DayGloification: Frank Stella's Fluorescent Turn, an Art-Scientific Approach *

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DayGlo paints found their way into the art world around the early sixties.¹ By then, these bright hues had already conquered the commercial sector (Fig. 1) as well as the streets, drastically changing the look of society in process. Frank Stella (1936) was one of the pioneering artists who incorporated these synthetic self-luminous colors into his famous striped paintings. Stella's DayGloification² (transition to DayGlo colors) took place during the stage in his career where he was determined to refine the Greenbergian modernist theories and to show the art world the 'essence of painting'. One of the ways to obtain pure abstraction, he thought, was to use materials that refer only to themselves. His conceptual focus on the use of household paints, however, made him overlook their peculiar visual effects; DayGlo-illusionism had found its way into his Moroccan series. With this article, the author investigates the dialectic between Stella's conceptualization toward self-referentiality and the actual incorporation of effect-paints in his paintings, in this case DayGlo paints, which can be seen as direct indicators of his later "maximalisms".

The genesis of this study did not arise from traditional art historical practice alone, but grew from the authors' experiences as a painting conservator. Through working on some of Stella's artworks, she became aware of the unusual material characteristics which lead to certain visual complexities. DayGlo colors, as the name suggests, have the ability to glow by interacting with (day)light, which significantly increases the appearance of hues like yellow, orange, red, pink, green, and blue. The paints consist of encapsulated (organic dye in resin) pigments which have the property to both absorb and emit light from the visible and part of the ultraviolet region of the electromagnetic spectrum (Hinde et al., 2013). The emission causes the release of photons that appear as visible light, an effect that is not present when observing

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¹ The magazine American Artist was the first to mention the use of fluorescent colorants in artworks already around 1944 (Hinde et al. 2013). However, it was only in 1957 that DayGlo Corporation patented a new method to produce pigments which were bound in a polymer carrier. That way, the encapsulated colorants could be mixed with other media. This discovery significantly ameliorated the stability of their light response and improved their longevity: where initially fluorescent paints tarnished after short periods ranging from months to days, they could now be held several years without visible deterioration (American Chemical Society 2012). This development made it possible for artists to include these paints in their pallet.

 $^{^2}$ The term "DayGloification" was first used in the summer edition of Time Magazine in 1951 to capture the growing popularity of fluorescent colors in advertising and fashion. In this article, the term will be used as a synonym for Stella's fluorescent turn.

conventional pigments, which gives fluorescent paint its high luminescent intensity (DayGlo Corp., 1969). Their visual strength is three to four times higher. Whereas conventional colors tarnish and "grey out" when the spectator distances herself from them, fluorescent colors remain surprisingly unaffected (Tsang et al., 2007). When included in the artist's pallet, they inevitably change the common rules of color theory as thought by Goethe, Itten, and Albers: "Have you ever seen uncut, chemically pure Cadmium orange look like dirty ochre? Just place it into a field of fluorescent green" (Aach, 1970). Once placed on canvas they provide its beholder with an alienating experience: "the inner light" of fluorescent colors cause "spatial illusions regardless of perspective clues" (Aach, 1970, 136).



Figure 1: (left) DayGlo Color Chart, (right) Commercial Add DayGlo.

From the art-historical literature it became clear that the sensitivities of these type of paints were not taken into account when discussing Stella's art. This point remains particularly salient in art criticism: it has been rather exception than rule to consider the fluorescent aspect explicitly, and in the rare cases that this has been done, the intricacies of fluorescence have largely been overlooked. Two camps can be distinguished: on the one hand, those who hold on to Stella's modernism by ignoring the impact of his DayGloification. Or, if they mention the visible depth effects, they are immediately reduced as 'visuals that cancel them self out'. On the other, there are those who claim that Stella had found a new kind of 'abstract illusionism'.

Up to this day, it is still impossible to capture fluorescence with photography or by digitalization: only high key colors remain visible, without the specific fluorescent component. Moreover, when fluorescent artworks are shown in museums, they are now being illuminated by sophisticated, filtered lamps and covered with Plexi-glass boxes which prevent the harmful rays to cause degradation (Fig. 2). As a result, these works do not fully reveal their 'true' colors. If that is not enough, they will start to lose their intensity already after ten years and eventually turn into milky colored ruins (De Winter, 2010). In order to provide a correct assessment of these artworks, knowledge of vision science and analysis of materiality will both be incorporated in the discussion. This art-scientific approach will lead to a new awareness of the impact of the complexity of contemporary materials on art theory.

First, the road toward Stella's choice for bucket paints, with special focus on metallic and DayGlo paints, will be mapped. This will provide the necessary context for understanding Stella's DayGloification in the Moroccan series, which will be analyzed in light of the principles that Stella established in his previous series. After highlighting the overlooked effects, the related art criticism on medium specificity, flatness, and temporality, will be carefully reanalyzed, borrowing knowledge from perceptual psychology.

