

# The Painting in Front of Itself: Frank Stella's Atypical 'Projective' Spaces through Canvas, Paint and Colour

Hannah De Corte<sup>1,\*</sup> and Stefanie De Winter<sup>2,\*</sup>

<sup>1</sup> Independent scholar, scientific collaborator at Université Libre de Bruxelles, Brussels,  
Belgium

<sup>2</sup> Department of Art History, University of Leuven (KU Leuven),  
Leuven, Belgium

\*E-mail: [hannahdecorte@gmail.com](mailto:hannahdecorte@gmail.com) or [stefanie.dewinter@kuleuven.be](mailto:stefanie.dewinter@kuleuven.be)

<sup>1</sup>The two authors contributed equally to this work.

## **Abstract**

*Frank Stella's early works tend to be characterized as displaying the flatness of painted surfaces and an ambition to negate pictorial illusionism. However, beyond their emphasis on flatness, these early series of paintings generate new forms of illusions and, in some cases, initiate another type of pictorial space – one that bodies forth, coming toward the viewer, appearing as if in front of the canvas. We consider the materials of the painting format in Stella's early work (1959 to 1986) that create or facilitate the emergence of such a protruding or 'projective' space: mainly canvas, types and colours of paint. After introducing notions of flatness and illusionism and our respective approaches, we focus on Stella's use of unprimed, raw, canvas, on the one hand, and his use of reflective and fluorescent paint skins, on the other, and how paint and canvas relate to each other. We focus on the material conditions that Stella sets up to manifest his intentions regarding the perception of space in painting and where he believes painting 'should' go. Indeed, in a book published in 1986, Stella describes projective effects from painters who use different tactics than his, but he does not reveal how he achieves his own. We analyse precisely which elements in Stella's early paintings tricks the eye of the viewer into seeing a painting, as it were, in front of itself, and we demonstrate the aesthetic impact of Stella's chosen materials. Or how colour, paint and canvas, working together in a*

---

<sup>1</sup> To whom correspondence should be addressed. E-mail: [hannahdecorte@gmail.com](mailto:hannahdecorte@gmail.com) or [stefanie.dewinter@kuleuven.be](mailto:stefanie.dewinter@kuleuven.be).

*sort of symbiosis, generate a protruding effect in a new, previously unseen manner, and challenge Stella's assertions against illusionism.*

## **1. Introduction**

“I'm not a colo[u]rist ... To me colo[u]r is physical, like everything else in painting.” Frank Stella (Auping and Stella, 2015)

After 1945, the approach to painting changed dramatically, with the most prominent being the rejection of its initial function of representation (Varnedoe, 2006). The experience of any type of illusion (Note 1) was labelled taboo by the art critic Clement Greenberg, and later by other critics like his successor Michael Fried. Frank Stella (born 1936, American) became known as a young painter with his Black Paintings (1959 – 1960), with which he attempted to realize Greenberg's ideal of 'flatness'. Throughout the development of the black paintings, Stella revised Greenberg's concepts and developed his own Modernist theory of anti-illusionist painting (Rubin, 1970). After the Black Paintings, throughout the 1960s, Stella made further series – the most prominent of which were the Aluminum, Moroccan, Irregular Polygons and Protractor series – in which he wanted to make the painting as autonomous as possible and thus detached from any type of illusionism or relationality with something outside of itself. He came up with the idea of conveying the painting as nothing more than an object, which made him think about the relationship between of all the materials used to make a painting. Therefore, Stella deconstructed the painting, analysed each part of it, reflecting about its function and in what way it could contribute to making the painting visible as an object: he eliminated the painter's signature, revealed the canvas from under the dominant, preparatory, layer of paint, worked with an all-over pattern (first with stripes that referred to the thickness of the stretcher bars and later, from the Irregular Polygons on, with “multi-surfaces” (see below 2.2.3) that formed a unity with the shaped structure of the canvas and he started to use so-called self-referential paints (e.g., metallic and fluorescent alkyd and epoxy paints) (Rubin, 1970; Graw, 2018; De Winter 2020).

Though Stella's statement “What you see is what you see” (Note 2) was meant as an unambiguous instruction of how to see his work and its materials for themselves, today the statement appears ambiguous. At the time, Stella was referring to his early stripe paintings

which were interpreted as doing away with illusionism (all you see then, is what the stretched canvas is, a “flat surface with paint on it, nothing more” (Bourdon, 1968)) but of which he later said that they have “illusionism in them, too” (Auping and Stella, 2015). In his later writings, Stella claimed to have cautiously examined the possibilities of what he calls “working space” (Stella, 1986), which to him explained “the tension between the dual realities that while a painting consists of colo[u]rs arranged on a flat surface, colo[u]rs also exert pressures on the eye and on the spaces around them, advancing and receding in an optical push-pull effect so powerful that it feels physical and spatial” (Litt, 2011). Stella's commitment to purity started to soften as he explored different colours, which caused him to make adjustments to his anti-illusionistic approach (De Winter, 2020). He then stated that, mostly in his later works of the late 1960s and 1970s, he purposefully sought out optical effects from specific use of colour and paint technique. As his *Working Space* book reveals, one of his main goals was to give rise in painting to a ‘different’, *protruding* or *projective*, pictorial space (Stella, 1986). In this paper, we show the material means that Stella engaged to this effect, including fluorescence, the use of raw canvas and (feigned) traces of absorption. For this, we rely on both our individual and combined fields of interest;

Stefanie De Winter studied Stella’s use of fluorescent colours for over a decade. First within conservation studies, examining the fast degradation of these paints and later, in art history, focusing on the impact of these paints on Stella’s Modernist discourse, questioning to what extent fluorescent paints interfered with the artist’s intentions (De Winter, 2020). To investigate this, De Winter designed several perception studies in which she examined how spectators (experts and laypeople) experienced the fluorescent colours in relation to Stella’s assumptions about his work (e.g., colour depth, instantaneousness, and self-referentiality) (De Winter et al., 2018; De Winter et al., 2020; De Winter and Wagemans, 2022). These studies showed that Stella’s purist approach seemed to build rather on certain conceptions that his works should be experienced in a certain anti-illusionist way. It was striking that all the studies showed that many of his concepts were incompatible: the first study on colour depth showed that while most participants did notice the fluorescent colours, indicating the effect of self-referentiality, the intensity inherent in these paints provided depth of perception. The second study showed that the viewing experience did not culminate with the grasping of the fluorescent effect of the colours and thus the self-referential effect. Likewise, the final study found that the inherent visual complexity of his applied materials, patterns, and colour combinations did not

allow for an unambiguous, uniform viewing experience. The results of these studies clearly challenge Stella's anti-illusionistic stance.

Hannah De Corte comes to Stella from her preoccupations with painter's canvas and its underestimated role in the history of Western painting. Her doctoral dissertation is an investigation into painters' uses of a specific type of support – the stretched but unprimed canvas. De Corte studies the canvas as a carrier, a sieve (giving the word 'medium' its fullest sense) and as an iconological partner in the painting process, to artists such as Pieter Bruegel, Frank Stella, Agnes Martin and Jackson Pollock (De Corte, 2019). She also looks at encounters between canvas and paint as an artist, and devises strategies to generate projective spaces in some of her series of paintings like the *Wanderer* and *Un dimanche* series (De Winter, 2022). In *Wanderer IV*, for instance, the light vertical band comes at the viewer in a type of reversible illusion (Note 3). What is in effect the background (blue forms coming through from under the canvas) can be perceived as being in front of *and* behind what is technically the foreground (the black grid drawn freehand following the diagonal weave).

