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National College of Art and Design

Department of Craft Design (Glass)

A contextual study of the Art of James Turrell.

"Light is the material and the medium is perception"¹

by

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Introduction

1.

In modern philosophy the effect of physical fire and light on the thought process is important. In his paper "Philosophy of Light" (1979), the author Professor S.L.Knee of the Technical University of Eindhoven states that Light plays an important part in human life. He makes the distinction between two different forms of Light, that of external Light and internal Light.

As words of pure vision, almost pure thought, James Turrell, a contemporary artist working with Light in Space seems to bring into view an internal Light, that which exists in our imagination and our perception of the world. Turrells' work is presented in a straightforward way and abandons the physical object in order to gain access to direct perception. Looking at Turrells' Light images, viewers gain insight into the workings of their own visual systems and discover that within the simple act of seeing there is considerable room for wonder.

We see things around us because they are illuminated from the outside by external physical Light or the object itself is illuminous. We not only observe things in the outside world, we also possess an inner Light which could be described as intellect. Light stimulates the retinal surface of the eye and conveys images to the brain. But when we dream, can we be said to see? There is no physical Light in the brain, only the illumination of thought itself. This interface between exterior and interior Light is echoed in Turrells words;

"I have an interest in invisible Light, the Light perceptible only in the mind. A Light which seems to be by entering the senses. I want to address the Light that we see in dreams and make spaces that seems to come from those dreams."³

James Turrell was born in Los Angeles in 1943, the son of an aeronautical engineer. In the sixties he studied psychology at Pomona College and Art at the University of California., Irwin and at the Claremont Graduate school. The sixties in America was a time of general optimism in both the fields of art and science, a time when artists'dreams could be

2.

realized. Despite the reservations many Americans had about social and political issues such as conserbtion and the Vietnam war, the sixties was a time when anything seemed possible. Many artists as well as scientists felt few if any restrictions. This was the climate in which Turrell emerged as an artist in a time when man was reaching out into the expanses of space. Man walked on the moon for the first time.

As an American, Turrell says " we don't have the same restrictions as you do in Europe in terms of what is Art and what is not."⁴ The directness in Turrells' Art is an American approach, he is interested in the creation of the " equivalent rather than illuscollary experience."⁵ Turrells' use of Light in Space has no precise parallels in the history of Art. But Light has always had significance for mankind in all disciplines of life. Raismund Stecker emphasises the importance of placing the artist in context: "Contemporary Art is characterized by historical continuity, so that today's Art must be seen arising from cultural traditions."⁶

3.

Chapter One

Looking into Light.

Early representations of light in both culture and Art; Distinguishing Turrell's use of literal light from the depiction of light on a flat surface or from three-dimensional objects that are revealed by light.

In ancient times great importance was placed on watching the cycles of the sun and moon. From the oldest sources of literature there is evidence that the considerations of ambient light played a major role in many significant expressions of mental activity. These expressions are the oldest forms of culture, such as those of the Egyptians in the worshipping of the Sun god , Ra, the Babylonian Sjamj, the Japanese goddess Amaterasu and the Greek, Helios. In worshipping the sun as a source of life, ancient structures were built in response to events in the heavens.

In his exterior works Turrell is seeking to create spaces comparable to archeological sites that in ancient times provided a connection between the people and the heavens. Turrell makes reference to Mayan and Egyptian ruins, places such as Mesa Verde as places of interest to him. E.C. Krupp, an astronomer and archaeoastronomer who has served as one of the advisors for Turrells' *Roden Crater Project*, points out that the architectural spaces planned for the volcano are reminiscent of archaeoastronomical observatories;

" These spaces resemble places like the inner sanctuary of Newgrange, the High Room of the Sun at Kamak, and the sacred ground inside Koji temple. The ancient builders orientate to the sky, control the ambient Light in these shrines and capitalised on the periodic intrusion and dramatic display of sunlight."¹