1. "Color Is Simply Color," So Why the Urgency for Ready-Made Bucket Paints?

In 1972 the Color and Appearance journal published a special edition on fluorescent materials which has been influential in the understanding of their chemical aspects and visual effects. Remarkably enough, an artist was given the opportunity to share his insights on the matter, in an edition that is otherwise dominated by chemists and color-scientists. Color researcher Ralph Evans addresses a need for cooperation between artists and scientist in the introduction of the journal. He deplores the lack of communication between two parties, which are both knowledgeable about the same subject, albeit in a complementary manner. If the question why they do not communicate would be asked, he says: "scientists are more interested in the cause

and the artists in the effect, however, both would feel that they are two aspects of the same thing" (Evans, 1972, 3). He continues his argumentation by saying that this problem lies much deeper. According to him "the fault lays by the scientist [...] whose viewpoint on the subject is so narrow compared to that of the artist that few artists can comprehend its narrowness and are 'turned off' if they do" (Evans, 1972, 3). Off course, the goal of science is to penetrate as deeply as possible into the essence of a matter. In an attempt to communicate, the artist probably lacks the vocabulary when he wants to ask clearance from the well-supplied scientist about certain visual effects. The scientist only sees the inadequacy of the description and does not understand the fact that the artist looks without limitations (Evans, 1972). However, this inadequacy is just as complicated the other way around. Just imagine that an empirical researcher can have a voice in an art-historical discussion. The art historian is unlikely to revise or retract his reading of a work of art, based on a set of findings from vision science. In an ideal situation, as Evans said, they both look for the same objectivity. Some art historians like Alois Riegl, Ernst Kris, and Ernst Gombrich, first attempted to include empirical studies in art history, which was developed at the Vienna School of Art History, in the twentieth century. They saw benefit in grounding the discipline in psychological principles and opened up the art theoretical spectrum by incorporating the beholder's share (Gombrich, 1980), which arose from studies in cognitive psychology, biology of visual perception, and psychoanalysis (Kandel, 2016).

The fascination for the unusual visual effects of DayGlo paints in Stella's artworks first derived from more material-technical considerations. Later, in consulting the art historical literature in order to understand their context and impact on Stella's discourse, the author noted a gap. Because their positioning required more knowledge about what was actually visible, she felt compelled to familiarize herself with the knowledge on color perception, when confronted with the evaluation of aspects like self-referential color, illusion(less) and instantaneity. These terms arose at a time when perceptual psychology developed itself as a scientific field, which had strong influence on artists, including Stella. Unfortunately, in their enthusiasm and freedom, the 'scientific depth' in how artists wanted to achieve or defined concepts like 'flatness' or 'illusion' is often missing, causing misconceptions, which, in turn, impacted the evaluation of those works of art.

Clement Greenberg redefined flatness, which got famous as a quality-measure according to which twentieth-century modernistic art, mostly painting, should be validated. The conception claimed that the more the depiction referred to the natural flatness of the carrier, the purer the painting became. Artists at that time were bound to the modernistic dogma and

wanted to guide the viewers' attention toward the natural flatness, in order to make them appreciate the unique act of painting itself (medium specificity). Later, however, Greenberg nuanced his own criteria by admitting that modernist flatness can never be an absolute flatness. In other words: "The first mark made on a canvas destroys its literal and utter flatness, and the result of the marks made on it by an artist like Mondrian is still a kind of illusion that suggests a kind of third dimension" (Greenberg, 1993, 90). He found a solution in distinguishing the illusion of space created by the old masters from the illusion created by a Modernist, that to him, "is one into which one can look, can travel through, only with the eye" (Greenberg, 1993, 90). In the development of his Black Paintings, Stella was constantly aware of the Greenbergian concept of flatness. However, in its implementation, he picked up where Greenberg seemed to have dropped the discourse about achieving abstract purity in painting. Stella went a step further (which to Greenberg was a step too far) in flattening the medium as such, by eliminating any trace of his signature, opting for self-referential paints, and striving to achieve paintings as 'visual unities' (Krauss, 1990). Stella wanted the spectator to have a visual imprint, when looking at his paintings, 'right into the eye' (Tillim, 1964), in which the pattern stamps itself, as a rubber stamp on the retina. In an interview with Donald Judd and Bruce Glaser, Stella communicated what he wanted to achieve in terms of flatness: "My paintings are based on the fact that only what can be seen there is there. It really is an object [...] all I want anyone to get out of my paintings, and all I ever get out of them, is the fact that you can see the whole idea without any confusion. What you see is what you see" (Lippard, 1966, 6).

