract

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119 Hans Hofmann and Jackson Pollock qtd. in Engelmann, 66.
Expressionist works and computer-generated fractal art, and he has re-categorized them as “fractal expressionism.”

Chaos theory was developed in the 1960s and found natural systems, such as weather patterns, to be organized by an underlying subtle form of order. Taylor notes that two aspects of Pollock’s process could introduce chaos into his paintings: his motion around the canvas and his application of paint by way of dripping. Taylor notes that fractals can often be found in the recorded patterns created by chaotic systems. The term “fractal”, coined by Benoit Mandelbrot in 1975, comes from the Latin adjective meaning fractured or irregular. Fractals are patterns found in nature and are defined by repeating, though not identical, forms that can be observed at finer and finer magnifications, which Mandelbrot calls statistical self-similarity. These repeating forms create complex shapes, and common fractal patterns in nature are found in woody plants, clouds, waves, snowflakes, and retinal blood vessels. Taylor explains that the two visual cues of fractal content, fractal displacement and fractal scaling, have both been found in Pollock’s painted patterns. Since fractal patterns are statistically similar at different magnifications, it can be difficult to distinguish the magnification being viewed, which is referred to as fractal scaling. Fractal displacement is the repetition of the pattern’s property at

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125 Taylor, “Fractal Expressionism,” 129.
different locations, which gives the pattern an overall uniformity, a characteristic evident in Pollock’s canvases.131

To determine the statistical qualities of the fractal pattern in Pollock’s drip paintings, Taylor, Micolich, and Jonas used what is called the box-counting method, in which scanned images of Pollock’s paintings were overlaid with a grid and the proportion of squares in the grid occupied by the pattern was calculated and compared with the proportion of unoccupied squares.132 This calculation was repeated using grids with increasingly smaller squares, which allowed for a comparison of the painted pattern at different magnifications.133 Taylor calculated the statistical qualities of Pollock’s canvases using a computer, which allowed him to compare the statistical qualities of the pattern at different magnifications.134 The fractal dimension variable, indicated by $D$ (dimension), provides a value for the relationship between patterns at different magnifications that defines the overall fractal shape, and it allows for comparisons to be made between one fractal pattern and another – in this case, between Pollock’s paintings.135 The value of $D$ always lies somewhere between 1 and 2: 1 representing a smooth line and 2 indicating a filled area. Neither the value of 1 nor 2 indicate any fractal content, and the more complex a fractal pattern, the closer the $D$ value is to 2.136 Since there are two different chaotic processes identified in Pollock’s work, there are two different $D$ values: $D_L$ quantifies the pattern produced by Pollock’s movements across the canvas and $D_D$ indicates the drip pattern of the paint.137

132 Taylor et al., “Responses to Jackson Pollock’s fractals,” 2.
133 Taylor et al., “Responses to Jackson Pollock’s fractals,” 2.
137 Taylor, “Fractal Expressionism,” 133.
While living and working in the countryside, Taylor notes that Pollock spent many hours on the back porch of his house in The Springs looking out at the scenery, and he speculates that this activity helped Pollock absorb the patterns in his natural surroundings. Neuroscience can confirm this speculation and that Pollock was developing a visual preference for the environment as he studied his surroundings during those hours spent on the porch. Figure 14 shows the environment surrounding Pollock’s studio and an image of a tree found in that environment at

14. Pollock’s studio in East Hampton and magnified images of the fractal patterns of a tree.

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138 Taylor et al., “Responses to Jackson Pollock’s fractals,” 1.
various magnifications to demonstrate its fractal patterning. The $D$ value of woody plants and trees is between 1.28 and 1.90, and forests have a $D$ value of 1.9.\textsuperscript{139} The $D_L$ value of Pollock’s paintings is always greater than 1.9 and the $D_D$ values range from 1.12 to 1.72 with an average value of 1.7.\textsuperscript{140} *Autumn Rhythm (Number 30)* (figure 15) has a $D_L$ value higher than 1.9 and a $D_D$ value of 1.67.\textsuperscript{141} The statistical qualities of Pollock’s work correspond to the complex fractal patterns found in the wooded environment that surrounded the Pollock-Krasner property.


This link between woody plants and forests and Pollock’s paintings as identified by Taylor demonstrates that invariant qualities in Pollock’s environment are reflected in his art and his canvases are not only abstract representations of his ecological environment, but they are reflections on how we see and represent the world.

\textsuperscript{139} Taylor, “Fractal Expressionism,” 140.
\textsuperscript{140} Taylor et al., “Visual Complexity.”
\textsuperscript{141} Taylor et al., “Visual Complexity.”
After verifying the fractal content of Pollock’s work through the box-counting method, Taylor explored this area further, finding that the fractal dimensions in Pollock’s work increased over the years.\textsuperscript{142} This theory is consonant with a neurological perspective because it supports the view that as someone looks at something repeatedly he or she develops and restructures neural connections to help them see it better. In this case, Pollock strengthened neural connections for fractal patterns the longer he studied his environment and experimented with techniques of reproducing their visual effect in his paintings. With repeated exposure to nature’s fractals, Pollock developed an increasing affinity towards fractal geometry, which explains why over the course of his career, the fractal value of his drip paintings increased. Moreover, the fractal theory of Pollock’s work becomes complete when we understand this procedure neurologically, for it explains why Pollock had an affinity for fractal patterns, a design that previously had thought to be only created by nature or generated by computers and why he would be compelled to repeat those patterns.\textsuperscript{143}