Looking at Stella from two different perspectives and backgrounds, our preoccupations with colour and canvas have come together in the understanding of Stella's specific suggestion of space and its material conditions. First, De Corte will briefly introduce projective spaces, before addressing the aesthetic role of unprimed canvas in their emergence and the reflective paints. Then, De Winter will analyse the effects of fluorescent and industrial paints on depth-perception of colour and of the fields of colour/materials, where they are situated with regard to the canvas itself. The discussed images (Figures 1 – 10) are available online, at <https://osf.io/z8syh/files/osfstorage>. We outline Stella's evolution to full projective space through different levels of spatiality by examining the types of paint and their relation to the canvas (Figure 1): from black enamel and metallic (projection through reflective space), to full fluorescent (intrinsic projective space).

- Figure 1 here -

*Figure 1. Schematical representation of reflective and projective spatiality in Stella's black, metallic and fluorescent paintings*

## **2. Projective, working, space**

Before Frank Stella and others developed strategies to instigate a projective charge to their pictorial space they relied on projective effects, it was Jackson Pollock who had opened up this space in front of the (unprimed) canvas (Kaprow, 1958; Fried, 1965, p. 230; Slifkin, 2011, p. 65). In paintings like *Number 1A, 1948*, *Autumn Rhythm (Number 30), 1950* and *One (Number 31), 1950*, *Number 28, 1950*, Pollock's paint is in *and* on the canvas. His threads of paint appear both soaked in the canvas and deposited on it and over threads of paint (Figure 2a, b). Some paint is absorbed, and the following networks of threads can lie on the weave, over the absorbed paint and, higher up, over previous applications of paint, or mix with them, forming emulsions. In some places they can float, seemingly detached from the canvas and elsewhere, soak the canvas again. This complex topography causes the viewer not to know exactly where the paint is: but seeing that in the canvas and before it opens up a non-static space in front of the picture in which the "coordinates" of the applied paint vary (in between the level plane of the canvas and before it, Figure 2a, b and c). This Frank Stella suggests in *Working Space*. In the text of 1986 – a text based on the lectures of the same name given by the painter at Harvard in 1983, he writes about Pollock's surfaces: "The paint skeins appear to do two things at once: first, they float, billowing up from the surface of the picture apparently attached only to the edges; and second, they float freely in front of those same edges parallel to their surface, apparently unattached," (Stella, 1986, p. 84) which makes the painting exist in front of itself (Note 4). Stella compares Pollock's interlaced skeins of paint and its effect of an opened space with varying coordinates, to Mondriaan's gridwork; Stella situates the origin of a projective kind of space in Mondriaan's last grid paintings, his late New York paintings *Broadway Boogie-Woogie* and *Victory Boogie-Woogie* (Figure 3a and b). In these, Mondriaan attained a "freeing of his spanning grid (...and of the) background," with as a result that the grid is "in front of itself." Likely, Stella means that the coloured grid can alternately be read as on the same plane as the white rectangles, and as in front of a white background composed of the white rectangles. On the canvas, this takes the form of a simple structure painting with few layers; each rectangle of colour in *Broadway Boogie-Woogie*, for example, is only one or two layers over the primer. It is not applied *over* the white; the white is on the same topological level as some of the coloured rectangles, even appearing lower where the edges of the white rectangles have raised borders (Figure 3b). This means the white paint, in its material, does not function like a background; the eye can sense the peculiar organization of non-layering, and tries to experience the painting as it is, devoid of figure and ground, while it is also tricked into seeing the predominantly yellow grid as in front of a white background (and other rectangular elements as in front or behind the grid). This confusion opens up a space for the eye as it senses more

than one spatial location at once. A projective space can emerge thanks to the ability “of our two moving eyes”, Stella explains, to “sense more than one spatial location at a time” (Stella, 1986, p. 84; Note 5). The painting appears as itself and in front of itself, possibly several times.

Though Stella describes in *Working Space* some of the mechanics at work in the rise of spatial ambiguities and projective effects and admits to seeking them out to remedy the flatness and stagnancy of painting of the 1960s and 1970s (Stella, 1986, p. 12, 74, 79), he remains elusive about concrete techniques and means that he may have used to accomplish them. Let us examine some of the means – similar to and different from Pollock and Mondriaan – that Stella developed to this end. First, we’ll address the role of the canvas support before that of the various types of paint and colour.

- Figure 2 here (see <https://osf.io/z8syh/files/osfstorage>) -

*Figure 2: a and b) Detail of Jackson Pollock, One: Number 31. c) Jackson Pollock, One: Number 31, 1950, oil and enamel paint on canvas, 269,5 x 530,8 cm, The Museum of Modern Art, New York, United States. Photographs by Hannah De Corte.*

## **2. 1. Canvas in projective spaces**

### **2. 1. 1. Stella’s unprimed canvas and exceptions**

Contrary to illusionism, the technical and aesthetic role of canvas in Stella’s work has received little attention. Yet he is one of the painters of the twentieth century for whom the use of unprimed canvas was the most systematic and its presence determinant. He utilized the technical and aesthetic possibilities of raw canvas throughout ample series of works, which are also his most discussed: the Black Stripe paintings, the Copper paintings, the Irregular Polygon series, the Scrambles, Protractor series, etc. When he works on canvas, Stella (almost) always foregoes the preparation, at least in some areas.

Stella’s canvas is mostly unprimed; raw canvas is present throughout the surface in the ‘blank’ areas of his paintings in the 1950s, 1960s and 1970s (Rubin, 1970). Furrows of canvas separate colour applications. Though the support appears to be unprimed, from own observations we found that in some cases, Stella used alternative forms of preparation. In (some of) his Protractor Series, Stella prepared the canvas with one layer of brush-applied paint before applying three layers of the same alkyd paint (he mixed fluorescent paint with normal acrylics) with a roller (De Winter, 2020). Only with this preparatory brushwork layer (to introduce

texture that mixes with the weave of the canvas), is it possible to recreate Stella's textured skins of paint (De Winter, 2020). He also used PVA (wood glue) to size parts of some these canvases (Note 6). Stella used a white primer or white layer of paint – 'selectively' preparing the canvas – underneath all or some of the composition's colours: white peeks out from underneath the yellow of *Effingham I* (Figure 4) for instance and underneath the borders of some bands of colour in his Scrambles and Protractor series. Exceptions of entirely primed canvases exist. Several of Stella's small version Moroccan paintings are done on white primed canvas (Note 7) (Figure 5a). The pencil lines especially make visible the presence of primer underneath them, compared to their habitual presence on a woven off-white ground.