From now on, the painting can only refer to itself and a significant part of the artists and critics of that time started to scrutinize the possibilities of the banishment of "any form of illusionism in painting." The need for "realness" was at stake because illusionistic effects were seen as "the handmaidens of appearance, and not of reality" (Colpitt, 1993, 107). Stella borrowed the term illusion—originally meaning³ an instance of a wrong or misinterpreted perception—as a more refined version of flatness. Evans redefined this term as a perception of external reality, "which is not in accord with the evidence derived from other senses and from our knowledge of physical probability" (Little, 1966, 8). Here the artist and the scientist agree on the fact that an illusion is not real, it is a construction that occurs from our perceptual apparatus. It is in the determination of the border of illusion-less that the wheel of art criticism gets stuck into loose sand and where empirical psychological knowledge is needed in order to continue the road. The definitive renunciation of illusionistic representation was the most

³ According to oxford dictionaries: https://en.oxforddictionaries.com/definition/illusion.

significant development from the 50s and 60s that reflected the growing desire to make the artwork more into an object (Nodelman, 1967). In retrospect, it could be said that the black paintings are the landmark of the closest painting could get to all-over-depthlessness. At that stage, Stella had almost eliminated space entirely from painting. He nevertheless found that there still was left a limited amount of space that resulted from chiaroscuro-effects between the black surface and the lighter open parts of canvas. Moreover, it bothered him that black is reminiscent of traditional, representational art. This made him opt for self-referential paints (Rubin, 1970). This transition in painting could be visualized as an hourglass, in which the evolution toward the black paintings marks the upper part. The black paintings are the narrow part, marking the transition toward the self-referential effect-paints, which made an important contribution to the change in conception toward a completely minimalistic approach, which falls in the deeper lower, opposite part of the modernistic course.

As mentioned before, Stella's motivation for using metallic and fluorescent effect-paints derives from his dissatisfaction with the black paintings' appearance, in which the black color, although in an alkyd synthetic skin, still has a traditional connotation. The idea of self-referential paintings, which should be made out of self-referential materials, imposed itself. This assumption forms the basis of the minimalistic principles, because the materials only refer to "the world of man-made objects, in particular industrial products and machinery" (Rubin, 1970, 60). At that time, German-born New York artist Herb Aach (1923–1985) had a similar mindset and saw these synthetic DayGlo colors as metaphors of the evolution of mankind. As indicated in the introduction, he experienced society as gradually alienating from nature. He claimed that men will eventually end up living in an "entirely artificial environment" and that "none of the fluorescent colors appear in nature, all [will in the end be] synthetically constituted" (Aach, 1972, 26–27). Given that art is a mirror of society, it is logical that such a synthetic environment is expressed and portrayed through synthetic colors (Aach, 1972).

Initially, Stella found the metallic paints to have a more abstract character than the black paints, despite the ambiguity of their mirroring-effect: "The shimmering surface has very much his own kind of surface illusionism, its own contained space. You can not quite go into it" (Rubin, 1970, 60). In the early sixties, when considering one of Stella's Aluminum paintings, art critic Michael Fried welcomed the new mirroring effect as the enhancer of modernistic flatness: "The gentle play of granulated reflected light off metallic stripes has the effect of dissolving one's awareness of the picture surface as a tactile entity in a more purely visual mode of apprehension" (Fried, 1965, 44–45). Donald Judd (1965, 3) describes the visual qualities of the aluminum artworks as "something of an object, it is a single thing, not a field

with something in it, and it has almost no space." It is true that a metallic paint does not have the capacity of a mirror to recognizably reflect its opposite surrounding. However, since the aluminum is ground in flakes of equal size, which are dispersed in the alkyd medium (Berns, 2016), this does mirror the surrounding color (and thus light) in a manner that is comparable to the effect of a broken mirror. Stella described the reflective property of the paint as "a quality of repelling the eye in the sense that you could not penetrate it very well. It was a kind of surface that would not give in, and would have less soft, landscape-like or naturalistic space in it" (Stemmrich 2012, 155–56). However, according to Judd, how the material (the paint) is conveyed in the aluminum works misses an important requirement for this so called 'specificity' (Judd, 1965)⁴.



Figure 2: An Impression of the "An Imagined Museum" Expo at Centre Pompidou Metz: Frank Stella, Rabat (1964) (Moroccan series), fluorescent (red and blue) alkyd housepaint on canvas $(2 \times 2m)$.

⁴ In his seminal 1964 essay "Specific Objects," Donald Judd develops his stance on objecthood through a theoretical inquiry which will eventually lead to minimalism. In it, he groups paintings by Stella and Kenneth Noland (1924–2010) together with sculptures by Claes Oldenburg (1929) and John Chamberlain (1927–2011), under the name "Specific Objects." For him, they are neither paintings nor sculptures, but should be considered as an autonomous, specific art form that accents the actual space instead of the illusionistic space. He commends the use of new materials which are selfstanding and do not refer to any external content.