Gombrich’s concept of the sense of order helps to clarify some of Taylor’s further speculations. Taylor performed a survey, which demonstrated that an audience had a general appreciation of fractal patterns over non-fractal patterns.\textsuperscript{144} One hundred and twenty people were surveyed, and over ninety percent found fractal patterns to be “more visually appealing” than non-fractal patterns.\textsuperscript{145} Taylor postulates, “The survey highlighted the possibility that the enduring popularity of Pollock’s Fractal Expressionism is based on an instinctive appreciation

\textsuperscript{142} Taylor, “Fractal Expressionism,” 137.
\textsuperscript{143} Taylor, “Fractal Expressionism,” 120.
\textsuperscript{145} Taylor et al., “Pollock’s Fractal Drip Paintings,” 206.
for Nature’s fractals shared by Pollock and his audience.”\textsuperscript{146} This instinct to look for subtly ordered patterns is, as Gombrich suggests, an innate drive to retrieve order from chaos, form from nature. In \textit{The Sense of Order}, Gombrich addresses why humans prefer forms with an interesting variety, such as fractals, to monotonous patterns. For example, Gombrich explains that paving a path with irregular slabs rather than standardized blocks is more pleasing to the viewer than the predictable nature of a patterned grid. The grid pattern is obvious and can be fully comprehended in a single glance, however the irregular slabs hold attention because delight, according to Gombrich, lies between boredom and confusion.\textsuperscript{147} In terms of fractal dimension, the predictable grid-like pattern of blocks would have a $D$ value close to 1, and a more complicated pattern constructed from irregular slabs would have a $D$ value between 1 and 2. Gombrich asserts that the grid pattern is difficult to attend to as the sensory information would bore the viewer, however a pattern too complex would overload the visual system and also pose attention difficulties.\textsuperscript{148} However, simple shapes organized in original patterns, such as a path paved with irregular slabs or Pollock’s use of line in complex fractal patterns, are what Gombrich claims make the most interesting configurations.\textsuperscript{149} A snowflake is another example that Gombrich identifies as having a unique blend of simple shapes with novel configuration, a natural form that has also been identified as being fractal and having a $D$ value of 1.7.\textsuperscript{150} Therefore, Gombrich, without identifying it as such, has identified fractal patterns as the most pleasing kinds of patterns, which allow for ease of perception. Gombrich’s theory explains how

\textsuperscript{146} Taylor, “Fractal Expressionism,” 139.
\textsuperscript{147} Ernst Gombrich, \textit{The Sense of Order}, 1979, 8.
\textsuperscript{148} Gombrich, \textit{The Sense of Order}, 1979, 9.
\textsuperscript{149} Gombrich, \textit{The Sense of Order}, 1979, 9.
\textsuperscript{150} Gombrich, \textit{The Sense of Order}, 1979, 9; Taylor et al., “Visual Complexity.”
and why Pollock was driven to create fractal patterns and why viewers find pleasure in these manifestations of this innate sense of order.

In a more recent study examining responses to Pollock’s fractals by Taylor, Spehar, Van Donkelaar, and Hagerhall, they found that when looking at fractal patterns, the human eye searched fractal patterns at a fractal dimension of 1.5. They indicate that animals use mid-value fractal motions when searching for food and humans use mid-value fractal eye motions when searching for information as these patterns cover terrain efficiently. The average $D_L$ value of Pollock’s paintings was greater than 1.9 and the average $D_D$ value was 1.7, which are both higher than the $D$ value of 1.5 that Taylor et al. indicate as being an inherent motion. However, Pollock’s extensive exposure to fractal patterns in and around his studio environment enhanced his neurological inclination to see fractals and explains why he preferred images with a higher fractal value of 1.7 and why, as Taylor et al. suggests, the average viewer prefers images of a slightly lower fractal dimension.

The echoic relationship Stafford establishes between the physical world and the brain is evident in Pollock’s canvases, which are “echo objects” that reflect information about the world and about the brain. Stafford claims, “certain…kinds of artwork…render visible neural cooperation and normally invisible operative forces of the central nervous system,” and Pollock’s canvases do just that. His paintings mirror the salient invariant patterns of his ecological environment, which echo the neural patterns within his inner biological system. Though there is no evidence to suggest that Pollock studied internal human anatomy, it is

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151 Taylor et al., “Responses to Jackson Pollock’s fractals,” 5.
152 Taylor et al., “Responses to Jackson Pollock’s fractals,” 5.
153 Taylor et al., “Responses to Jackson Pollock’s fractals,” 5.
154 Taylor et al., “Responses to Jackson Pollock’s fractals,” 7.
155 Stafford, Echo-Objects, 45.
interesting to note that the formal characteristics of his drip paintings also recall the formal qualities of a connective network, much like the neural networks that make up our own brains. \footnote{156} In fact, the structure of neurons and neural connections are fractal,\footnote{157} which means there is a direct formal link between Pollock’s drip paintings and neurology. Pollock’s drip paintings not only reflect the environment and what the brain does with that information, but they reflect the formal structure of internal biological mechanisms too. Zeki would argue that Pollock was a “neuroscientist” as he was not only able to portray fractal patterns within the brain, but also to exploit complex functions of the visual brain.