The way these ancient structures had a sense of presence, forming Space with Light, is more of interest to Turrell than any given symbolism. He enjoys spaces that have lost their civic or religious intent. He points out that ;"The impact of the space of the Gothic Cathedrals, and the Light within it is much more interesting to me than the rhetoric that is spoken there."²

Apart from the spiritual and religious associations of light which Turrell denies interest in, Light has always been connected with man's quest for knowledge. From the Greeks, the story of the demigod, Prometheus, represents the earliest associations of Light with knowledge. Prometheus stole fire from heaven in order to teach its use to the people

below, so that they could manipulate and use that fire and the Light generated from it. The Prometheus legend was gradually recognised by the Greeks as a reflection of their moral thinking with human civilization. Johan Jahsen, in his discussion of "Light in Literature", cites the ancient Greek poet, Aeschylus, who attributes "the spark of invention" to Prometheus in unravelling "the mysteries of the stars."³ Stephen Polyack has expressed the importance of light for the evolution of human beings in eloquent terms;

" Mankind during an uncalculably long and complex evolutionary process rose from the primeval ooze, through the incessant struggle for survival, principally through the instrumentality of vision and light, to life of self-consciousness and the realization of the world."⁴

Painting is an unconscious observer of the technological social and spiritual conditions that exist at a certain time. Turrells' Art is an exemplification of the hopes and conditions of our time, his work does not exist in a vacuum. Therefore it is necessary to recognize in relation to Turrells' work that Light has always inspired artists. Turrell himself was aware although not influenced by historic achievements whereby Light was put at the very centre of our attention. He recognizes that " New forms always began with reference to the old."⁵ It is the tradition of painting more so than sculpture that provides a more important frame of reference for Turrells' work. Turrells' *Dark Pieces*, *Skyspaces* and *Perceptual Cells* are directed at our perception of images; he also describes his artistic activities as the "three dimensional vision of painting." He does not use form and matter to display space and thereby affect it.

" The world depicted in the picture and Light as a source of Light are separate from one another. The Light itself does not reach us , the viewer, directly, but rather indirectly, in the form of reflected Light. If we imagine as an intellectual exercise, that the source of Light is extinguished, then the picture would become dark and its world invisible, but it still would continue to exist."⁶

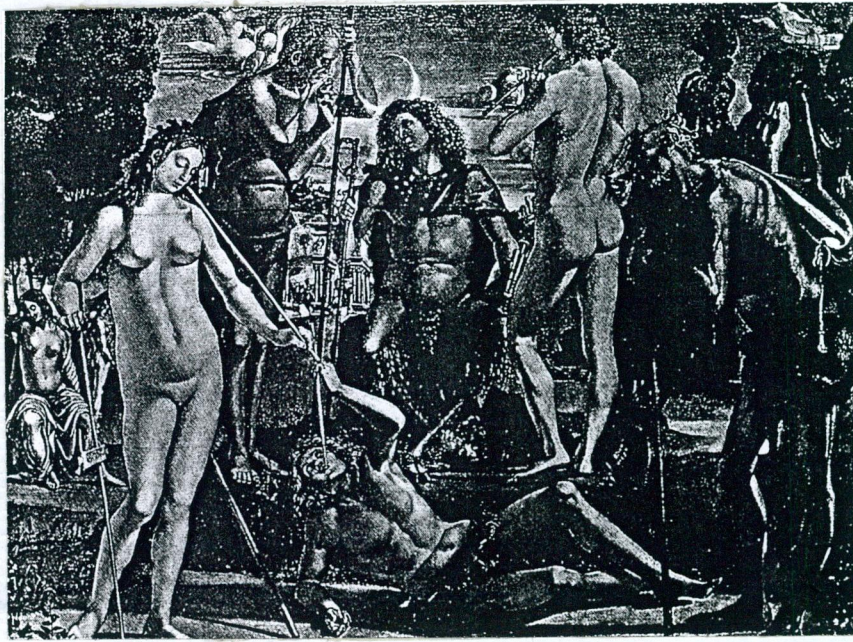


Fig 1: Luca Signorelli, Great Pan (1490)