After some series of metallic paintings, he ended up using Benjamin Moore paints, which, according to Rubin "represented a dead-end" (Rubin, 1970). This probably persuaded him to use DayGlo paints. In making the aluminum works, Stella marked a change by using synthetic self-referential materials and discovered the new possibilities (effects) of industrial paints. When focusing on the reception of the Moroccan series, it seems as if art theorists could not capture what was originally visible, although their extreme novel color pallet was striking. This made them generally overlooked in the art historical literature. To supplement the little that is known from the existing literature, the author conducted an interview with Mr. Stella in 2014, which has provided significant insight in his evolution towards Day-Glo paints. Despite his "color is simply color"-attitude (Appendix B), his DayGloification opened up a new dimension in the perception of painting.

2. The Dilemma of the Moroccan Series

Stella bought Day-Glo paints for the first time in 1963 from his local DIY store, where he found them in the discount section.⁵ Just as with the aluminum paints, he did not use them immediately, but conceptualizes his art toward their use. The Moroccan paintings form the landmark of his DayGloification consist of twelve large works, each named after a city in Morocco (six of the works also have a smaller analogue which Stella makes in 1965) (Rubin, 1986). Initially the paintings were grouped under the name Fluorescent Alkyd Paintings. The subsequent Moroccan-names were most likely given after a trip to North Africa.⁶ Maghreb culture is full of exotic, intense, contrasting colors, contained in Stella-like abstract motifs and patterns. When Stella started using them, fluorescent colors were still somewhat of a rarity in the art world, and can therefore be seen as an exotic factor, just like the harem women in the paintings of Delacroix. Rosenblum points out that this series should be placed in the canon of traditional painting, because of the specific title choices. According to him, Stella completes a line of painters which includes Delacroix, Kandinsky, Klee, and Matisse, who all integrated a certain exoticism in their work. Rosenblum therefore considers this series to mark the end of Stella's purely formalist period: "Stella's own capacity to make decorative striped patterns of exotic flavor lock into place with Western tautness and logic [...] the once air-tight armor of

⁵ Fluorescence is a form of luminescence in which an electron becomes excited by absorbing a high-energy photon and subsequently returns to its base sate by emitting a lower energy photon. It comes in several forms: ultraviolet, stokes, and daylight fluorescence, the latter being the one mostly used in painting, under the name *Day-Glo*.

⁶ Subsequently to visiting Europe in 1961, Stella makes a trip to Morocco, during which he becomes fascinated by North-African architecture, of mosques and gardens in particular (Keers 1970, 16).

Stella's work has been punctured" (Rubin, 1986, 18). Although Stella systematically opted for the use of shaped canvases from the metal paintings onwards, for this series he temporarily returned to the familiar rectangular plane. Rubin marks this return as a direct cause of his choice for DayGlo paints, in which he said, Stella achieved a new emphasis toward color that, in order to be fully expressed did not benefit from the shaped canvas (Rubin, 1970). Another important difference that was revealed from careful scrutiny and the interview with Stella, was the transparency of the fluorescent layers, which is clearly visible from up close. Stella finds this transparent quality of fluorescent paints fascinating, especially the fact that it leaves the cotton texture of the canvas visible through the paint (Appendix B). This point is relevant when considering Stella's use of specific materials—starting from the Aluminum Series—of which Judd declares that they should be used as purely as possible, without mediation of a carrier. In Stella's fluorescent work the carrier plays a much greater role in how the painting is perceived than in his previous series. The perception of the specific materiality thereby becomes obstructed. On the other hand, one could make the case that the specificity of the fluorescent layers is accentuated by the visibility of the carrier, creating a clear distinction between the paint layers and the canvas on which they have been applied. Stella is attracted to the transparency of the fluorescent layers, which is conducive to his idea of showing the work in its total form (the viewer can not only see the cotton of the canvas in the interstices, but also through the paint itself when he or she stands close enough) (Appendix B).

On a visual, theoretical, and emotional level, the new Day-Glo works appear to be the antipodes of the ivory tower formalism of the black paintings (Rubin, 1986). However, Stella's DayGloification in the Moroccan series can nevertheless be seen as a logical successor to the aluminum series, when his evolution is considered with the necessary scrutiny. First, there is the rather banal fact that Stella, after the aluminum paints, also 'finds' these synthetic colors. Secondly, they both refer to nothing else but their own artificial nature. Thirdly, they both fall under the category of 'effect-paints', implying that the paint causes an intrinsic visual effect. Bachelor sees these as paradoxical attractions of the commercial paints (and materials) that both resemble the dead and bland, as well as the dynamic and brilliant (Auping et al., 2015). According to him, a shiny surface causes a certain depth, while this nevertheless emphasizes flatness. "This kind of depth," he continuous, "is entirely the opposite of the atmospheric depth of traditional easel painting," in that it can be experienced as an "inexpressive, mechanical depth," rather than "a psychological or emotional" depth (Auping et al., 2015, 23–24). Before going deeper into the presence of illusionism, a distinction should be made regarding the self-referential nature of both effect-paints. The metallic colors create an effect of detachment and

are considered as "lifeless" (Moss, 2007), because of their capacity to passively mirror the surrounding light. Fluorescent pigments differ from metallic flakes in that they emit light from within. The glow transforms the paint layers into an alienating, glowing skin. In contrast to the passive character of the metallic paints, DayGlo can be conceived as active. Descriptions of this kind, about the surplus effect which fluorescent colors add to the whole painting, remain largely under the surface in the literature.