If one takes into consideration the theories of Onians, Gibson, Gombrich, Stafford, and the findings of Taylor and others, we can come to an understanding of Pollock’s work that aligns his social context, neurobiography, ecological environment, and stylistic aptitudes. The conventions of the discipline of art history explain many of the circumstances that led to the now mythic event in which Pollock spearheaded the drip painting. But, neuroarthistory pushes these conventions of analysis further, calling us to reflect on the recursive operation of seeing the environment and representing it. \footnote{158}

Conclusion

Within the context of American modernism, Pollock holds an important position as an artist who created an innovative painting technique and could produce complex and compelling abstract

form on canvas. Pollock’s achievements go well beyond the formal successes outlined by Greenberg, and even beyond the creation of fractal patterns identified by Taylor. In the context of neuroarthistory, Pollock stands as a strong example of how the ecological context informs and shapes individual visual and neural preferences, which in turn, influence patterns of representation and techniques of artistic practice. Neuroarthistory redirects biographical context toward a directed analysis of works of art in relation to new theories about the environment, neurology, and art. The following chapter provides a new understanding of the development of American modernism through an assessment of Greenberg and others and analyzes the location of vision and perception in the relationship between the viewer and the work of art.
Chapter 3: Vision, Visuality, and the Viewer

Formalism and Neurology

The analysis of Pollock’s drip paintings in the previous chapter serves as a springboard for understanding how the relationship between artistic practice, criticism, and neurological perception has unfolded since the mid-20th century. The focus of the previous chapter was on the site of artistic creation, specifically the relationship between neurological perception and artistic production. This chapter will reflect on the relationship between neurological perception and critical analysis, from Clement Greenberg to subsequent “post-formalist” generations.

Different art historical methodologies propose specific ways of looking at, thinking about, and reacting to art. These methods influence the way a viewer approaches, interacts with, and analyses a work of art. Equally, neuroscience presents a new set of methods that address the relationship between representation and perception. There are precedents to understanding this relationship such as formalism, a methodology that concerns itself with evaluating form and style over representational content and social context, and which privileges the eye in sensory experience. In this sense, formalism has many continuities with the neurological perspective. However, neuroarthistory and theories of ecological perception broaden and deepen this method by looking at the more complex workings of the visual system as a whole and not just simply the eye. Neurology and formalism can work together in addressing a new way of perceiving art and determining the location of vision.

Modern formalism developed in the late 19th century, when Austrian art historian Alois Riegl and Swiss art critic Heinrich Wölfflin reacted against Vasari’s dominant model of art history and pursued a systematic analysis of the history of art through style, rather than
This study of style proposed that the evolution of art could be charted through its formal progression and that changes in style reflected the essence of the culture that produced it. Wölfflin and Riegl were interested in the attributes of art that distinguished the work of one age from another and how style shifted between time periods. In the mid-20th century, at the height of Pollock’s career, formalism reached its peak when Clement Greenberg geared his writings on modernist art toward an all-encompassing model of criticism that blended formal analysis with aesthetic judgment. However, Greenberg’s modernist formalism as an art historical method fell out of favor in the late 20th century with the rise of social art history, which maintained an emphasis on the content and socio-political context of works of art and broadened the scope of inquiry, which was becoming myopic through formalism. Given the recent scholarship on neurology and its genealogical connection to formalism, it is worthwhile to reassess Greenberg’s theories and his critics, for neurology can add a new dimension to understanding perception and the relationship between the viewer and the work of art.

Clement Greenberg: the American Avant-Garde and a Modernist Formalism

Greenberg, formalism’s strongest advocate, followed Wölfflin and Riegl’s tradition of a critique focused on form. However, rather than attempting to explain the history of art through the evolution of style, Greenberg’s writing focused on legitimizing abstraction by making it more accessible to the general public. For Greenberg, abstraction was the main feature of the avant-garde, and it could be achieved in art through the abandoning of subject matter in favor of a

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focus on the artistic medium. His most well known essays “Avant-Garde and Kitsch” and “Towards a Newer Laocoon” outlined the main ideas that underpinned his formalist critique.

In “Avant-Garde and Kitsch,” Greenberg argued that the avant-garde was the only true form of culture and that kitsch, or mass culture, was simply an artificial form of culture that provided instant pleasure for the masses. Kitsch, the German word for poorly designed consumer products, manifested itself in North America through “popular, commercial art and literature with their chromeotypes, magazine covers, illustrations, ads, slick and pulp fiction, comics, Tin Pan Alley music, tap dancing, Hollywood movies, etc., etc.” According to Greenberg, kitsch blurred the lines between art and life, and the masses need not understand the values of genuine culture in order to derive delight from kitsch, which created a kind of universal literacy. In contrast to kitsch, genuine culture demanded that the specific individual, social, and historical contexts that inform aesthetic experience and condition the viewer of culture were required for a genuinely critical reflection on the work of art. Thus, Greenberg saw the avant-garde as challenging for the viewer to interpret because its value was not pre-fabricated, but formulated in a sustained and concentrated examination of the work of art.