- Figure 3 here (see <https://osf.io/z8syh/files/osfstorage>) -

*Figure 3: a) Piet Mondriaan, Broadway Boogie-Woogie, 1942-43, oil on canvas, 127 × 127 cm, The Museum of Modern Art, New York, United States. Captured on: Moma's website, accessed January 2024, <https://www.moma.org/collection/works/78682>*

*b) Detail of Piet Mondriaan, Broadway Boogie-Woogie. Photograph by Hannah De Corte.*

### ***2. 1. 2. Technical and aesthetic role of canvas***

By the end of the 1950s, when Stella began working on unprimed canvas, unprepared cotton canvas had become a common support among North-American painters of the East Coast of the United States. Painters like Jackson Pollock, Morris Louis, Helen Frankenthaler, and Sam Gilliam utilized the absorptive qualities of the unprepared cotton and often let areas of canvas bare in their paintings. Staining techniques were said to highlight the flatness of the support and to do away with traditional recessive space. Though such effects can indeed be observed, paradoxically, the very means which were relied on to highlight flatness and challenge forms of perspectival/recessional space would turn out not just to be relative (recessive space is perceptible in many stain paintings by Frankenthaler and Gilliam) but to be adept at fostering *new illusions* and an atypical pictorial space. In combination with other particularities of their respective techniques, the staining techniques of Pollock, Louis and Noland stimulated the perception of protruding or projective spaces – forms and colour that seem to advance outward and forward instead of receding inward and backward, inside the frame of a painting. In

addition to the qualities of types of paints and colour, the raw canvas can play a significant role in the suggestion of a different pictorial space.

Though Stella used the canvas in a similar state as the stain painters, staining is minimal and often unintentional with little drops of paint accidentally falling on the canvas; Stella's types of paints, tools and techniques did not soak the canvas. Because of the industrial paints he used and the size of primer he applied selectively, except for a few Scrambles with seeping edges, his paints lie atop the canvas without staining it much, forming a textured skin on the canvas.

Unprepared or unprimed canvas (between Stella's colours) is able to confuse the eye because it increases the number of perceived physical localizations of the pictorial elements. The paint appears (rarely in and mainly) on the raw canvas and above or in front of it. Just like traces of absorption such as halos and the coffee ring effect, the presence of canvas gives indications to the viewer as to where and how the paint is, on the non-transparent, reactive, support. One could say that it gives away to the viewer's eye that the painting "begins" in or on the canvas, on that fibrous plane. Upright on the wall, the colour most soaked in, between the fibres, or closest to them, is the ensemble of "coordinates" or plane that is furthest away from the viewer with subsequent paint appearing as if situated closer to the viewer, whereas the traditional window-type pictorial space features a (metaphorically) translucent support with a recessive space opening up behind it, away from the viewer. If perspectival space begins with a transparent plane on the surface of the canvas, the (stained) unprimed canvas appears opaque and object-like, as opposed to transparent, because the viewer is not always made to believe that anything opens up behind the canvas. Quite the contrary: the painting starts in the canvas, precisely in that plane. Without any point of reference or footing (like a horizon line or cosmic elements that could evoke a landscape), the eye is prevented from injecting a traditional recessive space into the painting, a traditional recessive space.

Comparison between primed paintings and their unprimed counterparts shows what the canvas does that the primed ground does not (Note 6). Canvas between the bands of colour forms a 'neutral' ground that is not white. This meant that white could have the same status as any other colour, in that it would not just repeat (or slightly diverge from) the primer and Stella could keep white (or any other colour he may have primed the surface with) as an option. Furthermore, canvas plays the role of a texture more than a colour, of a foreign material that can be seen as blank or absent in contrast to the full presence of the colours; "I don't get a very strong sense of the material quality of the canvas. It sort of disappears," Stella said (Glaser,



1966). He relied on the canvas so strongly because it is a discreet backdrop that no paint would resemble. The raw canvas as a ‘neutral’ choice is in line with the (square and rectangular) formats of Stella’s paintings and the compositions based on those formats as well as the 2B pencil he used; like these elements, canvas facilitates the colours to take centre stage. While the bright primer clearly divides the colours in the primed versions (Figure 5a), from afar, nothing seems to separate the colours in the bare canvas versions (Figure 5b and c). Yet the canvas isolates the colours from one another and provides a neutral fabric for them and between them. It makes the viewer forget that there is a background, while providing crucial information about that background.

- Figure 5 here (see <https://osf.io/z8syh/files/osfstorage>) -

*Figure 5: a) Frank Stella, Agadir I (small version), 1965, fluorescent alkyd on canvas, 53,6 × 53,6 cm, private collection. Captured on: Christies website, accessed January 2024, <https://www.christies.com/lotfinder/Lot/frank-stella-b-1936-agadir-i-small-6076285-details.aspx> b) Frank Stella, Marrakech, 1964, fluorescent alkyd on canvas, 195,9 × 195,6 cm, The Metropolitan, New York, United States. Photograph by Hannah De Corte. c) Detail of Frank Stella, Marrakech. Photograph by Hannah De Corte.*

Synthetic paints being particularly flat paints when they dry, layers in acrylic or alkyd do not create a low relief or impasto like they can in oil, instead they tend to merge to form a thin film, suggesting a more sculptural space, especially in alkyd, with a harsher-looking effect. This seems to have happened in the primed versions such as *Agadir I (small version)* and *Tetuan I*: everything appears physically on the same plane in the primed versions: the pencil, the yellow and the red lie very close together in space... (Figure 5a) even if they do produce an optical effect between the yellow and red bands, it is a much flatter experience. Unlike [Stella’s description of] Mondriaan’s surface, the eye senses that the purple and yellow in *Agadir II* and red and yellow of *Agadir I (small version)* are situated on or over the white but very close against it, and so is the pencil. The three elements are layered close together which gives a flat impression of the entire surfaces. *Marrakesh* (1964) (Figure 5b and c) which features the same colour combination as *Agadir I*, on the other hand, functions very differently and not unlike Mondriaan’s *Broadway Boogie-Woogie*. Because the raw canvas encircles each

band of paint, it dislocates the colours, provides a plane that is further away than a primer, placing them higher up than the canvas and leaves more possible spatial locations in front of the canvas plane for the colour to appear in the eye. While the colours protrude and appear in different places in front of the canvas (see 2.2.2. Fluorescence) presence of canvas *also* brings the actual paint film of colour back to the furthest plane (two contradicting indications/realities for the eye) where it is physically attached to the fibres of the canvas. *Marrakesh* and other Moroccan paintings work like Mondriaan's *Broadway Boogie-Woogie* grid, relying on an analogous confusion in the eye. The eye is confused about the protruding colours that appear one in front, the other behind, yellow behind the red, the red in front, the red grid possibly appearing as in front of the yellow – different people have a different experience of which colours appear in front (De Winter et al., 2018). Yet when the eye travels on the surface, it is clear from where the bands of colour meet (on the canvas, adjacent to raw canvas); that they are both on the same pictorial plane, with raw canvas in between. With the grid appearing as in front of itself (and in front of the canvas grid), the eye can hesitate, and fail to determine or fail to choose one reading over the other, depending on where we're looking, especially since our eyes and mind are able to hold two conflicting perceptions in unstable images (Muth and Carbon, 2016: 145-146, 167-168). As Stella explains, if the eye senses more than one spatial location at once, this confusion can open up a projective space thanks to the ability “of our two moving eyes”, to “sense more than one spatial location at a time” (Stella, 1986, p.84).