Figure 3: An impression of the Frank Stella opening show of the New Whitney museum of fine art in New York. Paintings from left to right: Marrakech (1964) fluorescent (red and yellow) alkyd housepaint on canvas ($2 \times 2m$); Palmito Ranch (1961) yellow alkyd housepaint on canvas ($2 \times 2m$), detail of Avicenna (1960), aluminum industrial alkyd paint on canvas ($1.9 \times 1.8m$), detail of Jasper's Dilemma (1962), multi colors alkyd housepaint on canvas ($2 \times 3.9m$)

In the interview the author conducted, Stella indicated that he had not been aware of other artists using fluorescent colors, simply because he was not conscious of their existence (Appendix B). Of those who precede him, one must note West Coast artist Richard Bowman (1918–2001), who was the first to use fluorescent paints in the early 50s (Bowman, 1970). Aach followed in the 60s and dedicated the rest of his life to perfect the use of these fierce hues (Aach, 1970). In fact, Aach was the artist who was included in the special edition of The Journal of Color and Appearance on fluorescent materials which was mentioned in the introduction. He was utterly committed to a better understanding of color perception and to incorporate his knowledge in his art. Aach supplemented the rather subjective theories on the interaction of colors by Albers, Itten, and Goethe, with material technical knowledge that he developed in his

job as a color engineer, and with his insights from his interest in perceptual color psychology. In his writings, he analyzed the appearance of daylight fluorescent colors. This is of tremendous value when addressing the question of illusionism in Stella's Moroccan and later DayGlo works, in an effort to position them. Aach noticed a unique quality of fluorescent colors: they caused the illusion of space all by themselves, without applying the laws of perspective. He describes this as "light-at-the-end-of-the-tunnel-effect" (Aach, 1966). The glowing capacity of the luminous paints, which makes the colors appear much brighter than their conventional variants, causes the 'flat' surface to dissolve, which causes the illusion of a transitive spatiality. This type of optical illusion is typical for this kind of material and could be described as an intrinsic illusion. This illusionism is material bound and therefore a self-referential quality.

Stella did not want to use them monochromatically, but combined two or more fluorescent colors in his Moroccan series. In this case, the common rules of simultaneous contrast are applied, although the effect is much stronger because of the additive (previously mentioned) intrinsic illusion. When observing, for example, *Marrakech* (1964) (Fig. 3), fluorescent yellow and red strips tightly alternate in a simple cross-pattern. The contrasting red and yellow hues enhance each other the same way as their conventional variants. However, the glow and intensity are making it more difficult to hold on to the pattern, resulting in the perception of a distorted image. Another illusion can be detected when observing Stella's fluorescent paintings, which falls under the term neon-imaging: "the bands do not actually touch each other, being separated by narrow runs of raw canvas, but nonetheless react to create a shimmering approximation of 'the heat, the dessert' of North Africa" (Auping et al., 2015, 23–24).

The strips of bare canvas cannot be perceived easily because of the high intensity of the fluorescent colors, which cause the crevasses to optically disappear under the colored glow. Longer observation gives rise to the illusion of visual vibration, creating an unintended dynamic that is reminiscent of op-art paintings. Robert Rosenblum notes that op-artists merely use a variety of tightly focused patterns within their works. Stella however, uses an "irreducible chunk of radiating energy" (Rosenblum, 1971, 33). Rubin and Stemmrich think that the optical vibration caused Stella, in the end, to abandon the striped patterns in favor of larger surfaces in the Irregular Polygon series (Rubin, 1970; Stemmrich, 2012). Rose resembles Bachelor idea of "flat and shiny" (Auping et al., 2015), in that she finds the combination of the shining, hard, and synthetic nature of the alkyd medium in combination with the intrinsic illusions cancel each other out. The explicit surface marks a shift from conventional illusionism toward a purely

abstract, conceptual, and anti-naturalistic variant (Rose, 1967). From what was found in the literature it seemed as if the Moroccan paintings had a rather difficult reception, in the sense that the intentions of Stella were overshadowed by the ambiguous visual effects of the DayGlo paints, which probably forced him to relax his strict rules with regard to illusion.