“Towards a Newer Laocoon” works towards legitimating the avant-garde through an explanation of its context within the history of art, and Greenberg strives to inform and condition the viewer of culture to better comprehend the avant-garde. Art history demonstrates that for centuries, painting imitated the narrative function of literature, which had been the dominant art form in the Western world since the Enlightenment era. Painting lends itself to the portrayal of illusion and imitation with no consideration of the medium used. However, beginning with

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Courbet’s objective paintings in the mid-19th century, then with the Impressionists’ use of colour in the late-19th, artists began to escape from representational subject matter within their paintings and started to experiment with visual experience.\textsuperscript{162} According to Greenberg, the avant-garde sought to emphasize the sensorial effects of the artistic medium used, and music, the ideal of purely sensorial experience, challenged avant-garde painters to define their practice by the operations of vision itself. For Greenberg, the goal of abstraction was:

To render substance entirely optical and form as an integral part of ambient space – this brings anti-illusionism full circle. Instead of the illusion of things, we are now offered the illusion of modalities: namely, that matter is incorporeal, weightless and exists only optically like a mirage.\textsuperscript{163}

With this shift in emphasis from content to medium, vision became the primary sense required for interpreting painting, and the sensations produced in the eye became the most important for aesthetic experience. In order to create works that were purely visual, Greenberg insisted that painting should eliminate any reference to recognizable objects and three-dimensional space, which were qualities that belonged to the realm of sculpture.\textsuperscript{164} Avant-garde painting focused on primary colours, line, simplified geometric shapes, and, most importantly for Greenberg, emphasized the flatness of the picture plane. While the eye was drawn into the depth of the


avant-garde picture, it was then returned to the surface of the canvas where a tension lingered between depth and surface. The illusionary planes that were constructed in perspective painting were flattened because of this tension, and the planar surface of the canvas overcame depth and, according to Greenberg, was the only true plane in the work of art. Pollock was able to achieve strong abstract compositions by subverting three-dimensional space and emphasizing the surface of the canvas, which is why Greenberg, in response, appreciated his work.

Greenberg privileged vision and disregarded the other senses. In this way, Greenberg’s formalism and Baxandall’s period eye are similar in that they both emphasize the sensorial experiences of the eye in informing aesthetic experience. Greenberg developed what one might call a “modernist period eye,” which encouraged artists to achieve pure visual sensation as a depiction of high modernism in mid-20th century America. However, unlike Baxandall who, despite not having any formal understanding of the inner workings of the brain acknowledged the role of neurology in determining visual preference, Greenberg overlooked all other parts of the body and honoured eyesight alone.

Though Greenberg was not the first to identify Pollock’s work as important, he was one of Pollock’s most important advocates, and he greatly assisted in propelling Pollock’s career forward. Pollock and Greenberg met in 1942, and in a November 1943 review, Greenberg claimed Pollock’s canvases were the strongest abstract paintings accomplished by an American.165 Greenberg and Pollock became acquaintances, and the critic would often visit the artist’s studio. In Painting After Pollock: Structures of Influence, Jeanne Siegel addresses this relationship between artist and critic and speculates on the conversations that might have

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occurred behind closed barn doors. What interests her most is whether or not Pollock listened and responded to Greenberg’s aesthetic judgments. However, based on a comment by Roger Wilcox, one of Pollock’s close friends, Siegel suggests it was not likely that Pollock was Greenberg’s painting puppet.\footnote{Jeanne Siegel, \textit{Painting After Pollock: Structures of Influence} (Singapore: G+B Arts International, 1999), 27.} While it is difficult to determine the extent of Greenberg’s feedback on the direct result of Pollock’s paintings, Greenberg’s praises were nonetheless encouraging and important to the artist. A few years after his first review of Pollock, Greenberg stated that his second solo show at Art of This Century, “establishes him, in my opinion, as the strongest painter of his generation and perhaps the greatest one to appear since Miró.”\footnote{Clement Greenberg, “‘Art,’ \textit{The Nation}, April 1945,” in \textit{Jackson Pollock: Interviews, Articles, and Reviews}, ed. Kirk Varnedoe and Pepe Karmel (New York: The Museum of Modern Art, 1999), 52-53.} And in 1949, Greenberg stated with confidence that “Pollock is one of the major painters of our time,”\footnote{Clement Greenberg, “‘Art,’ \textit{The Nation}, February 1949,” in \textit{Jackson Pollock: Interviews, Articles, and Reviews}, ed. Kirk Varnedoe and Pepe Karmel (New York: The Museum of Modern Art, 1999), 62.} positioning Pollock as the epitome of formalism. This claim, while a broad one, was supported by the fact that Greenberg argued that painting should only refer to itself and the qualities that were particular to its medium, and Pollock did just that, creating flat, abstract compositions.

Greenberg identified line in Pollock’s compositions as an important element that worked to flatten the picture plane. Pollock’s line did not contour form or indicate illusionist space, which allowed for the focus of the canvas to be dispersed across its surface. In Greenberg’s review of Pollock’s fourth solo show at Art of This Century, he also notes the importance of
colour in Pollock’s work, which assisted in achieving flatness. These colours, “maintain the consistency and power of surface of his pictures,” and Greenberg asserts, “it is the tension inherent in the constructed, re-created flatness of the surface that produces the strength of his art.” While Greenberg’s model of American modernism was able to propel Pollock’s painting career forward and establish himself as an influential art critic, many found fault in Greenberg’s claims.