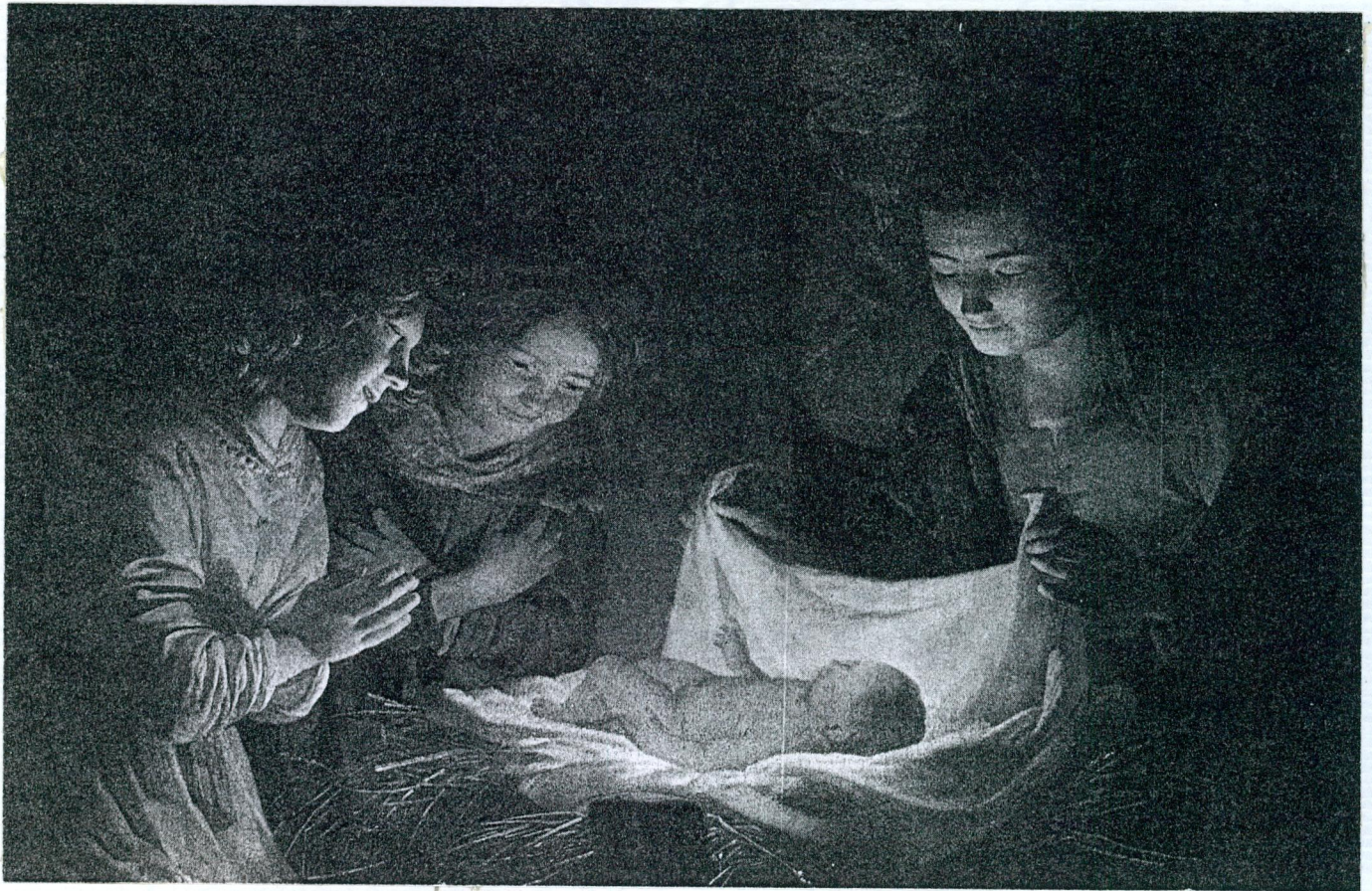


Fig 2: Gerit Van Honthort(1590-1656), Netherlands,
Adoration of the Infant (1620)