In his theory Greenberg made a distinction between sculptural illusion (or trompel'oeil), which, according to him, was not permitted and optical illusion (Krauss, 1990), which was allowed up to a certain point. Stella, who was initially determined to completely banish illusionism from painting, gradually became aware that by using paints like aluminum and DayGlo, he faced all kinds of uncontrollable visual effects. Hence, just like Greenberg, Stella later adjusted his original concept and permitted the new optical illusions in his works, which he later discussed in his lectures and book Working Space (1986). Around that time, Judd had fully transitioned to his definitive position that painting remains indissolubly connected with the wrong kind of illusions and focused on achieving the opposite with his Specific Objects (Judd, 1970). In terms of modernism, the experience of illusion was bound to a certain timespan, which was equated with the amount of flatness in a work of art. A flat picture plane would cause a timeless experience according to Greenberg, in which the essence of the work could be experienced in only a split second. Observing the work any longer would only cause the work to "gaze back at you" (Greenberg, 1988, 34-35). In his essay on Art & Objecthood Fried (1967) enhanced this claim by stating that reobserving and long observations would not add anything to the first glance experience. Time can also be seen as an aspect that enhances the probability to experience illusionism in a painting. The longer you look, the more chance you have of seeing things that are not actually there. Stella was strongly aware of the impact of time, as previously mentioned. He wanted his paintings to act as rubber stamps, which gave the eye an instantaneous visual imprint. Krauss places this type of speed art under the category "visual modernism": "the image performed the condition of an abstracted and heightened visuality, one in which the eye and its object made contact with such amazing rapidity that neither one seemed any longer to be attached to its merely carnal support [...]. Vision had, as it were, been pared away into a dazzle of pure instantaneity, into an abstract condition with no before and no after" (Krauss, 1990, 284).

3. Flash Lab Experience

Stella's awareness of fast perception of images goes back to the time of his education at Princeton, where he knew from art students that they had to participate in flash lab exercises (Clearwater, 2018). During such a session, students were seated in dark rooms with a large screen on which images were "flashed" with a tachistoscope (varying from a fraction of a second to longer timespans). After the short exposure, they immediately had to draw them from memory (in the dark). The level of difficulty increased, from simple abstract configurations which grew more complex over the course, until the point at which very detailed old-master drawings were shown (Gonzales, 2013).

In essence, the theory of anti-illusionism is entirely based on the encouragement of a certain experience of works of art. Stella applied this theory in such a clinical way that his artworks can be confused with stimuli for a flash lab experiment. Unfortunately, the claims about these particular works are nothing more than the summation of first-person phenomenologies by experts. To gain a fuller understanding, this should be supplemented by an approach in which the impact of the naïve spectator on the experience of illusion is included. The Gombrichian beholder's share is something that Stella dismissed as "after the fact": "[the] sensation is one that the artist experiences as the first and only necessary viewer" (Stella, 1986, 127). This was in contrast with Greenberg's ideas, who measured the quality of the modernistic work from its experience by the spectator. According to him, the spectator's experience of selflessness is the highest reachable level, in that it differs from any other experience in daily life (Greenberg, 1988). Lessing stressed the importance of the spectator's role of association and imagination in the perception of an artwork, which he found important in order to validate it (Lessing 1874). Van Gelder went a step further in saying that corroboration of a theory about how to perceive an artwork is not possible. Rather, someone's perception is a personal choice (Van Gelder, 2003). In Towards a Genealogy of Flatness, Joselit considers modernistic flatness to be something that is more than a mere optical event: "the emergence of the flat painting marks a transformation in spectatorship in which mimetic identification with the picture is displaced by the private kinesthetic experience of the viewer. The event, as it were, moves from conscious to unconscious. [...] abstraction functions as a machine for recording the psychological responses of the artist in order to produce psychological responses in the viewer" (Joselit, 2000, 20).

Artists such as Stella, who were inspired by vision science discoveries, wanted to incorporate some of its findings as algorithms in their (conceptual) work, where they had to function as guarantees for certain wanted visual effects: "one could imagine that one now possessed the algorithm of vision, and that this algorithm could serve as an abstract generator for another field—that of the canvas—underwriting and rationalizing the relations occurring on the surfaces, on the plane of the canvas" (Krauss, 1990, 291). One of the basic rules in