Rosalind Krauss: Antivision and the Body in Aesthetic Experience

In the 1960s, when Rosalind Krauss, a student of Greenberg, first began writing about art she adopted his formalist approach. She believes the method used by a critic to make his or her arguments tends to have more resonance than their specific judgments of good and bad art. She explains that Greenberg’s formalism as a conceptual framework has had more of a lasting effect on subsequent approaches to art history and criticism than his preference, for example, of a Jackson Pollock over a Frank Stella. The resonance of Greenberg’s critiques and his privileging of the eye in an encounter with a work of art are of concern to Krauss, and as she became more interested in the post-Abstract Expressionist era, she found that it needed its own theories and began diverging from Greenberg’s formalism. Structuralist and post-structuralist theories inform Krauss’ writing, which offers a post-modernist, or what she calls a postmedium, critique of aesthetic experience.

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170 Greenberg, “‘Art,’ 1947,” 56.

171 Krauss, The Originality of the Avant-Garde, 1.

172 Krauss, The Originality of the Avant-Garde, 2.
Krauss criticized Greenberg’s modernism for being far too limited in scope and failing to acknowledge the role of the body in the perception of a work of art. Influenced by phenomenology, Krauss argued that vision is interwoven with tactility, bodily position, and motility. In her article “Antivision,” Krauss states her frustrations surrounding the lasting effect of modernism’s preoccupation with vision in art criticism, which she calls the “modernist fetishization of sight.” She demands an alternative approach for understanding contemporary art forms, and she advocates for restoring the relationship of the body to the earth.

Krauss asserts that the meaning of a work of art is not inherent in the piece; rather it is situated in the relationship between the object and its viewer. This meaning emerges through the viewers’ bodily actions and behaviours involved in viewing the work, an interaction that becomes the mode of interpretation. For example, Richard Serra’s large-scale metal sculptures encourage the viewer to move through space in order to comprehend the work. Krauss argues that because Serra’s work exceeds the limits of the visual field, the viewer must navigate around it in order to solidify their perception of it. This movement changes the visual perception of the object in relation to the body as well as the viewer’s consciousness of the body in space. For example, Serra’s infamous Tilted Arc (figure 16) bisected the Foley Federal Plaza in New York City and interrupted conscious space and bodily navigation through the plaza. Tilted Arc created conditions for a phenomenological encounter and demanded awareness of the bodily relation to lived space and vision lines in the environment. This tension created between the body and the work of art was so intense that Tilted Arc was removed eight years after its installation. The phenomenological meaning of Tilted Arc went beyond representation and was situated between the work and the body.

The connections between Krauss’ phenomenological arguments and the model of perception outlined by Gibson and Stafford, prime Krauss’ critical oeuvre for an extension into theories of ecological perception and neurology. Her criticisms consider the broader scope of surrounding space as well as the internal and unconscious influences on the viewer when approaching a work of art. For Krauss, the eye is the vehicle for the transmission of information into a larger network between the motile body and the site in which it is immersed. Krauss’ reinstatement of the living body into aesthetic experience and Gibson’s ecological approach to perception both relate the study of vision to its relation to the body and its environment. As previously outlined in chapter one, Stafford also indentifies the link between embodied experience and formalism as an important relationship in perception. However, the precise nature of the relationship between the eye, the body, and space remains somewhat latent in Krauss’ work. It is only now that we might
begin to articulate this as a specifically neurological circuitry. First, however, it is important to understand how art historians have come to politicize vision itself, a move that has influenced the development of visual studies.

**Caroline Jones: Greenberg’s Modernist Visibility and Eyesight**

Using Krauss’ postmodern analysis of Greenberg as a critical context, modern and contemporary art historian Caroline Jones criticizes Greenberg for failing to recognize the importance of the social and political implications of modern aesthetics. Similar to Krauss, Jones believes Greenberg’s lasting critical influence should be disavowed, however, unlike Krauss, who opposes Greenberg’s claims, Jones constructs a “critical history” of Greenberg in *Eyesight Alone: Clement Greenberg’s Modernism and the Bureaucratization of the Senses* in an attempt to end his critical reign. Jones’ critical history is an in-depth study of Greenberg and his theories, which she notes as characterizing the majority of modern Western thought. Jones suggests that Greenberg’s modernism established a dominant way of seeing in the 20th century in which the visual experience of a work of art was privileged over every other sensory experience of it, and Jones believes this aesthetic approach has had social and political consequences.174

Through her critical history, Jones explores how Greenberg’s identity and subjectivity were shaped by the modern world. Although Jones approaches her analysis through biographical context, a similar vein that neuroarthistory considers, she does not address the role of neurology in informing his theories. Rather, Jones is interested in using other methodologies to understand Greenberg’s role in modernism. She takes account of a diverse range of views on the modern subject including the theories of Marx, Freud, Adorno, Benjamin, Lacan, Althusser, Foucault,

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and Gramsci. In considering these theories, Jones is able to better assess how Greenberg established himself as a key figure in culture within a larger body of critical theory. Jones aims to connect these systems that generate meaning in modernist visual culture to understand Greenberg as both a major contributor to and consequence of “modernist visibility,” which she defines as, “that system (always dynamic) as it operates in the historical period associated with rapid industrialization, beginning…during the nineteenth century and extending through the Second World War.” ¹⁷⁵ Jones’ “modernist visibility” can be equated with Greenberg’s “modernist period eye.”

