Interdisciplinary Foundation Edition

Version 2

Consolidated Conceptual and Terminological Foundation for a Child-Centered Study of the Generative Role of Color

Based on the foundational theoretical study:
Color as a Generative Principle in the Work of Sonia Delaunay
A conceptual preamble on color theory in the context of algorithmic image production
(Version 9.1)

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Authorial Research Framework
NVO987

Affiliated scholarly communities
Visual Theory in the Age of Algorithms (Zenodo)
Sonia Delaunay and Modern Visual Systems (Knowledge Commons Works)
Visual Theory in the Age of Algorithms (Zotero)

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Abstract

The document addresses color not merely as a visual property or formal element, but as an autonomous, generative principle that plays a determining role in the organization of pictorial systems, the formation of spatial structures, and the temporal organization of perception. Its point of departure is the understanding that color is not static visual data, but an event that unfolds through the interaction of light, material, movement, and the perceiving body, thereby shaping visual experience and the processes of meaning formation.

The text establishes a conceptual and terminological framework grounded in the defining traditions of modern artistic color theory, with particular emphasis on approaches that interpret color as an independent organizing force rather than as a decorative or subordinate element. This framework serves as a historical and theoretical point of reference for understanding how color becomes a structuring factor in contemporary visual culture, especially within the context of algorithmic image production.

The document does not constitute empirical research and does not seek to formulate new theoretical theses. Its task is to articulate an interdisciplinary foundation that connects artistic interpretations of color with questions of bodily perception, spatial experience, and the temporal organization of perception. In this sense, the text fulfills an orientational and framing function that enables the subsequent examination of color within various scientific and theoretical contexts.

The conceptual framework developed within the Interdisciplinary Foundation Edition provides a direct foundation for research directions initiated subsequently, which examine the generative role of color not exclusively on a theoretical level, but within perceptual, developmental-psychological, and applied contexts. These investigations proceed from the foundational assumptions of the completed pre-research theoretical study titled “Color as a Generative Principle in the Work of Sonia Delaunay – A conceptual preamble on color theory in the context of algorithmic image production” (Version 9), as well as from the assertion established in the present document that color is not static visual data, but a temporally unfolding, bodily and spatial experiential event.

This theoretical foundation enables the examination of how the relationship between color, memory, and temporality develops in children’s perception, with particular attention to experiences formed under natural, variable lighting conditions as well as within algorithmically generated, optimized visual environments. From the same point of departure, the pedagogical problematics of children’s visual and color perception become interpretable

in environments in which sensory experience is increasingly mediated through screen-based, normative, and statistically regulated image systems.

The framework further grounds the examination of how color perception develops during critical phases of neural and perceptual development, and how the processing of natural, continuously changing color phenomena differs from that of algorithmically produced, repeatable, and optimized visual stimuli. These research directions are situated at the intersection of neuroaesthetics, developmental psychology, and visual culture, while remaining conceptually tied to the understanding of color as an autonomous, generative organizing principle.

The framework also enables the examination of color as a culturally emerging experience, in which perceptual processes are shaped not only by neural and environmental conditions, but also by social, media, and visual-cultural structures.

Research Framework - NVO987

The present document is situated within the research framework designated as NVO987, which was previously established by the author in order to provide a transparent conceptual and infrastructural system for a series of interrelated theoretical writings and visual analyses. NVO987 designates an authorial research structure that connects questions of generative color, the functioning of visual systems, and the historical and contemporary transformation of image production.

This framework does not operate as a closed theory, but as a traceable line of thought that allows different periods, media, and visual systems to be brought into relation with one another. Its aim is not to fix a unified model, but to make visible how questions concerning the generative role of color take shape and interconnect across differing contexts.

The theoretical grounding of the framework was established in a previously completed and published study that interpreted color as an autonomous generative principle within the context of modern artistic thought and algorithmic image production. The present Version 2 document does not redefine this point of departure, but carries it forward and extends it in an interdisciplinary direction, in which the role of color within developmental processes of perception – particularly in childhood – becomes a central field of investigation.

In this sense, NVO987 provides the conceptual and terminological continuity that allows studies separated in time and theme to be understood as part of a coherent research trajectory, while remaining open to the examination of new theoretical, perceptual, pedagogical, and visual-cultural relationships.