The pencil lines in Stella's paintings indicate the upper fibres of the canvas, they mark them, they become visibly fibrous and opaque as they are seen to 'resist' the graphite in a way, the graphite delineates the surface of the fabric. The wobbly edges of paint create a slight vibration between the colour fields as they are not exactly straight (Figure 5c). This creates a 'perspectival' effect of the band of colour retrieving or protruding slightly. Similarly, the pencil lines vibrate as they vary in thickness and width; when the hand slows down or the pencil tip is obtuse, the width increases and where the pencil had just been sharpened, the lines appear thin. Stella's delicate pencil lines echo on a very small scale some of Pollock's lines/threads of paint's ability to delineate a space in front of the canvas. Yet apart from the use of unprimed cotton as a favoured support and use of enamel in early paintings, Stella did not borrow direct strategies from Pollock. Indeed, the complex topographies that Frank Stella observes and describes in Pollock's paintings are not translated as such into his own work. Pollock's meshwork opens a box-like space in front of the painting, with paint starting in and on the canvas (the raw edges of unprimed canvas on the borders of his so-called “all-over” paintings

always indicating to the viewer where stains begin (Note 8)), and completely detached from it, in front of it as Stella explains, his space is inhabited by baroque, sinuous, lines that mesh and puddles of paint that ‘repulse’ in a network of paint threads that are also materially located (in some part) in the fibres of the canvas, stained, and entirely in front of the canvas. Stella’s bodying forth of colour planes are in fact closer to Morris Louis’s protruding rivulets that Stella never discusses; Stella’s coloured planes are bodied forth through very thin pictorial layers.

The unprimed canvas can increase the amount of spatial locations of the paint thus increasing the coordinates on a spectrum of progression. The more different colours, slight differences in textures (obtained also through the application of a white underpaint or primer in selected areas), the more different types of paint (traditional, fluorescent, enamel, metallic, etc.), tools for application (roller versus brush) and combinations of types of paint (he was one of the first painters to combine traditional and fluorescent paints (De Winter 2018)), and pictorial elements like ‘wobbly’ pencil lines or tiny remainders of adhesive tape, the larger the spectrum of possible physical locations, and the more the layering that appears in front can be deep or complex.

Even up close it is impossible to look at many of Stella’s paintings (of the 1958 to late 1970s era) without seeing slivers of canvas (especially in the Moroccan and Protractor series where unprimed canvas divides the surface into many different planes); canvas and pencil remind the viewer throughout the surface of that physical location of the furthest plane and thus, indirectly, the material placement of the paints. Canvas and paint provide varying “coordinates” of the background for the paint to be measured against, even as colours indicate something else to the eye, sometimes strongly protruding, seemingly hovering in front of the picture. Some material observations conflict with the generated optical effects (that come from the fluorescence, for instance), which encourages the eye to explore the surface further to situate the elements more accurately in space, (which is impossible, but it will gather new clues, and so it continues).

Additionally, the painted bands and the interruptions of canvas reflect light differently which impacts the perception of the painting. Smoothly painted bands, especially with a white primer underneath, reflect light more directly, in one direction: ‘specularly’. In contrast, textured surfaces like canvas fabric reflect light ‘diffusely’, in a scattered manner, in lots of smaller little rays (Komatsu and Goda, 2018). Specular reflection can cause a glare, so we see faster but less well. The diffuse lines of canvas interrupt the more specular reflection, further causing an unfolding of elements in the experience of viewing the picture. [To nuance the

spectrum further, some bands of paint appear texturized by the canvas underneath, in addition to brushwork in the first layer (see up-close details *Marrakesh*) – all such factors will impact perception.] Canvas possibly counteracts the very fast perception of his special, protruding, paints (see below). First the colours (fluorescent then conventional), then canvas and pencil. So as we see paintings, our eye registers several deployments of pictures in front of the painting, the fastest and first painting with colours that come at the viewer before ‘slower’ traditional colours, then the fabric of the canvas and its graphite markings appear. On that last plane exists also the painting in a textured version, the colours further back, in their textured form appear ‘behind’ the first-impression colours and they are seen more slowly (De Winter et al., 2020).

## **2. 2. *Paint in projective spaces***

### **2. 2. 1. *Reflective paints on raw canvas***

As mentioned above, Stella is most known for showing paintings as objects, highlighting what has been dubbed as the *objecthood* or objectness of painting. He showcases his paintings as literal objects anchored in the world, made from “materials [which] refer to the ‘world’” (Auping and Stella, 2015), rather than a reference to everyday objects, landscapes or scenarios... found in the real world (again, what you see is what you see). Familiar materials and shapes (including shaped canvases) underscore the objectness of the painting and already anchor it in the viewer’s space. In early technical choices of paint and support (both stretchers and canvas (Note 9)) transpire ideas that will become increasingly significant in his practice. His Black paintings feature such embryos.

In 1958, Stella began to use enamel and aluminium paints for his black stripes. At the time, enamel referred to oil-based coating paints, a kind of house paint meant for the outdoors. In and of itself and when applied to a primed canvas, glossy enamel has a distinct sheen. The glossy enamel produces a specific effect when it is applied on unprimed canvas: it becomes matte when it is absorbed by the canvas, acquiring a tar-like quality. Enamel becomes iridescent again, however, when it pools; where it accumulates ever so slightly or where it is applied in more than one layer, it reflects light strongly and appears shiny.

- Insert figure 6 here (see <https://osf.io/z8syh/files/osfstorage>) -

*Figure 6: a) Detail of Frank Stella, Tuxedo Park Junction. b) Frank Stella, Tuxedo Park Junction, 1960, enamel paint on canvas, 31 × 187 cm, Van Abbemuseum, Eindhoven, Netherlands. c) Side-view of Frank Stella, Tuxedo Park Junction. Photographs by Hannah De Corte.*

In the Black Stripe paintings, Stella applied at least two layers of black; one layer was absorbed and appears matte around subsequent layers which have acquired a sheen (Figure 6a, b and c). The main sites of the black bands present a gloss finish and convey wetness while the matte contours (of the first layer peeking through) transition to the bare canvas. The (thick) bristles of the house paint brush against the rough texture of the cotton leave traces at the surface everywhere, as much in the painted areas as where the canvas is left bare. Between the bands of textured sheen and the thin matte lines of canvas, some enamel from the dry peripheral bristles of the brush was caught only on the upper part of the fibres of the canvas making the weave very legible in the thin lines of bare canvas.

Intense reflection of light from some points of view prevents a good look at the surface and tends to highlight irregularities and thus the texture of the canvas. As it prevents the eye from seeing certain parts, enamel disrupts the viewing experience in a “repoussoir” effect (O'Connor, 1980, p. 7). Stella said he used the house paint precisely to do so, to repulse the eye. Stella mentioned that his aluminium surfaces, even more than the black ones, had the “quality of repelling the eye in the sense that you couldn’t penetrate it very well” (Rubin, 1970, p. 60). A recent study confirms that viewers express unease and dislike about failing to see the black paintings properly. (“Tracking Frank Stella,” (Van Abbemuseum, Eindhoven), February 2019 (De Winter and Wagemans, 2022)). And a change in position from the viewer (to avoid certain reflections) means new parts of the painting are reflective and hard to see; the movement of the viewer displaces the repulsory effect, making it impossible to apprehend the painting in its entirety at once from a single point of view.

Indeed, the apparent placement of the paint changes accordingly. The surface of the paint appears to have a different colour and sit on a different plane, black or white/blank; somewhere deeper or higher up. Depth- and colour-perception switch. Where the enamel appears matte, the thin canvas lines look like blank/light crevices (Figure 6a). Where it is strongly reflective and appears to glisten, the black appears as a burnt material, almost pure white (Note 10) while the lines of unprimed, off-white canvas look dark and appear much higher up like thin bridges above a void (Figure 6a). It is possible to see white lines between

(and slightly below) black paint *and* black lines between white or silver receding bands of paint. Light and dark areas strongly contrast. Shifts between sheen and matte suggest different surfaces, materials, even different weights. Under direct frontal light as in most museums, the black paintings' reflective surfaces, for instance, upfront, look like heavy stone steles (Figure 6b). Seen from the side however, where the sheen is inactive, the same object resembles a painted lightweight wood (Figure 6c). In a study, participants compared the Black painting *Tuxedo* to engraved marble, a stone floor and blackboard with chalk (De Winter and Wagemans, 2022).