Despite the fact that vision was not the dominant form of cultural production in the mid-20th century, Jones explains that Greenberg experienced modernism and learned to negotiate his modern identity primarily through vision. Furthermore, visual culture as a system had an effect on the production of Greenberg’s specific “seeing-subjectivity,” and he felt compelled to share through art-writing his organization of sensual subjectivity with his readers, who in turn, adopted his ocular approach to modernism and became modern visual subjects themselves. ¹⁷⁶

Jones viewed Greenberg’s celebration of the eye in the organization of the sensing self in the modern world as a manifestation of segregated and hierarchical bodily senses, and it led to what Jones calls the “bureaucratization of the senses.” She notes that larger systems in modern mid-century America established regimes of sensory isolation, and this bureaucratization of the senses prompted the apparent necessity of formalism and established the ground for general acceptance of Greenberg’s theories. ¹⁷⁷ Jones quotes Greenberg, “The human body is no longer

¹⁷⁵ Jones, xvii.
¹⁷⁶ Jones, xviii.
¹⁷⁷ Jones, xix.
postulated as the agent of space in either pictorial or sculptural art now it is eyesight alone."\textsuperscript{178}

Jones hopes that \textit{Eyesight Alone} will put an end to the Greenberg effect and promote a new one that encourages democratic sensory and embodied experiences.

**Post-Formalism: Vision, Neurology, and Visual Studies**

Outlined here is the rise and fall of formalism, the development of a phenomenological understanding of vision, and the politicization of vision, whereby Jones critiques the supremacy of eyesight. In the wake of Greenberg, art history is no longer dealing with modernist art, but rather a larger visual field composed of all visual and material culture and of visuality itself. This visuality is shaped through human interaction with cultural products and is defined by socially constructed ways of seeing. If the previous chapters suggest that neurology confirms that an artist’s neurological and aesthetic preferences are informed by all visual experiences, the same conclusions must be applied to the viewer since the biology of the artist and viewer are the same and the same individual can occupy both roles. Similar to Krauss’ phenomenological approach to the reception of artworks, the neurological model of vision is an embodied one that does not privilege eyesight. Neuroscience can now offer deeper insight into the phenomenological approach, informing the function of the eye and the brain and allowing for a more refined understanding of how things are experienced, specifically through the body. This neurological model positions vision as one sense that is more fully informed and elaborated by the entire neurological system. Furthermore, it is one that locates the body in a broader ecology that delivers and receives neurological information. Helen Anderson notes that with an understanding

\textsuperscript{178} Jones, xxvii.
of how experience and the environment shape our visual brains and how perception functions, the opportunity for a more analytical approach to art reception (and production) arises.\textsuperscript{179}

In the way that Krauss and Jones react against Greenberg’s modernist medium specificity, Whitney Davis similarly rejects Greenberg’s precedent, Heinrich Wölfflin. While Krauss identifies art criticism after Greenberg as the post-medium condition, Davis calls this condition post-formalism, and it is the avenue into a neurological understanding of vision. Whereby Wölfflin’s intentions were to establish a history of artworks, Davis advocates for a history of visual imaging and imagining.\textsuperscript{180} He explains that early formalists, including Wölfflin, made connections between formalism and psychophysiology, and he equates his own post-formalism with a post-neuroaesthetics. In terms of the object in art history, Davis indicates that this tradition is not important in post-formalism, and just as Kant argued, Davis reminds us that the power of visual art is in seeing it or imagining its visibility.\textsuperscript{181} Rather than focusing on the form itself, Davis emphasizes that it is the function or use of the visual object that is important here. For example, the aspects of the environment that are translated into representations and what features are not can reveal the visuality of a people in a particular time and place. Davis suggests that vision itself has an art history since art objects and the products of visual culture can tell us about the history of vision.

Davis’ concept of post-formalism draws on his earlier notion of “neurovisuality,” which is the method needed for a neurological understanding of vision that goes beyond existing modes


\textsuperscript{181} Davis, “Post-Formalism.”
of inquiry. Davis’ neurovisuality proposes a way of bringing together theories of visual culture and scientific theories of vision, and it addresses the neural identity of individuals that visually interact with the products of visual and material culture. Neurovisuality is the neural specificity of visuality, and offers a slightly different perspective on the relationship between the visual subject and visual culture that neuroarthistory and neuroaesthetics do not yet fully address. Art history and vision science have addressed vision and visuality in their own ways, but they have not allowed for an intersection of the two, which is needed for a neurological understanding of visuality. If pursued further, Davis believes that neurovisuality could make important contributions to both the science of vision and art history.