The Role of Scholarly Communities as Discursive and Infrastructural Context

The present document is situated within the discursive and infrastructural space of platform-organized scholarly communities that provide a structured environment for interpretation, access, and connection. These communities do not function merely as archival or dissemination surfaces, but as spaces that shape the context of the research and delineate its horizon of interpretation.

Within these communities, the document does not appear as an isolated unit, but becomes accessible together with related materials such as theoretical texts, research programs, conceptual datasets, and positioning documents. Together, these form a thematically coherent and structured research corpus in which individual writings can be interpreted in relation to one another.

In this sense, the scholarly communities fulfill an organizational and context-generating function: they create a research environment in which the present study can be understood as part of a broader, continuously expanding space of thought. Platform-based presence thus becomes not merely a matter of access, but a conscious form of discursive positioning that enables related works to be compared and interpreted together, while remaining open to the integration of later investigations that are thematically distinct yet theoretically connected.

Citation and Reference Framework

The present document is designated as Version 2 and appears as an interdisciplinary theoretical foundation text connected to the previously completed and published pre-study entitled Color as a Generative Principle in the Work of Sonia Delaunay.

Version 2 operates as an independent document that is not a continuation of the earlier version chain, but is to be understood as a separate and stable point of reference. Its function is to fix and consolidate the previously developed conceptual, structural, and terminological framework and to situate it within a new context.

The document takes the theoretical state concluded in Version 9.1 as an external foundation and renders it accessible in a form that enables the unfolding of interdisciplinary research directions. These directions give particular attention to the developmental processes of perception and to questions concerning visual experience in childhood.

The primary function of Version 2 is to ensure that the theoretical framework established in Version 9.1 remains clearly citable, interpretable, and consistently applicable for subsequent studies, documents, and research initiatives that will be developed later.

Note on previous versions

The theoretical pre-study titled Color as a Generative Principle in the Work of Sonia Delaunay was originally published on the Zenodo platform under the following
DOI: https://doi.org/10.5281/zenodo.18009245

The first version of the present document (Version 1) was published under the following
DOI: https://doi.org/10.5281/zenodo.18356657

The present Version 2 document is not part of the earlier 9.1 version chain, but refers to it as an external and stable theoretical foundation, making its conceptual outcomes accessible again within an interdisciplinary context.

Related Book Publication

Color as a Generative Principle in the Work of Sonia Delaunay (Version 9.1) will also be published in book form, independently of the preprint publications. The open-access monograph is based on the final manuscript of the separately developed preprint version chain and presents its edited and expanded form.

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Keywords

Color Theory; Sonia Delaunay; Robert Delaunay; Orphism; NV0987; Visual Culture; Modernism; Algorithmic Image Culture; Modern and Contemporary Art; Paris;Digital Images; Color Symbolism; Abstraction; Visual Perception; Sensory Perception; Visual Cognition; Neuroscience of Vision; Cognitive Neuroscience; Human Perception; Visual Processing;

Table of Contents

Introduction

Childhood color perception cannot be understood merely as visual stimulus processing, but rather as a complex experiential process in which color becomes an organizing principle of perception, memory, space, and temporality. In this sense, color is not static visual data, but a generative event that unfolds through the interaction of the body, environmental lighting conditions, cultural context, and technological environment. The four studies outlined in the present document examine different yet interconnected dimensions of this generative role from a child-centered perspective.

The first study analyzes the relationship between color, memory, and temporality, with particular attention to how color contributes to the structuring of temporal experience in children's perception. The second study investigates the question of the neural experience of color within the context of developing vision, reflecting on a theoretical level on how the processing of natural, continuously changing color phenomena differs from the experience of algorithmically generated visual systems. The third study examines the role of color in pedagogical and learning environments, with particular attention to how colors shape the perceptual structures of learning spaces and children's interactions. The fourth study explores color as a culturally emerging experience, analyzing how the meaning and perception of color are formed at the intersection of social, media, and visual-cultural environments.

The four directions of inquiry do not designate isolated problem areas, but rather articulate a child-centered unfolding of the generative principle of color, connecting questions of perceptual development with the transformation of natural and digital visual systems.