The same enamel surface can thus confer monumentality and lightness, glisten or be muted, attract and repulse, appear as different colours; be perceived as empty or full, recede or protrude, from one point of view, as well as from changing points of view. Such differences [attributable to the quality of the enamel, the composition and unprimed canvas] increase the number and the variety of spatial locations of forms, in the eye. Just like those of aluminium and other reflective paints, enamel reflections result in spatial ambiguities (Upright, 1985, p. 52), but the optical effect is a mere shift between two states, similar to a 'reversible' illusion (cfr. "abstract illusionism" - Rose, 1967), rather than a spectrum of states or localizations. On the contrary, in Stella's later series a spectrum of spatial ambiguity develops.

Rubin draws attention to similar surface effects of the metallic paints, stating that the "metallic particles radiate a sheen of light that seems almost independent of the body of the colo[u]r, as if situated ever so slightly in front of the canvas itself". This appearance tends "to 'gray out' an individual colo[u]r," which is why it produces "a kind of uniform luminosity — a metallic paint on canvas, tonal unity — when different metallic colo[u]rs are juxtaposed" (Rubin, 1970, pp. 90-91).

The (specular) reflection of light from Stella's early choices of paints also counteracts the matte effects of absorption by the canvas, plays with light (in a way that usually requires priming, layering or transparent paints) and tricks the eye into perceiving variations in volume, weight and depth, thus stimulating forms of illusionism. The shallow but present optical effects of the reflective paints make it almost impossible to see the painting from most points of view as what Stella intended: as a "flat surface with paint on it, nothing more" (Bourdon, 1968, p. 49).

## **2. 2. Projective space in Stella's 'full' fluorescent (*DayGlo*) works (*Moroccan, Persian and Mittered Maze series*)**

After his previous experimentations with black, metallic and Benjamin More paints, Stella applied fluorescent paint to surfaces for the first time in 1964 for his Moroccan series. As in the case of the previous series, he used these fluorescent bucket paints because of their ‘actuality’: they are literal colours that only refer to themselves (see self-referentiality) (De Winter, 2020). When Stella became interested in fluorescent colours, they were not meant for artists but had mainly been developed for commercial purposes and signage (Day-Glo corp., n.d.). Thus, fluorescent paints completely fitted within the concept of industrial non-artist materials. Besides that, Stella particularly liked the transparent effect of the fluorescent paints: he said in an interview with De Winter, “I like the effect of transparent layers of paint on unprepared canvas, which allows you to see the texture of the canvas through it” (De Winter, 2019). The texture of the canvas in turn, signals the place of the paint above the canvas. And finally, they fit Stella’s aim for instantaneousness, because they are seen much faster than conventional paints (De Winter et al., 2020).

Daylight fluorescent pigments (DFPs) are an American invention developed in the 1930s by the Switzer family, the founders of DayGlo Colour Corp. *DayGlo*, the brand Stella used, is the trade name for daylight fluorescent pigments and paints. DFPs consist of a mixture of organic dyes and a clear formaldehyde resin, which are melted together and grounded into a pigment powder. The appearance of daylight fluorescent colours is “attributed to a select range of colo[u]rants that both absorb and emit strongly in the visible region of the electromagnetic radiation spectrum” (Hinde et al., 2013). For his Moroccan, Persian, and Irregular Polygons Paintings Stella used alkyd enamel DayGlo bucket paints which consisted of a mixture of pigment, solvent, and alkyd binder, which are all mutually soluble (Waldie, 1983).

The fluorescent effect distinguishes DayGlo colours from conventional ones, because the light is substantially brighter “in relation to the surroundings [, which] allows the visual perception of fluorescence” (Agoston, 1987, 37). The appearance of a *glow* arises because visible radiation (which is the re-emitted light or energy at longer wavelengths) is reflected from the surface, which adds to the “light normally scattered or transmitted from the material” (Agoston, 1987, 37). This effect can only be experienced live, it cannot be seen on computer screen or printed image, similarly highlighting that painting is an object. A surface of pure fluorescent colour can be considered to be a self-luminous colour field that, according to the

artist Herb Aach, generates a material-bound spatiality, which has been categorized as *intrinsic illusion* (Aach, 1970; De Winter et al., 2018).

Like conventional coloured paintings, the colours of fluorescent works in a well-lit room will appear brighter than when they are presented in a darker room. However, in the case of fluorescent surfaces, it is not only the amount of light that influences the appearance of the colours, but also the amount of UV and short wavelength radiation present in the room's light source. Because they react differently depending on the light composition, fluorescent surfaces can look different from one room to another, because UV and short wavelength radiation give fluorescent paint layers additional qualities (Johnston-Feller, 2001). In the case of non-fluorescent paints, these additional qualities will not appear when they are put under UV and short wavelength radiation. The colours of DFPs are therefore difficult to determine because they are subject to *metamerism*. The comparison of the images of the same painting under museum light and UV light (Note 11) gives an indication of the range of metameric effects that can appear when observing these paint layers (see Figure 7). When fluorescent colours are placed in a darkroom with UV light, they light up and their colour transforms into another hue than that seen with daylight; for example, the Saturn Yellow paint layers will appear greener than in daylight because they absorb UV light. Therefore, a distinction should be made between the colours in the picture taken with museum light, which are *daylight* fluorescent colours, and those that appear under UV light, which can be considered *neon* colours (Note 12) because the hues are in their most intense state. This is the result of a full self-luminous effect, similar to the effect of coloured neon tubes.

- Insert Figure 7 here (see <https://osf.io/z8syh/files/osfstorage>) -

*Figure 7: (left) Image of Frank Stella's Cinema de Pepsi (1966), made with pure and mixed daylight fluorescent paints on unprimed canvas; 72 × 72 × 4, Private collection; photograph taken with museum light. (right) Photograph of the same work under ultraviolet light. Photographs by Stefanie De Winter.*

In order to illustrate the true brightness of the DayGlo paint layers and their glowing, protruding, qualities in some of Stella's paintings, they have been exposed to UV light for the first time ever (see Figure 7 (right)). Images of the same work under different light conditions illustrate the extent to which fluorescent colours can take other forms. Here, the underestimated



full capacity of the paint's colour is exposed, revealing their most brilliant state. The result is a compilation of *hyper*-high-keyed synthetic-coloured bands that appear as if they float in space, because the DayGlo paint layers fully reveal their glowing capacity while interacting with the short wave and UV light, causing the effect of a neon ghost.

Stella used all available DayGlo bucket paints in his 'full' fluorescent works, which are the entire Moroccan and Persian (and some of the Mittered Maze) series. When Stella introduces his first two series of DayGlo works, he holds on to the fact that these synthetic paints are anti-illusionistic because, in addition to their straight-from-the-bucket literalness, they have a transparent quality Stella likes to emphasize. He ignores or seems to ignore the specific optical effects that contribute to the artificial look of the paint. Taking this a step further, Stella considers the fluorescent artificial house paints to be "dead" (Auping, 2015, p. 24). Auping responds to this as follows: "our perception of these paintings would indicate that they are not as dead as the artist might have us think" (Auping, 2015, 24). Due to their tactile qualities, they appear "like slabs collaged onto the surface of the canvas, and have a singular presence, the way a wall painted an odd colour comes out at you in a flash" (Auping, 2015, p. 24).