Zeki’s model of neuroaesthetics offers a study of the neural correlates to aesthetic experience for configuring a visual image either in the brain or on the canvas. However, similar to Greenberg’s formalism, Zeki’s theories do not encompass the larger social system in which aesthetic experience is situated. Although Baxandall’s period eye does address the social context of visual experience, he hasn’t fully considered the scientific and neurological aspects of vision. And, Onians’ neuroarthistory does not assume neurovisuality, though Davis’ work stems from Onians’ project to unite neuroscience and art history. For Davis, existing methods in art history and vision science have not been able to address neurovisuality, and he believes art history is far from seriously pursuing an avenue that integrates neurology due to the lasting effects of “visualist and formalist prejudices” initiated by Wölfflin and continued by his contemporaries. Despite the paths of investigation that focus on visuality and the codes of vision itself, rather than art objects, Davis notes that the discipline is still fixated on the objects of visual and


\[183\] Davis, “Neurovisuality.”
material culture. Perhaps once the focus on neurovisuality becomes more serious, the shift will be from visual culture to neurological culture since vision itself is being recast as a more embodied, systemic, and imaginative sense. When neurovisuality, or neurological culture, is pursued, it will signify the mutual illumination of both disciplines that neuroarthistorians have been hoping for.

In the way that the conditions of modernity became modern sensations in art, which have been treated as neurovisualities by some theorists, new ways of thinking about and experiencing time and space in the contemporary world transform the visual subject neurologically and consequently the way they approach the interpretation of an artwork. Davis aims to understand Baxandall’s concept of the period eye neurologically by determining its dependency on specific neural formations in the populations of viewers who interact with the products of visual culture of their time. In anticipation of this new avenue, Davis hopes that art historians in the near future might take up a “post-visualist and post-formalist phenomenology.” This method would employ neuroaesthetics in order to identify formal connectivity between everyday visuality and the products of visual culture.

**Mirror Neurons: Embodied Experience and Aesthetics**

So, what happens to the viewer of Pollock with this new critical perspective on vision and neurological perception? Pollock’s work need not be left behind in a historical moment that is confined to the modernist subject who privileges vision as his work could still be a worthwhile study through which to rethink a post-formalist criticism. Taylor and others conclude the article “Perceptual and physiological responses to Jackson Pollock’s fractals” with an interesting quote on perception by Pollock’s friend Ruebin Kadish: “I think that one of the most important things
about Pollock’s work is that it isn’t so much what you’re looking at but it’s what is happening to you as you’re looking at his particular work.” In making this comment, Kadish confirms Barthes’ and Krauss’ arguments that the viewer’s role in the relationship with the work of art is the most important aspect of interpretation.

A discussion of viewer response to Pollock’s art would not be complete without mentioning mirror neurons. The recent research of art historian David Freedberg in partnership with neuroscientist Vittorio Gallese furthers Stafford’s discussion of mirror neurons as the means by which we gain insight into others’ minds and the relationship between ourselves, the world and other people. In their 2007 article “Motion, emotion and empathy in esthetic experience,” Freedberg and Gallese address the role of mirror neurons in aesthetic experience. They recognize that Maurice Merleau-Ponty’s phenomenological theories address bodily reactions to works of art, however they note that these theories have not found root in art history. Freedberg and Gallese believe that basing embodied theories within neuroscience makes understanding aesthetic experience more precise and definable. They challenge the primacy of cognition in aesthetic response and assert that the universal biological mechanisms that simulate motion, emotion, and bodily sensation must be considered alongside other contextual factors. Mirror neurons, as described in the first chapter of this thesis, are the neurological mechanisms that allow for an empathetic response to the actions, emotions, and sensations we see through embodied simulation. Visual stimuli activates a similar, though weaker, response in our own bodies as though we are experiencing the same sensation we are observing without actually making the physical movement or experiencing the emotion or sensation.

Freedberg and Gallese focus exclusively on the embodied experience of the viewer when visual attention is paid to works of art. According to Freedberg, the “power of images” derives from the neural basis of empathy. In other words, embodied simulation and empathetic feelings can create a profound response in the viewer and explain why a work might “move” them. When confronted with a work of art depicting a particular posture, movement or action, the viewer’s muscles are activated in an empathetic response to the work, which can aid in understanding the movements of those depicted. Similarly, an illustration of bodily harm or endangerment simulates a physical response in the location where the body appears to be threatened as well as an emotional response to this proposed danger. Aside from figurative works, viewers also respond to architecture and abstract art, which create a simulation of the movements and actions involved in making the work, and the work functions as an indexical sign of the artists’ movements and process.

Freedberg and Gallese cite a study by Marieke Longchamp and others that used functional magnetic resonance imaging (fMRI) to indicate that neurons in the premotor cortex were activated when participants observed graphic letters as well as when they actually wrote these letters. The neural response in participants was stronger when they observed hand-written letters over typed letters, indicating that the gestural traces of the hand are more easily empathized. Based on this study, Freedberg and Gallese conclude that a similar somatic response occurs in viewers when observing a work of art in which the artists’ handling of the

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186 Freedberg and Gallese, 197.
187 Freedberg and Gallese, 197.
188 Freedberg and Gallese, 197.
190 Freedberg and Gallese, 202.
medium is evident from the marks left on the canvas. This response in viewers is a neural simulation of the specific movement indicated by the artistic mark. More specifically, Freedberg and Gallese infer that observation of the static graphic output of an artist’s goal-oriented hand movement can invoke a response in viewers through the simulation of the same action used to produce it.\textsuperscript{191} Freedberg and Gallese note the work of Lucio Fontana and Jackson Pollock as specific examples of art that prominently display artistic gestures that can be corporeally felt by viewers. In conclusion, through observation and the activation of mirror neurons, the viewer of Pollock may experience similar sensations he would have felt when creating his art. Additionally, the viewer may gain an empathetic understanding of the goal-directed gestures involved in the creation of his art through embodied simulation. This embodied simulation may also assist in better understanding how Pollock created fractal patterns within his work.