This is how Wolfgang Schone comments on Signorelli's Great Pan (Fig. 1, page 6) painted around 1490, in the introduction of his book, *Light in Painting*. With these words, the art historian describes the lighting conditions that enable us to perceive sculpture. If the light was extinguished in a room full of sculptures, then this would now affect the objects themselves, though they would no longer be visible to us. The Light in James Turrell's Art is dealt with quite differently. If the light in it were extinguished, then it would cease to exist. The two positions of 500 years apart; during these five centuries the importance of light in Art has changed fundamentally. The light is no longer in the picture; Turrell uses light as the picture.

Prior to Edison's invention of the electric lamp in 1879, imagination of the painter, by lack of practical lamps, had to be helped by his fantasy. The contrast in brightness and colour were romanticised especially when portraying mystical events. Otto Luhrs in *Art in Light* suggests that the mystical light as fantasised in these paintings disappeared as lamp technology increased. In religious Art, the main focus of the painting was identified by light, one example of this is *Adoration of the infant* (1620), (Fig. 2, page 6) by Gerrit von Honthorst, in Florence. The fantasised Light as depicted in these paintings disappeared in the wake of Enlightenment around 1800s'.

Under the influence of engineering developments at the start of this century, a group of artists - mainly Italian, devoted a great deal of their work to newly introduced technical inventions. In their Futuristic Manifestos, they expressed their wishes to break with the past and to concentrate on the dynamism of modern life, they proposed " that movement and light destroy the material substance of bodies."⁷ Giacomo Balla, an Italian Futurist, painted a study of the radiation of light from a street light. In the *Study of a Street lamp*, painted in 1909, (Fig. 3, page 8) he depicts the criss-cross lines and colours produced on his retina when peering at a street lamp through his eyelashes. Balla later wrote;