- Insert Figure 8 here -

*Figure 8: a) An illustration of the virtual swelling of the colours from the surface of Marrakech as described by Michael Auping. b) An illustration of the experience of Tetuan I, as described by Ben Tufnell. The painting causes an orange glow and a complementary afterimage. Composite by Stefanie De Winter.*

Ben Tufnell characterized the pictorial structures in the Moroccan series as "optical rather than physical colour combinations," which he illustrated through *Tetuan I*. Describing "the alternating red and yellow of *Tetuan I*," he said that, "the bands do not actually touch each other"; instead, according to him, they are "separated by narrow runs of raw canvas [...] which nonetheless react to create a shimmering approximation of 'the heat, the desert' of North Africa: pulsing white light, a rich orange glow, complementary after-images" (Tufnell, 2011, p. 69). First of all, Tufnell probably mistook the fluorescent brown colour for a red. Furthermore, he described the effect of the "glowing of the colours." The latter causes, according to Tufnell, the appearance of neon colour spreading, which is described as "shimmering approximation" of "the desert heat" (Figure 8a). Analysing the visual effect of

the painted DayGlo bands reveals that on the unprimed canvas, the red colour of the Rocket Red band and the yellow colour of the Saturn Yellow band partly mix with the beige colour of the cotton duck due to their transparent character (Figure 9). Because the colours appear to be glowing, an effect that resembles *neon colour spreading* (Note 13) can be experienced when observing the strips of open canvas, as the open spaces are partly “overshadowed” by a coloured glow (Figure 9). This relationship between paint and canvas in Frank Stella's Moroccan series works as a unique symbiosis. It should be nuanced that the transparent effect is not the same for all fluorescent pigments. A pigment that is not entirely fluorescent like Horizon Blue, is somewhat more opaque than a completely fluorescent one like Saturn Yellow (Figure 9). Furthermore, the type of medium, the percentage of pigment mixed in the medium, and the degree of glossiness of the medium all influence the transparency of the paint layer. Moreover, it also appears that the transparent effect is somewhat overruled by the intensity and glow of the fluorescence. These nuances mean an even greater spectrum of combinations between paint and canvas on the surface and on the scale of perception.

- Insert Figure 9 here -

*Figure 9: Illustration of the visual appearance of a fragment of Marrakech. This shows how the canvas and fluorescent paint layers are interacting. Composite by Stefanie De Winter.*

Due to the paint layers' radiating appearance, the colours spread further around the edges of the surface. In *Tetuan I*, a transparent orange glow appears to shine over the open spaces of canvas. Moreover, due to their characteristic intensity, an afterimage can be experienced after a few seconds of observation (Figure 8b). This is in line with Michael Auping's experience of a long-lasting afterimage (an image that stays on the retina for a while). Auping also described the appearance of an illusionistic effect that occurs when observing Stella's DayGlo works: “The Moroccan series (1964—65), partially inspired by bright Arabic tile patterns, is made with fluorescent paint, which absorbs and reflects light with such intensity that the colour virtually swells from the surface. ...In fact, they are best looked at from a distance, in order to process the colour and illusion of Stella's geometry. As the bands of colour travel across the picture surface diagonally, each band is interrupted by a colour change that sequentially lines up with colour changes on the other bands, creating a line or what appears to be a deep wrinkle in the picture plane. Here, Stella uses illusionism to distort the flat objectness

of the painting into something that expands out from the wall, radiating its presence into the room.” (Auping, 2015, p. 23-24). Due to the fluorescent surplus effect (Note 14), the coloured patterns seem to swell or project from the pictorial surface – *projecting into space*. In combination with the contrasts of the alternating coloured bands, the glowing appearance can produce a shimmering effect, in addition to noticeable afterimages.

While Tufnell and Auping experience the fluorescent colours as causing illusory depth effects and vibration of the pattern (Figure 8), from their descriptions, it seems that other critics like Creeley, Rubin, and Broeker (Creeley, 1965; Rubin, 1970; Broeker, 2012) did not experience the fluorescent effects. This may be due to the fact that their descriptions were based on non-fluorescent reproductions of the works and/or to ambient fluophobia among the critics at the time (De Winter, 2020). It is especially surprising that Rubin did not attempt to provide a similar description of the DayGlo colours to that of the metallic particles that radiate an “almost independent” sheen, situated in front of the canvas (Rubin, 1970, p. 90-91), given that these descriptions may also partly apply to the effects of fluorescent paint layers. Particularly since the glow of a daylight fluorescent paint layer ensures that the colour is projected forward and similarly creates a smoothing effect, due to the reflection of light, as with the metallic paint layers in Rubin’s description. Unlike the contrast effects due to the presence of different hues, the radiation contributes to the uniformity of the entire surface and the mixture of colour and canvas.

In the late 1960s, Stella introduced a groundbreaking series called the *Irregular Polygon* series. With this body of work, he sought to address the spatial illusion that had previously compromised the purity of his anti-illusionism paradigm in earlier series. For this series, Stella used the fluorescent colours alongside conventional coloured planes, giving rise to “new pictorial or spatial ambiguities” (Fried, [1966] 1998; Rose, 1967; Rubin, 1970; Rosenblum, 1971). The works in the Irregular Polygons series are characterized by their surface eclecticism due to the use of various types of industrial bucket paints (Figure 10). Although Stella kept the paint *as good as it was in the can*, this did not prevent specific optical effects from occurring on the pictorial surface (De Winter et al., 2018). According to Isabelle Graw, the industrial quality of each paint Stella used did not “reduce [the] potential for affective, psychological, and bodily experience[s],” and she asserts that the “industrial paint only displays its intrinsic affective-bodily potential when seen in its pure state: unmixed and undiluted” (Graw, 2018, 98). In the Irregular Polygons Paintings, the unique dynamism or “animation” of the shapes appears not only through colour interactions, but also through new kinds of visual effects caused by the combination of fluorescent and conventional colours and

the mix of matte and glossy finishes, thereby expanding Stella's "surface vocabulary." Graw describes the effect of the fluorescent colour in a version of *Moultonboro* (most likely version III) as an "enormous luminescence of colo[u]r: at times, they shine so intensely they seem to reach out from the wall into the space" (Graw, 2018, p. 98). Once again, literature describes the appearance of these paintings "in front of themselves" caused by Stella's specific material choices, primarily fluorescent paints. In this Irregular Polygon series, the spatial illusion appears more fragmented causing the pictorial field to "flip-flop between two- and three-dimensionality" or flatness and illusion (Kennedy, 2010, p. 11). His choice for multi-surfaces causes the observer to experience a visual play of receding and protruding coloured planes, not only caused by chromostereopsis but also because of the fluorescent effect against regular non-fluorescent colours (De Winter et al., 2018). Additionally, he applied the canvases on thick stretchers, projecting the pictorial surface even further into space. Although he attempts to circumvent spatiality here with that particular material fragmentation, he once again creates a pictorial surface that unfolds into a new sculptural spatiality.