The Relationship of Color, Memory, and Temporality in the Development of Children's Perception

Abstract

This research examines the cognitive correlations between color perception, memory processes, and temporality within the context of childhood development, with particular attention to the visual environment shaped by contemporary algorithmic image culture. Its point of departure is the recognition that, for the child, color is not a static visual property, but a temporally unfolding, relational, and experiential event that participates in the formation of mental structures and mnemonic traces. In the course of perceptual development, color does not appear merely as information, but as a rhythmic and energetic dimension that organizes experience through its embeddedness in spatial and affective relations.

One of the central problems addressed by the study is the cultural and technological transformation that contrasts the "process-bound" experience of color with the instantaneous generatability offered by algorithmic systems. In traditional developmental environments, the experience of color requires time: it takes shape through repeated encounters, changing lighting conditions, movement, and embodied presence. By contrast, AI-based image-generating systems treat color as a numerical parameter and statistical distribution that can be rapidly modified and optimized. The research does not claim that algorithmic visuality necessarily harms childhood development; rather, it investigates how the relationship between color and memory may be altered when the duration of perception is significantly shortened.

The study hypothesizes that the stability of the relationship between color and memory depends on the temporal extension of perception. If visual experience increasingly shifts toward instantaneous, optimized image configurations, there is a possibility that color may lose its role as a "temporal anchor" and contribute less to the formation of enduring mental structures. In this sense, color is not merely visual data, but a decision-making and organizing operation that requires time in order to fulfill a mnemonic and cognitive function.

Background and Context

The theoretical foundation of the study rests on the recognition of a broader transformation in visual culture, in which the image has increasingly shifted from a material and sensory surface toward a data-based and computational structure. Within this transition, color has been redefined from a material and perceptual phenomenon into a set of numerical values, channels, and parameters subject to algorithmic control. This technological context establishes a tension between embodied perceptual development and computational image production.

Childhood represents a phase in which perception operates as an evolving, plastic, and temporally extended process. The differentiation and stabilization of color perception take shape gradually through interaction with the environment, movement, repetition, and affective engagement. Within such a developmental framework, color functions not merely as a property of objects, but as a relational and organizing dimension of experience.

The study is structured around three theoretical pillars. First, it analyzes perceptual temporality within a phenomenological framework, interpreting perception as a gradually unfolding, active process of form formation. Second, it contrasts color as an autonomous act of decision with algorithmic color production understood as probabilistic distribution. Third, it examines the cultural construction of the apparent “neutrality” of color, arguing that optimized visual systems transmit pre-structured data logics that may influence the development of children’s visual thinking.

The aim of the research is not empirical proof, but the elaboration of a theoretical framework that enables the reinterpretation of the temporality of color in the age of digital acceleration. It argues that preserving the experiential time of color in childhood is of fundamental importance for maintaining the capacity for independent visual thinking. In this context, defending the autonomy of color is not merely an aesthetic concern, but one of the conditions for the formation of mental structures.

The Generative Neural Experience of Color in Developing Vision and Childhood Perception

Abstract

This project applies the closed theoretical framework of Color as a Generative Principle in the Work of Sonia Delaunay (Version 9. 1) to the context of neural development in childhood vision and perception. Its point of departure is the understanding that color is not an isolated visual stimulus or technical parameter, but a temporal, relational, and embodied experiential event that participates in the organization of the visual system. During childhood, neural processing does not yet operate according to stabilized perceptual codes, but exhibits a high degree of plasticity, within which color experience is connected to affective, spatial, and temporal patterns.

The project examines the theoretical implications of the fact that natural, continuously changing light and color phenomena and algorithmically generated, optimized visual environments give rise to different experiential structures. The study does not constitute an empirical or clinical investigation, but offers a theoretical interpretive framework for understanding the generative role of color in the context of neural development in childhood.

Background and Context

The contemporary environment of visual experience has been fundamentally transformed by the spread of digital and algorithmic image production. Images increasingly appear less as material or sensory phenomena and more as data structures and computational processes, within which color is handled in the form of numerical values, channels, and adjustable parameters. In this technological context, the production of visual configurations is tied to rapid, automated, and instantaneous operations, where images emerge without an experiential or temporal prehistory.

In parallel, the development of childhood perception unfolds within a different temporality. During this stage of life, vision is not yet organized according to stabilized perceptual categories, but operates as an evolving, open, and plastic process. The perception and differentiation of colors gradually take shape through continuous interaction with

the environment, movement, play, and repeated experiences. Color thus appears not merely as a visual quality, but as part of spatial, affective, and temporal relations.