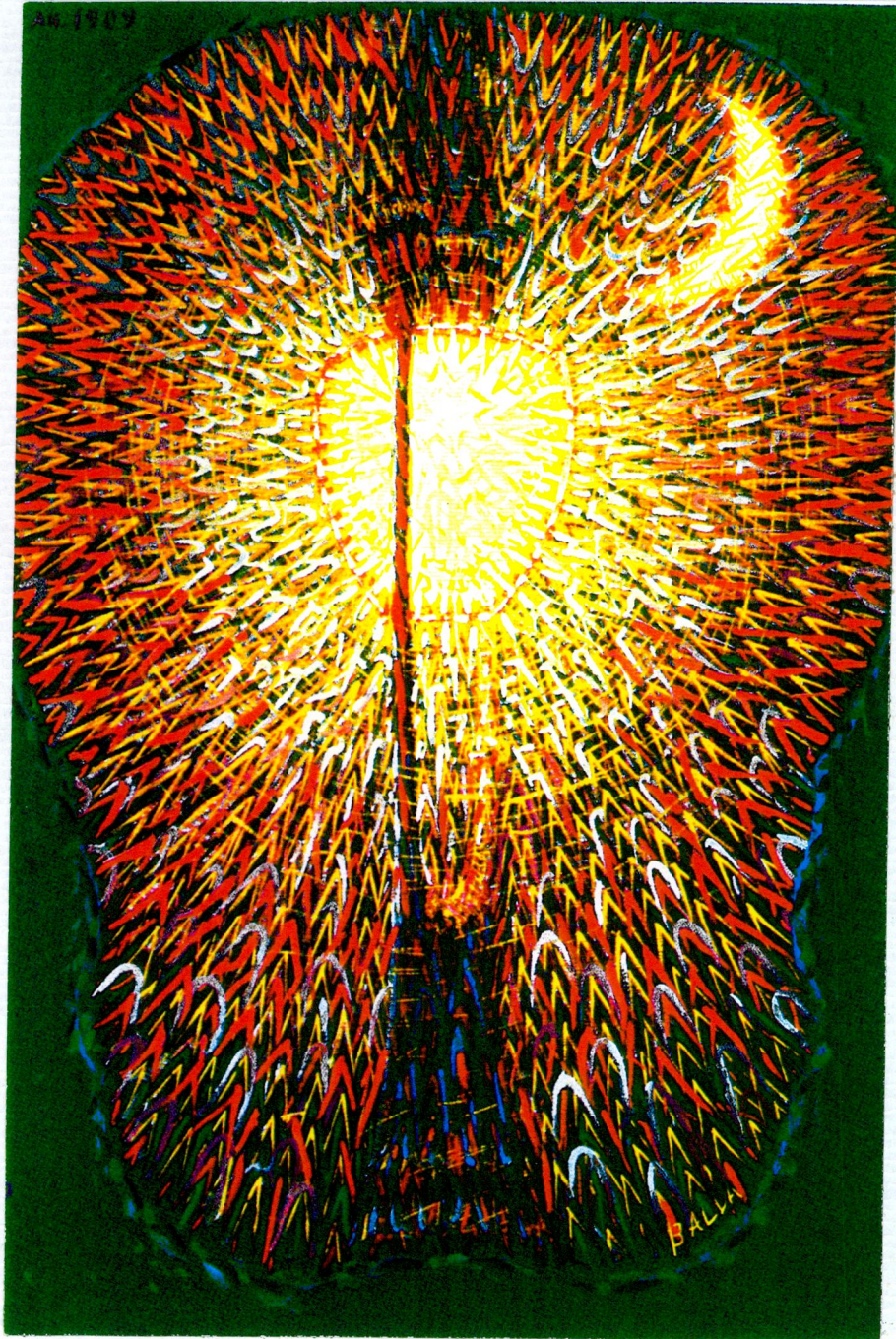
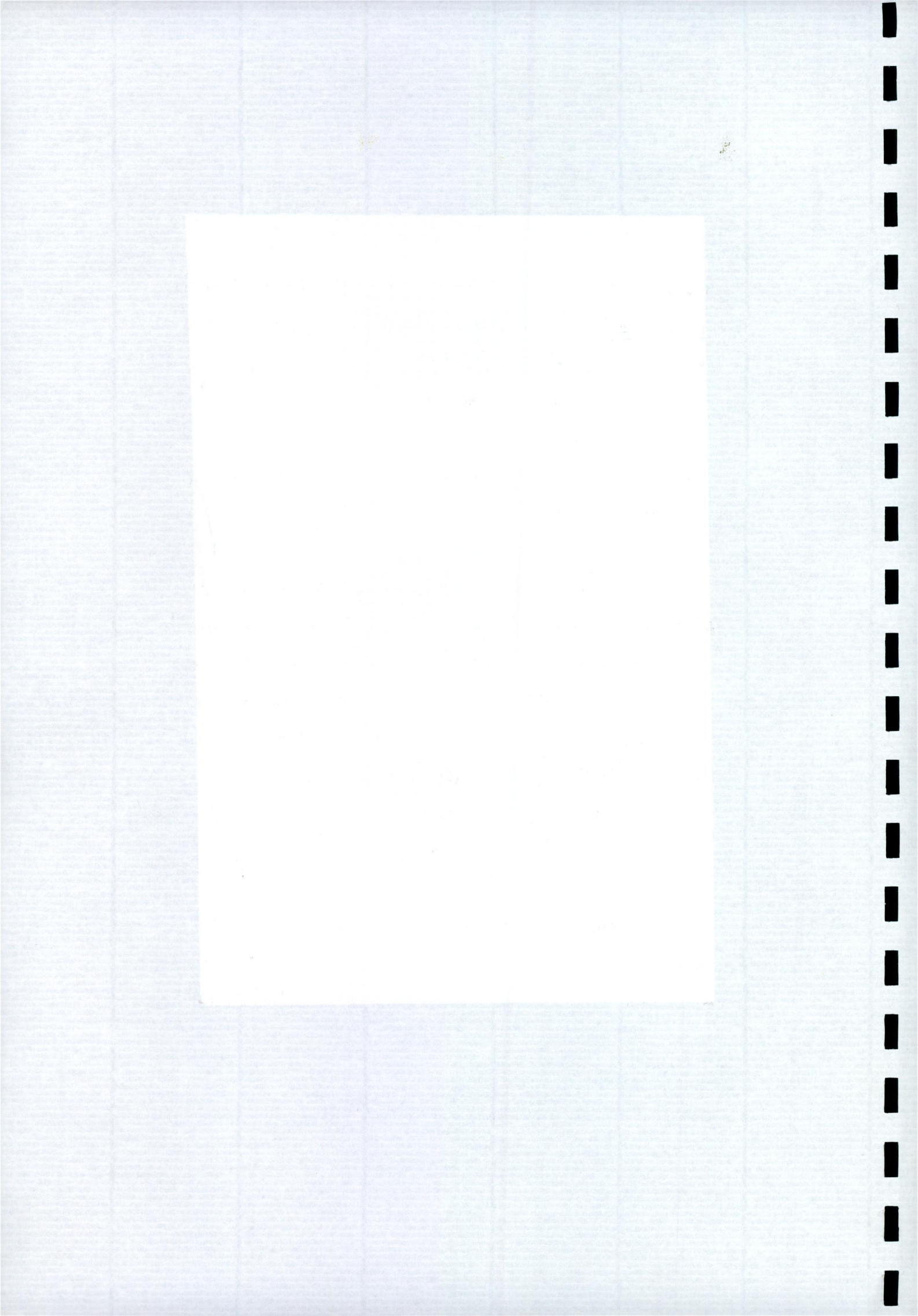