perceptual psychology, however, is that "what I see is not the same as what you see." In other words, it is impossible to imagine what others might see when you confront them with, for example, the painting Marrakech. At this point it is important to realize that induced perceptual biases, both in the case of Stella, as in the case of the art theorists, have had an important (unconscious) influence on the motivation of their own claims, in which they assumed that their perception applied to everyone. Through Stella's communication process, a change toward his audience can be noticed, which develops from an almost encouraging "you see what you know" (Garrard 2007) in the direction of a rather apathetic "what you see is what you see" (Lippart 1966). "You see what you know," allows the spectator's own aesthetic appreciation, which cannot be removed, as stated by Lessing and Van Gelder. While "What you see, is what you see" comes in as an order that must be followed. The command resembles the related work of art in that it penetrates the viewer's mind as a semantic stamp, which wants to discourage him from engaging in personal interpretation. The assumption underlying Greenbergian modernism is that the mind is subjected to complex cognitive processing when observing a figurative work of art, which becomes simpler as the artwork becomes more abstract, resulting in a purer perception. However, research on brain-activity reveals that, in terms of survival, our brain "constantly needs to acquire knowledge about the permanent, essential properties of objects and surfaces in the world that is constantly changing" (Meulders, 2012, 130-32). This means that "while abstract art is clearly reductionist in terms of figuration, it can encourage our imaginative capabilities to a far greater degree than many figurative counterparts would. [...] The abstract paintings [...] seem to rely on bottom-up processing, which primarily serves to resolve potential ambiguities; instead, they rely heavily on our imagination, our top-down associations from personal experiences and encounters with other works of art" (Kandel, 2016, 122, my italics). This raises the big question whether Stella succeeded in influencing the 'brain activity' of his audience in such a way that, more than in the previous abstract works, 'purer' connotations are experienced, namely those related to the self-referential nature of his works. This new awareness might be the key to undo the node of claims and, in the case of Stella's fluorescent turn, to "correctly" evaluate his Moroccan, Persian, and later Irregular Polygons and Protractor paintings. The art theoretic claims pertaining to the new (DayGlo-) illusionism, caused by the effects paints, should be carefully (re)assessed from a more scientific perspective, in which, rather than adding to the summation of the 'brainchilds' of individuals, they will be put to the test by the "audience's brain." Did Stella, by following his artistic intuitions, provide the world with the fastest capturable paintings?

In recent years, scientists have been able to measure our ability to perform a 'flash recognition', in other words, to see an image in a blink of the eye, thanks to advanced computer screens that are able to expose images at such short times. From a study in 2013 at MIT, scientists discovered that in order to recognize an entire image, the visual apparatus only needs as little as 13 milliseconds. It was already known that our eyes move (saccades) to take in new information three or four times a second, and our understanding of the visual input (brain) seems to keep pace with this information flow (Potter et al., 2014). This new discovered speed is almost ten times faster than the 100 milliseconds suggested by previous studies (Potter et al., 2014).

4. Self-Referential Flatness?

In order to clarify and assess a number of claims that pertain to Stella's DayGloification and to better understand the visual effects of the paintings, the need for an interdisciplinary collaboration imposed itself. Together with the Laboratory of Experimental Psychology (KU Leuven), a short exposure experiment was designed, in which a selection of Stella's Moroccan paintings, which were replicated as screen-prints, were tested for their "instantaneousness" (De Winter et al., 2018). The aim was to find out if and to what extent the fluorescent aspect of daylight fluorescent colors resulted in better 'capturability' than the same stimuli with conventional variants. Forty psychology students who did not know Stella's work were asked to identify the correct pattern and color combination after exposures of around ten milliseconds. This experiment can be compared to the above-mentioned study at MIT, with the difference that in this case, the images were abstract and real stimuli were used instead of computergenerated ones, requiring a more complex setup.

One of the most striking outcomes of the experiment, which has impact on Stella's reasoning, was that none of the subjects were able to recognize the colors as fluorescent. They only started to notice this aspect later in the second part of the experiment, when they had to stare at the stimuli for some seconds in order to attain an after-image. This means that the self-referential quality of DayGlo-paints can only be identified after some time—and thus not in an instant—because of the processing time required by the brain to fully process the 'glow-effect'. In other words, illusion, which is a result of the 'intrinsic-effect' of a fluorescent color, should be present in order to recognize the paint layer as self-referential. However, the preliminary results indicate that the quality of fluorescent colors to appear as brighter colors than their conventional variants, resulted in some better performances. The least mistakes were made in

the detection of the 'high contrast' fluorescent color combinations, in particular the combination of fluorescent yellow and red (Marrakech) scored best. In contrast, the fluorescent stimuli with 'low contrast' fluorescent colors combinations (mostly fluorescent green and orange Fez II) resulted in more errors in the same targeting task. When asking the subjects what they thought of their performances, they found it much more difficult to detect the pattern when one of the low contrast color combinations was used. Some had even mistaken the short exposed fluorescent colors for other colors. For example, fluorescent red appeared as 'red' to almost all participants when shown in combination with fluorescent yellow, but as 'orange' or 'pink', when seen in combination with fluorescent blue.

The fact that these participants showed an increase in performance, without the possibility to identify the fluorescent colors, could be explained as a consequence of the gap between semantic processing between low-level visual features, that can be automatically extracted from the visual content, and the high-level concepts that capture the conveyed meaning (Dasiopoulou, 2006). In other words, it seems as if the effect of the fluorescent colors enhances the visibility of the Moroccan paintings without our being aware of it. Our vision is dependent on the amount of present light, in order to register what we see, as fast as possible. Just like a photo camera, when getting a glimpse of a badly lit environment, it will result in the perception of a blurred image whose identification will be more difficult.



schematic representation of the realization of an image experience

Figure 4: Schematic Representation of the Realization of an Image Experience.