Insert Figure 10 here (see <https://osf.io/z8syh/files/osfstorage>) -

*Figure 10: Surface details from Sunapee II (1966; green part is fluorescent; top left), Moultonboro II (1966; green part is fluorescent; top right), Sunapee I (1966; bottom left), and Tuftonboro III (1966; red part is fluorescent; bottom right).*

Also in the late 1960s, Stella proceeded to create his Protractor series, marking it as his final entirely two-dimensional painting series. These colossal, shaped canvases showcase a mosaic of colourful planes in the form of interlace, rainbow or fan patterns, creating the impression of explosive bursts of colour. In this series, Stella introduced a heightened level of colour intensity intended as a counteracting force to neutralize the dynamism inherent in the circular patterns (Rubin, 1970; Rosenblum, 1971; Halley, 2013). The incorporation of fluorescent colours serves to generate an opposing force that counters the dynamism of the design, representing a novel approach (Rubin, 1970). In the Moroccan and Persian series, the fluorescent hues follow and thus accentuate the pattern, while in the Irregular Polygons, they activate a flip-flopping depth effect.

After the Protractor series, Stella broke away from the flat two-dimensional surface and increasingly propelled painting into space, as if unable to detach from the projective space that his paintings consistently lean towards. Instead, he filled that void with real, tangible space. This evolution in his work signifies a captivating shift from the purely two-dimensional to a more spatial approach. The paintings almost seem to transcend the canvas, engaging with the surrounding space, in this way further challenging traditional boundaries. With this evolution, in a sort of *tour de force*, Stella appears to communicate that flatness, too, in painting is an illusion.

### 3. *Conclusion*

Stella's puristic approach is built upon belief of a certain experience of the works: that it is possible to see a painting as a flat surface with paint on, and inject nothing more into the surface or into the experience of the viewing of painting than that of viewing an object instead of an image, annihilating senses of depth or sentiment, even: there is nothing "there besides the paint on the canvas" (Glaser, 1966). However, even though the radical self-referentiality and *objethood* of painting was certainly brought to a pinnacle in Stella's work, the suggestion of space in some of his paintings and the deployment of various elements in the eye of the viewer, challenge the unambiguous, instantaneous what-you-see-is-what-you-see apprehension of the works he initially claimed. The visual complexity arising from Stella's chosen materials, supports, patterns and colour combinations introduces optical effects and illusions contrary to his initial aim of eliminating them. The painter's initial radical approach and tropes are thus to be nuanced.

As Stella told curator Michael Auping about his early black stripes of paint: "well...they are not that straight." And: "there is illusionism in them created by that wobbliness".

Auping: Those blunt, straight lines make Abstract Expressionism seem facile and airy.

Stella: Well, another thing about those lines is they are not that straight. People don't look at them carefully. You can't paint a straight line over that big of a surface of a stretched canvas. They get a little wobbly. People have always said they are very matter-of-fact, very deadpan, but there is illusionism in them created by that wobbliness. Also, the edges of those lines are more brushy and "expressive" than they may have looked at the time. Everything is relative. Believe it or not, I think of them as somewhat painterly. They are closer to Abstract Expressionism than many thought at the time.

Auping: I don't see that much illusionism in the Black and Aluminum or the Copper paintings.

Stella: It's there. Look harder." (Stella and Auping, 2015)

This discussion about the black stripes' "wobbliness" and his acknowledgment can easily be extended to other series (including those with fluorescent colours and fluorescent with traditional colours, made on a similar schema), where illusionism persists. Against the grain of the textured canvas that offers resistance to the graphite, Stella's pencil lines aren't straight, either. Small pieces of tape used to apply the bands of colour, are often left behind on the canvas. These create little irregularities in the surface as well. Added to the contrasts between primed and unprimed bands of colour with white primer appearing from underneath some borders, and between the brushwork and roller-applied paints, Stella's paintings on raw canvas now appear much more handmade than they were perceived to be at the time. In at first sight deceptively simple paintings, interesting topographies, and an interplay of a great number of factors create intriguing and atypical spatial constructions.

Over time, Stella's spatial evolution moves from sculpturally projective in two-dimensional paintings featuring black enamel in the Black paintings (a thick layering of paint and brushwork, with enamel sheen...); to a more shimmering effect of the metallic enamel in subsequent series, culminating in an intrinsic projective space with fluorescent paints and series, even combining the various types of paint to broaden the spectrum of perceived elements. In the late 1970s and 1980s, the projective effect becomes literal in sculptural paintings as Stella introduces three-dimensional elements protruding from the picture plane in paintings such as his Polish Village (1970-1973) and Exotic Bird (1976 – 1978) series. The dynamic evolution of Stella's spatial concepts challenges the simplicity initially attributed to his paintings, revealing a rich and multifaceted engagement with the complexities of pictorial space.

## Notes

1. In the context of visual arts, the term "illusion" refers to any perceived spatiality when observing the pictorial surface, while "optical effects" (also used in this paper) denote specific visual phenomena resulting from material properties. Illusionism, originating from psychology, has gained broader significance in art history, influencing artistic movements and theories like Clement Greenberg's post-war art discourse.
2. Stella first said the words in an interview by Bruce Glaser, with Donald Judd and Dan Flavin (Glaser, 1966)

3. Barbara Rose relates this kind of 'reversible illusion' to an operation that evokes an 'imaginative projection'. (Rose 1967: 37)
4. We explain how Jackson Pollock's dripped paintings generate a protruding type of space in much greater detail in my doctoral dissertation *Uses of Unprimed Canvas* (De Corte, 2019, pp. 66-76) and forthcoming publications.
5. Stella specifies that he believes that it was not Pollock but Barnett Newman who truly broke with the easel picture and that Newman accounts for the emergent "binocular vision of 20th century abstraction".
6. We received this information from the conservation studio where Stella's works have been conserved.
7. *Agadir I (small version)* and *Agadir II* are both on white primer, while *Agadir I* and *Marrakesh* are unprimed. Similarly, *Tetuan I (small version)* is primed while *Tetuan II* is unprimed. We base these assumptions on our own observations of the works in real life. Firstly, upon inspecting the sides of the canvas with the naked eye, we noted the presence of a primer. Secondly, as these artworks are monochromatic in nature, it is evident that a primer has been evenly applied; otherwise, any colour changes would become apparent due to the transparent quality of the fluorescent paints.
8. De Corte argues against a habitual 'all-over' description of Pollock's paintings in her doctoral dissertation (De Corte, 2019, pp. 137-138).
9. Bare canvas, shaped stretchers with thicker stretcher bars and house paints are some of the strategies to show the physicality of painting.
10. The glare from the 'specular' reflection means no information is provided from the surface, resulting in a white glare.
11. For this research, the paintings in the exhibition *Frank Stella: Experiment and Change* at the NSU Art Museum in Fort Lauderdale (USA) were released for an inspection with UV light. It is the first time that the works have been shown in their neon-coloured state.
12. Up to this point, (*daylight*) *fluorescent* colours and *neon* colours have been used as synonyms. However, "neon colours" refer to the colours that shine from neon lamps. Therefore, it seems more precise to call fluorescent colours in daylight, "daylight fluorescent colours" (or DayGlo colours) and those under UV light, "neon colours."
13. The term "neon colour spreading" is used in perception-related studies to describe an illusion of colour spreading "around the colo[u]red elements of an otherwise black line pattern" in which the perceiver "has a strong impression of colo[u]red light projected onto a lattice of

black lines” (Van Tuijl & Leeuwenberg, 1979). In the case of a daylight fluorescent colour, this effect is caused by the glow that spreads the colour out of its edged surface.