Fig 3: Giacomo Balla (1871-1958), Italy
Streetlamps, a study in light (1909)



" Nobody could have thought that so trivial an object as a street lamp might one day become a theme for a work of art."⁸

These examples of light in painting are mentioned here in recognizing light as a continual source of inspiration for Art. It is by the reduction in imagery that paintings begin to draw parallel to Turrells Art. The painting of Barrett Newman address the viewer on similar levels of perception , in terms of directness. Newmans' *Anna Lights* painted in 1968, (Fig. 4, page 10) involves an area that appears unlimited because it extends over a height of 9 ft and spans an entire width of 20 ft. Standing in front of this painting, as Raismund Steker describes, attention is focused, " not on the red paint, nor on the red area, nor indeed on the red of the picture, but on red as such."⁹

The confrontation of pure colour is central to Turrells' *Dark Pieces*, the basic difference is that Turrell engages the viewer in colour, the eye is allowed to focus on colour, whereas in Newmans *Anna Lights*, the viewer is faced with colour. Both Turrells' *Dark Places* and his *Perceptual Cells* demand a hard and conscious effort on the part of the viewer to engross him/herself in them as events. Steker makes a comparison between Turrells work and that of Newman, Rothko and Ad Reinhardt, by saying that;

" Our perceptive interest is captured not so much by an impression of beauty, but one of powerlessness or of being overwhelmed."¹⁰

From the early part of this century artists began to appropriate aids of technology in an attempt to capture the essence of light. Lenses, reflectors, in fact any material which provided possibilities of reinforcing the optical and illusionary aspects of light have been used by many artists. One example of this interpretation of light is Adolf Luthers' *Focussing Space*, (Fig. 5, page 11) exhibited in "Szene Rhein Rhur 1972" in Essen. *Focussing Space* consisted of a number of static and concave mirrors which were arranged horizontally near the ground in a darkened room. As a result, the dust, made visible by the light, formed itself into cone and then danced, due to the moving mirrors. Turrells' first cited interest in