A well-lit environment, on the other hand, will increase our capacity to identify it and its components, when only seen in a blink of the eye (Tobii, 2018).

In the second part of the experiment, the afterimage durations, which were created by asking the same participants to stare for some time (two and ten seconds) at the screen-prints, were measured. In the case of the selection of Moroccan painting replicas, it is interesting to find out if the fluorescence increases the duration, which would equally suggest that it gives rise to faster afterimages. The preliminary results show slightly longer afterimages for the fluorescent versions, but they require further analyses before drawing any definitive conclusions. If they in fact give rise to faster afterimages, than this could corroborate the results of the first part, that fluorescent colors could be seen faster, and thus more instantaneously. More detailed information will be provided in a future article on this experiment which is currently being written.

This information makes it possible to re-evaluate the Moroccan paintings according to Stella's intuitive purposes. Moreover, when placed in the broader context against the concepts of temporality and illusionism, as schematically shown in Figure 4, some new more general insights reveal themselves. The above-mentioned studies give insight in the fact that a person can already recognize some aspects of an image (in the case of the experiment on the Moroccan paintings: certain color combinations or patterns) after an exposure of around ten milliseconds. However, it should be nuanced that this type of recognition is not the same as full conscious awareness of the image, also known as access consciousness. It has been shown that humans need around a quarter of a second to properly see an object, in the sense of identifying a thing as a thing of a particular kind (Koch, 2004). Before the image is access conscious, our perception is processing all incoming data, which can be compared with the development of a polaroid photo. During this time span, the percept stays in what is called the iconic memory. Some of the participants complained about difficulties in carrying out the task because they could not hold the image, which is a direct consequence of the shortness of the exposure time. It is striking that from the moment the image can be consciously perceived, illusionism arises simultaneously. When the image is conscious, it could be said that the brain automatically starts the association process in order to recognize what was seen. While scanning the scene or image, a multiplicity of saccades influences the course of the total viewing experience. At this stage, the information can be processed in such a way that, what an observer perceives, differs from its physical reality, which is the result of an optical distortion. This illusion appears, for example, when observing a DayGlo painted surface, which appears as self-luminous (glow),

because the pigments convert more light than was originally present in the light of the surrounding area (Livingstone, 2002). As the duration of the viewing activity increases, so does the complexity of the illusion (e.g. intrinsic illusion, optical movement, neon-imaging).

The instantaneous experience was, in the case of the experiment, determined by the limits of the shutter-instrument, which had the capacity to perform fast opening times of maximally around 10ms. In shortly exposing some of Stella's Moroccan paintings to a group of (naïve) spectators, it appeared that it is possible to detect their pattern and color, without the awareness of the fluorescent effect. However, the preliminary results show that paintings with high contrasting color combinations (mainly red-yellow Marrakech) cause some increase in performance (better detection of color combination and pattern), because the fluorescent property of the paint enhances the visibility of the whole image. Further investigation might be interesting, in which the same task, but with black and metallic paints, can be compared with the performances of the fluorescent colors. It is to be expected that fluorescent colors, because of their intensity, will have the highest scores.

Despite their rather difficult reception, at this point, it suddenly seems as if some of the Moroccan paintings closely match Stella's intuitive concepts about ant-illusionism, because illusion does not appear at the instantaneous-stage. Only after longer staring or wandering, when observing the Moroccan paintings, will the experience of illusion arise. At that stage of perception, the intrinsic illusionism that is caused by the paint's characteristics, contributes to a level of meta-illusion, in which the spectator might experience an op-like dynamic effect in the picture plane. This experience of a 'low-budget mysticism' (Halley, [1988] 2013), caused by the glowing skin, is a typical DayGlo quality, which makes these paints in Stella's terms 'self-referential'. However, their exposure for only an instant and voids the experience of this self-referential quality, simply because at that point associations cannot be made. This brings us to the conclusion that, although, the pattern and colors can be detected instantaneously, the self-referential connotation of the paints can only be experience after a while. Because of the inability to recognize the painting as self-referential in an instant, Stella's doctrine of anti-illusionism becomes self-contradictory.

Some critics had claimed the return of flatness, because the new illusionism in Stella's works had the capacity to "dissolve the pictorial surface" (Fried, 1965, 1967; Rose, 1965; Auping et al., 2015). In reality, this appears to be another "illusion" that might be the result of the critics' own perceptual biases. The process of Stella's choices has, on the one hand, led to strained arguments between Judd and Fried, making it seem that painting no longer had a future. On the other, it has led to a brief revival of the medium, when Rose and Krauss came

up with 'Abstract Illusionism' as a solution for the reception of the Irregular Polygons series (Rose, 1965; Krauss, 1971), in which the concept of flatness in the end fossilized itself. In holding DayGlo-paintings against new, in this case more objective, light we might perhaps overcome some of the difficulties surrounding their analysis, and in the process, not only discover the truth behind the intuitions of artists, but also learn more about our own perception.

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