\textbf{Conclusion}

Today, after Pollock, after Abstract Expressionism, and after Greenberg, vision and visuality are understood differently than they were in the middle of the 20\textsuperscript{th} century. The paradigm of visual perception is influenced by neurology, and the embodied experience of the viewer has become the most important aspect of understanding perception. The viewer of art is conditioned through the perception of art in the precise moment and specific environment that the work and the viewer inhabit. Furthermore and most importantly, the artwork has the power to condition the viewer to the artist’s perspective and carry the viewer through a neurological perception of the world that is shaped by the artist’s visual preference and creative process.

\textsuperscript{191} Freedberg and Gallese, 202.
The entire body functions as a system that interacts with and behaves in our environment when we view an artwork, which informs aesthetic experience. For Gibson, perception happens with eyes in a head on a body on the ground with a brain, which provides a democratization of the bodily senses. Gombrich claims that perception requires innate abilities as well as acquired experience. When a viewer approaches a work of art, the viewer brings his or her learned visual experiences into the interpretation of a work. The viewer gleans information, or as Gibson suggests, invariants about the artist’s environment, which informs the viewer’s own understanding of his or her environment. The conclusions derived by Freedberg and Gallese indicate that through embodied simulation, the actions, intentions, objects, emotions, and sensations depicted in a work can all be felt by the viewer as well as the implied gestures of the artist. It is not just the eye, as Greenberg argued, where vision takes place, rather it is within a complex system that extends beyond the body. Vision is an informed practice that is situated within complex systems of visual experience that varies from individual to individual.
Conclusion: Where Are We Going Neurologically?

Most scholars in this emerging field, despite their specific areas of interest or preferred methods, uniformly agree in the conclusions of their respective papers, articles, and books that neuroscience can contribute to our knowledge and understanding of the making and viewing of art and visual culture. This conclusion is no different. While this conclusion will not tie up any loose ends previously unbounded in the preceding chapters, it, like others that stand with one foot in the pool of neuroscience and the other in art history, encourages further scholarship into larger areas of study that may over time narrow the distance between the study of art and the study of science. And this area of scholarship has recently been gaining momentum throughout the world.

In July 2013, approximately twenty scholars and artists from 8 different countries came together at the Sainsbury Centre for Visual Arts at the University of East Anglia. These participants held a wide variety of interests in art and each applied different aspects of neuroscience to their own work; however, everyone was interested in utilizing recent scholarship in neurology to better understand cultural production. The Neuroarthistory Summer School, as it was called, was led by a team of academics from the University of East Anglia: John Onians, two of his former students, Helen Anderson and Kasja Berg, and neuroscientist Adam Zeman. Structured over two days, the summer school provided the opportunity for all participants to engage in discussion and to identify problematic areas of the neurological approach and formulate more questions. In the wrap up of the weekend, Onians explained that the Neuroarthistory Summer School was not designed as a program to define or set boundaries for the discipline, rather it was developed as a meeting spot for participants and was intended to function as a forum to expand the field by making connections across disciplines and between
fields. Onians emphasized that the approach of neuroarthistory is additive to any existing model of art history as it can contribute a new dimension to established methods and that no one could lose anything by knowing about it. From the evident enthusiasm about the topic at the Summer School, it is likely that a longer gathering will take place the following year to further discussion, continue making connections, and fuel the field.

I agree that a neurological approach to art does not take away or reduce any existing knowledge about the subject, and in terms of this project in particular, I believe that it not only adds to previous scholarship about Pollock, but it also validates many claims and speculations previously made. The claims I am making are not entirely new as others have made similar claims; however, neurology provides an explanation for connections between Pollock’s drip and the environment that are grounded in biological theory. For this reason, I believe a neurological argument to be stronger than others that may propose the same conclusions. A neurological approach proves useful as an investigative tool for bringing together a variety of approaches (biography, fractal theory, ecological perception, art history, visual culture, formalism) and making connections between them. Through this synthesis of various disciplinary approaches, a neurological one is able to allow for a richer reading of Pollock’s work than has existed. While this study provides a new reading of Pollock’s drip paintings, it is still difficult at this stage to apply a detailed neuroscientific reading to Pollock’s work and its reception as such a study would involve other dimensions of human neurobiology that go well beyond the ocular, such as motor, sensory, emotional, and all other non-verbal experiences.

Although the findings of neuroscience are incomplete and provisional, they can provide an additional tool for art historians to use in their explorations. The 21st century shows no signs of slowing down in terms of pushing the boundaries of knowledge about our own species as
further advancements in our existing realm of knowledge and new technologies allow us to probe
deep into the inner workings of our biological mechanisms. It is exciting to think that we may
soon know of other properties of our neurons that can enhance our understanding of aesthetic
experience and of the production and reception of visual culture. These links across disciplines
demand to be made and should continue in order to illuminate both nature and culture.
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