The theoretical framework of the study is also informed by Sonia Delaunay's understanding of color, which interprets color as a generative and relational organizing principle. Within this perspective, color is not an isolated attribute but a dynamic relation that actively participates in the formation of visual structures. This approach makes it possible to conceive of color not as static data, but as an experiential and formative process.

These three domains—digital image culture, developing childhood perception, and generative color theory—together establish a shared field of inquiry. Within this context, the study situates the role of color and offers an interpretive framework through which changing conditions of visual experience can be described by placing developmental processes alongside algorithmic environments.

The Role of Color in Pedagogical and Learning Environments and Children's Perception

Abstract

This study examines the role of color in pedagogical and learning environments, with particular attention to how color functions as an organizing principle of children's perception. Its point of departure is the recognition that color is not merely a visual stimulus or decorative element within educational spaces, but a generative experiential dimension that influences the formation of attentional structures, emotional states, and cognitive orientation. The study distinguishes three interrelated thematic domains: the use of color in pedagogical practice, the decision-making and responsibility of the educator in shaping the visual environment, and the structural and cultural impact of institutional frameworks on the application of color.

The aim of the study is not empirical measurement, but the elaboration of a theoretical framework within which color can be understood as a formative factor of the perceptual structure of learning space. Particular attention is given to how the meaning of pedagogical color use changes with the expansion of digital and algorithmically regulated visual systems. In this context, color is not merely an aesthetic choice, but a decision-making and structuring

operation that influences the temporality, relationality, and emotional space of children's experience.

Background and Contex

The visual structure of the pedagogical environment plays a fundamental role in shaping the learning process. The presence of colors in educational spaces—on walls, teaching materials, and digital interfaces - is not a neutral background element, but a relational factor that directs attention, frames spatial experience, and influences emotional attunement. In this sense, color functions as a structuring element of the learning space, contributing to the orientation of children's perception.

The role of the educator in this process extends beyond the transmission of curriculum to the conscious shaping of the visual environment. The use of color is a pedagogical decision that affects group dynamics, the quality of interactions, and the atmosphere of learning situations. Within a generative color-theoretical framework, color is not an external decorative tool, but an organizing principle that actively participates in the formation of experience within the pedagogical space.

Institutional frameworks - school architecture, classroom standards, and the regulation of digital tools - determine the extent and manner in which color can be applied within learning environments. Contemporary digital infrastructure increasingly relies on algorithmically regulated visual systems that create new forms of dynamically changing color environments. This transformation is not merely technological, but also pedagogical and cultural, as it may alter the temporality of children's perception and the structure of learning experience.

The study examines the role of color within the interrelation of these three dimensions - pedagogical practice, educator decision-making, and institutional framework. Its aim is to demonstrate that preserving the autonomy of color within pedagogical space is not merely an aesthetic consideration, but one of the conditions for the development of children's visual thinking and perceptual growth.

Color as a Culturally Emerging Experience

Abstract

This study examines color as a culturally emerging experience, situating children's perception within the broader field of social, media, and visual-cultural structures. Its point of departure is the understanding that color is not only a perceptual or neural phenomenon, but also a culturally mediated and historically formed mode of experience. Within this framework, color appears as a generative principle that does not operate in isolation, but unfolds within symbolic systems, aesthetic conventions, technological infrastructures, and institutional environments.

The study explores how children's color perception develops not only through embodied interaction and neural plasticity, but also through exposure to culturally structured visual environments. Particular attention is given to the ways in which algorithmically produced image cultures influence the stabilization, repetition, and normalization of color patterns. In this context, color is understood as a relational and socially embedded experience that participates in the formation of cognitive, affective, and interpretive structures.

The aim of the study is not to offer empirical cultural analysis, but to elaborate a theoretical framework in which color can be understood as a process of cultural emergence. It argues that the generative autonomy of color must be reconsidered within the conditions of contemporary media environments, where cultural repetition and algorithmic optimization increasingly shape perceptual expectations.

Background and Context

The cultural status of color has undergone significant transformation in modern visual history. While earlier perceptual frameworks were closely tied to material surfaces, natural light conditions, and embodied encounters, contemporary visual culture increasingly operates through screens, databases, and algorithmic systems. Within this shift, color becomes part of programmable and reproducible visual grammars that circulate across media platforms.