14. The fluorescent surplus effect is the glowing appearance of the colours.

### Acknowledgements

We extend our sincere gratitude to the reviewers for their insightful comments, which greatly improved the quality of this paper. Special thanks to Luca Bonetti Conservation Studio (NYC) for generously providing invaluable material and technical insights regarding Stella's work. This research was supported by funding (12E0723N) from the FWO (Research Foundation - Flanders).

### References

Aach, H. (1970) “On the use and phenomena of fluorescent pigments in paintings.” *Leonardo*, 3:135-138.

Agoston, G. A. (1987). *Color Theory and its Application in Art and Design*. Vol. 19 of Springer Series in Optical Sciences. Springer.

Auping, M. and Stella, F. (2015). The un-secret world of Frank Stella, *VoCA Journal*, 12 November. <http://journal.voca.network/the-un-secret-world-of-frank-stella/> (accessed January 2024).

Bourdon, D. (1968). A simple quality – like Mantle hitting a homer, *LIFE* 64, 3, (19 January), 49.

Broeker, H. (2012) “From the Birth of the Shaped Canvas to the Protractor Series (1960-1971).” In *Frank Stella: The Retrospective Works 1958-2012*. Wolfsburg: Kunstmuseum Wolfsburg: 155-160. Exhibition catalog.

Creeley, R. (1989). “Frank Stella: A Way to Go.” [1965] In *The Collected Essays of Robert Creeley*. Los Angeles: University of California Press.

De Corte, H. (2019). *Uses of unprimed canvas — looking at the absorptive qualities of the painting support and its material nature*, Doctoral thesis, Université Libre de Bruxelles, Brussels, Belgium.

De Corte, H. (2020). Selective preparation of canvas as an ‘artistic device’ in David Hockney’s early paintings (1964–1972). *Art Percept.* 8, 3–4, 311–336, doi : 10.1163/22134913-bja10015

Day-Glo Corp. (n.d.). “How Do You Measure the Day-Glo Difference?” Day-Glo commercial. Day-Glo Corp., Cleveland, OH, USA. <http://www.dayglo.com/fileshare/pdf/TelcomStudy-Summary.pdf>. Accessed January 2024.



De Winter, S. (2020). *Flattened Intensities: an Empirically Informed Assessment of Frank Stella's Fluorescent Paintings from the Sixties*. Unpublished doctoral dissertation, K.U. Leuven, Belgium.

De Winter, S., Moors, P., Van Gelder, H. and Wagemans, J. (2018). Illusory depth based on interactions between fluorescent and conventional colours: a case study on Frank Stella's Irregular Polygons paintings. *Art Percept.* 6, 116–150. doi: 10.1163/22134913-20181093.

De Winter, S. (2019) "Frank Stella en DayGlo." *De Witte Raaf*, 199, May-June: 2-3.

De Winter, S., Vissers, N., Bossens, C. and Wagemans, J. (2020). Instantaneous art? Investigating Frank Stella's Moroccan Paintings with a short-exposure experiment. *Art Percept.* 8, 121–157. doi: 10.1163/22134913-bja10001.

De Winter, S., (2022) "Woven picturality", for Self-Play exhibition by Hannah De Corte from 31 March - 7 June 2022. Patinoire Royale, Brussels.

De Winter, S., & Wagemans, J. (2022). Tracking Frank Stella: An Empirical Evaluation of Art-Historical Issues in an Eye-Movement and Questionnaire Study. *Art Percept.* 10(3), 201-243. <https://doi.org/10.1163/22134913-bja10038>

Fried, M. (1965). Three American Painters, in: *Art and Objecthood*, pp. 213–268. University of Chicago Press, Chicago, USA.

Fried, M. (1966). Shape as Form: Frank Stella's New Paintings, in: *Art and Objecthood*, University of Chicago Press, Chicago, USA.

Glaser, B. (1966). Questions to Stella and Judd, *Art News*, September, 58–59, in: *Minimal art: a critical anthology*, Gregory Battcock (Ed.), pp. 148-164. University of California Press, Berkeley, USA.

Graw, I. (2018). *The Love of Painting: Genealogy of a Success Medium*. Sternberg Press.

Greenberg, C. (1949). Our Period Style, *Partisan Review* 16, 11, 1 November, 135–39.

Halley, P. (1988). *Peter Halley: Collected Essays, 1981–1987*. New York: Edgewise Press.

Hinde, E., P. Nel, R. Sloggett, and A. Roberts. (2013). "Fluorimetric Analysis of the Constituent Dyes within Daylight Fluorescent Pigments: Implications for Display and Preservation of Daylight Fluorescent Artwork." *Journal of the American Institute for Conservation* 52 (2): 97–106.

Johnston-Feller, R. (2001). *Color Science in the Examination of Museum Objects: Nondestructive Procedures*. Getty Conservation Institute, Los Angeles, CA, USA.

Kaprow, A. (1958). The legacy of Jackson Pollock, *Artnews* 57, 6, October, 24–26, 55–57.

Kennedy, Brian. P. Frank Stella (2010): *Irregular Polygons, 1965–66* Exhibition catalogue. Hood Museum of Art, Dartmouth College, Hanover, NH, USA.

Komatsu, H. and Goda, N. (2018). Neural mechanisms of material perception: quest on Shitsukan, *Neuroscience* 392, 329–347, doi: 10.1016/j.neuroscience.2018.09.001.

Litt, S. Frank Stella's luminous "Irregular Polygon" series is reunited at the Toledo Museum of Art (2011), Accessed May 2018.

[https://www.cleveland.com/arts/index.ssf/2011/04/frank\\_stellas\\_luminous\\_irregul.html](https://www.cleveland.com/arts/index.ssf/2011/04/frank_stellas_luminous_irregul.html).

Accessed January 2024.

Muth, C., and Carbon, C.-C. (2016). SeIns: semantic instability in art, *Art Percept.* 4, 1–2, 145–184. doi: 10.1163/22134913-00002049.

O'Connor, F.V. (1980). *The Black Pourings, 1951-53*, exhibition catalogue, Institute of Contemporary Art, Boston, USA.

Rose, B. (1967). Abstract Illusionism, *Artforum* 6, October, 33–37.

Rosenblum, R. (1971). *Frank Stella*. City of Publication, MD: Penguin New Art.

Rubin, W.S. (1999). *Frank Stella*, exhibition catalogue, Museum of Modern Art, New York, USA.

Slifkin, R. (2011). Now man's bound to fail, more, *October* 135, Winter. 49–69, in: *Ango-American Exchange in Postwar Sculpture, 1945-1975*, Rebecca Peabody (Ed.), pp. 59–75. Getty, Los Angeles, USA.

Stella, F. (1986). *Working Space*, Cambridge, Massachusetts, USA.

Tufnell, B., Hobbs, R., T. Hunt, and K. Wilken. (2011). *Frank Stella: Connections*. Ben Tufnell, ed. Stuttgart: Hatje Cantz.

Upright, D. (1985). The technique of Morris Louis, in: *Morris Louis: The Complete Paintings*. Harry N. Abrams, New York, USA.

Varnedoe, K. (2006). *Pictures about Nothing: Abstract Art since Pollock*, Princeton University Press, New Jersey, USA.

Waldie, J. M., et al. Surface Coatings: Volume 1 - Raw Materials and Their Usage. *Oil and Colour Chemists' Association*, Australia (1983).