Children's perceptual development unfolds within this cultural environment. Color perception is not formed in a neutral sensory space, but within a field structured by shared symbols,

aesthetic norms, design standards, and digital interfaces. Cultural codes influence which colors are associated with emotions, gender, authority, play, or learning. These associations are not biologically determined, but socially constructed and historically variable.

The study therefore situates children's perception at the intersection of three interacting domains: embodied perceptual development, pedagogically structured environments, and culturally mediated image systems. Within this intersection, color functions as both a sensory event and a cultural sign. Algorithmic image production further intensifies this process by stabilizing and amplifying certain chromatic patterns through statistical optimization and repetition.

By examining color as a culturally emerging experience, the study completes the broader research trajectory in which color has been analyzed as a temporal, neural, and pedagogical organizing principle. It proposes that cultural emergence does not negate the generative autonomy of color, but reframes it within a relational network of social, technological, and symbolic structures.

Conclusion

In the context of the four studies, color appears not merely as a visual phenomenon, but as the organizing, generative principle of childhood experience. Color perception unfolding in childhood cannot be separated from temporality, embodied experience, spatial perception, cultural milieu, and institutional environments. In this sense, color is a formative force that simultaneously structures memory, perceptual patterns, and learning processes. The studies demonstrate that the generative role of color unfolds across different dimensions of development - neural plasticity, temporal experience, pedagogical space formation, and cultural meaning-making - yet can be arranged within a unified conceptual framework.

The emergence of digital and algorithmic image environments establishes new conditions for this generative process. Whereas natural phenomena of light and color shape children's perception as temporally unfolding and continuously changing experiences, algorithmically produced colors appear as instantaneous, optimized visual configurations. This transformation is not merely technological, but also perceptual-theoretical and pedagogical: the temporality, decisional character, and experiential embeddedness of color may be altered within environments where visual systems are increasingly data-driven.

The theoretical framework presented here therefore does not close the inquiry, but delineates the horizon within which the autonomous, generative role of color in childhood development can be examined at the intersection of natural and digital visual systems. Color as a formative principle is not merely an aesthetic category, but a structuring dimension of thought, memory, and learning, the understanding of which is of fundamental importance for contemporary visual culture and child-centered pedagogical practice.

Document Status

The present document can be interpreted as a child-centered, developmental extension of the theoretical framework elaborated in Version 9.1. It does not formulate new theoretical claims and does not present empirical research findings, but rather organizes, refines, and places the already established generative color theory within an interdisciplinary context. Its aim is to fix how color, as an autonomous generative organizing principle, becomes interpretable in relation to children's perception, memory, temporality, as well as pedagogical and cultural environments. In this sense, the document provides a stable conceptual and terminological foundation for subsequent investigations that are thematically differentiated yet theoretically interconnected.

Declarations

Conflicts of Interest

The author declares that there are no financial or personal conflicts of interest related to the preparation of this study that could have influenced its content or conclusions.

Data Availability Statement

The present study is theoretical and conceptual in nature. No new empirical datasets were generated, and no existing data collections were analyzed during the course of the research.

Funding Statement

This research received no external funding.

Author Contributions

The author solely developed the concept, theoretical framework, and written content of the study.

Ethical Statement

This study did not involve research with human participants or animals; therefore, ethical approval was not required.

Intellectual Property Statement

All intellectual content of this document, including its conceptual framework, theoretical arguments, analytical interpretations, and structural organization, constitutes the original intellectual property of the author.

Preprint Status

This document has been published as a preprint. The text has not undergone formal peer review.

Research Ethos Statement

The present study was conducted as an independent theoretical and conceptual inquiry. The author understands research as a reflective and responsible practice grounded in conceptual clarity, the clear delineation of the scope of investigation, and intellectual honesty.

The text does not seek to assert empirical authority and does not aim to replace disciplinary expertise or formal peer review. Its purpose is to articulate a coherent theoretical position and to make explicit the conceptual assumptions and limitations within which the analysis is valid.

The author considers ethical research practice to involve the clear distinction between theoretical speculation and empirical evidence, the appropriate acknowledgment of intellectual influences, and the avoidance of claims that would exceed the scope of the presented analysis.

This document is intended as a contribution to ongoing theoretical discourse and remains open to critical reflection, reinterpretation, and future development within appropriate research contexts.

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