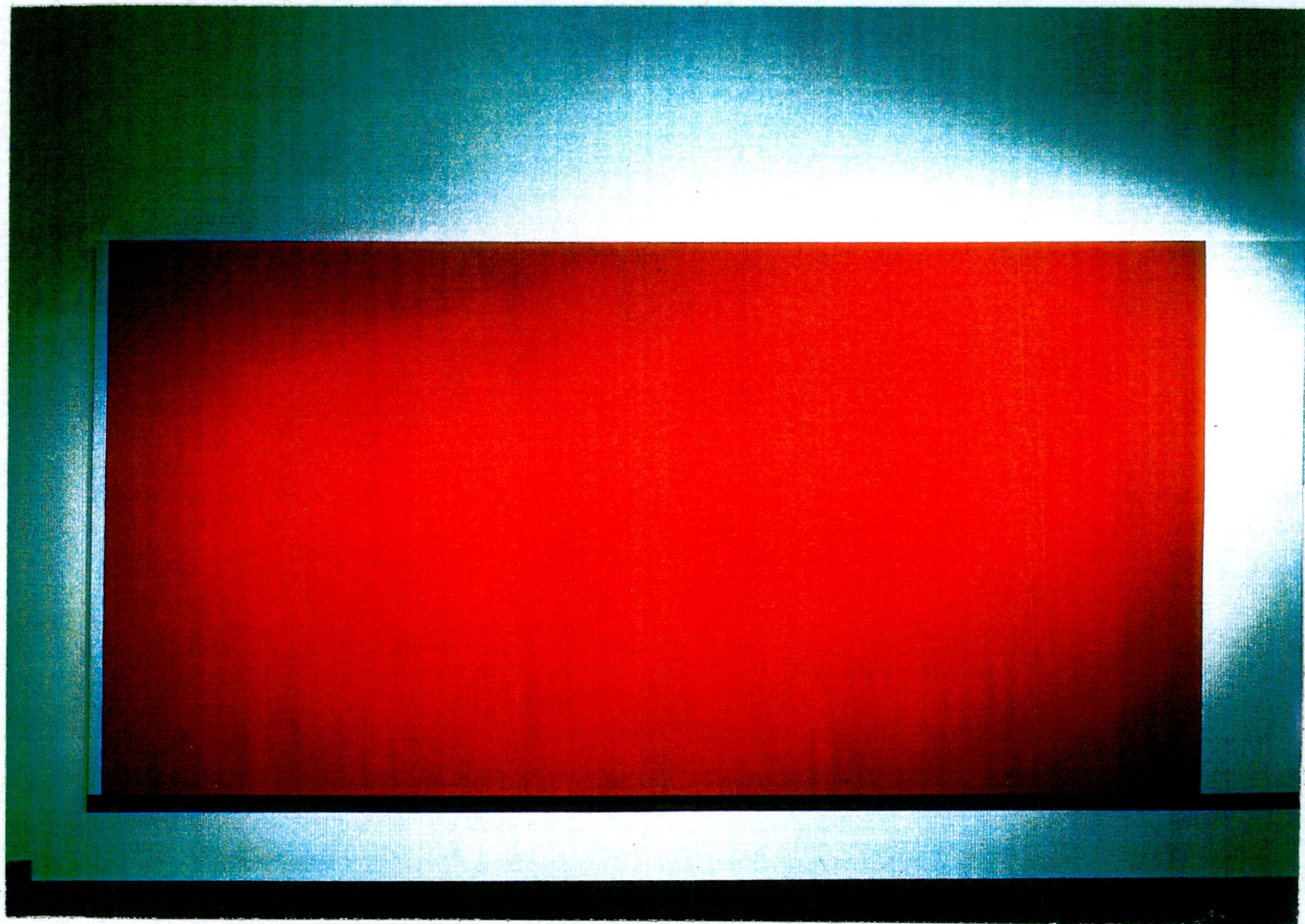
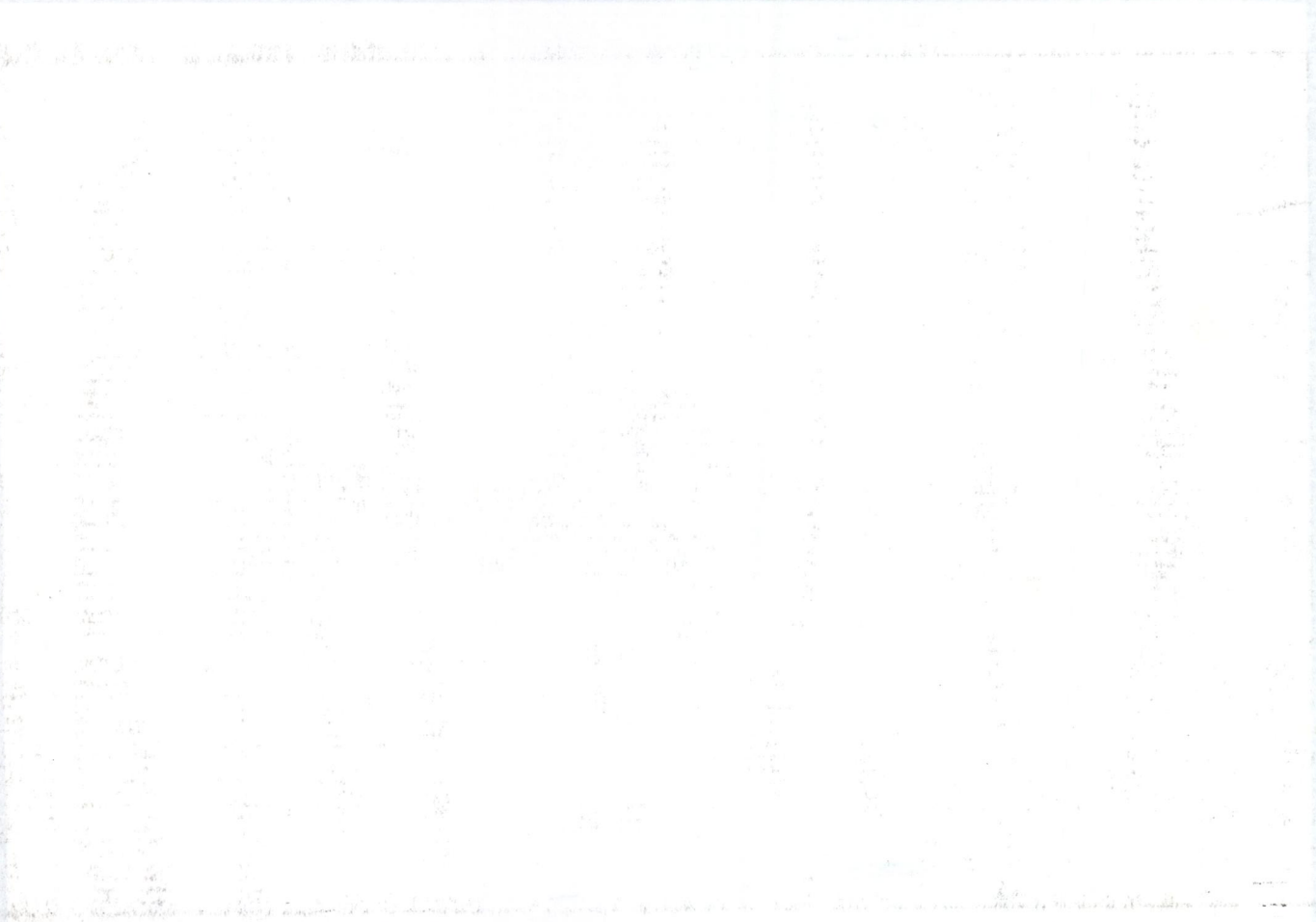


Fig 4: Barrett Newman, America
Anna Lights (1968)



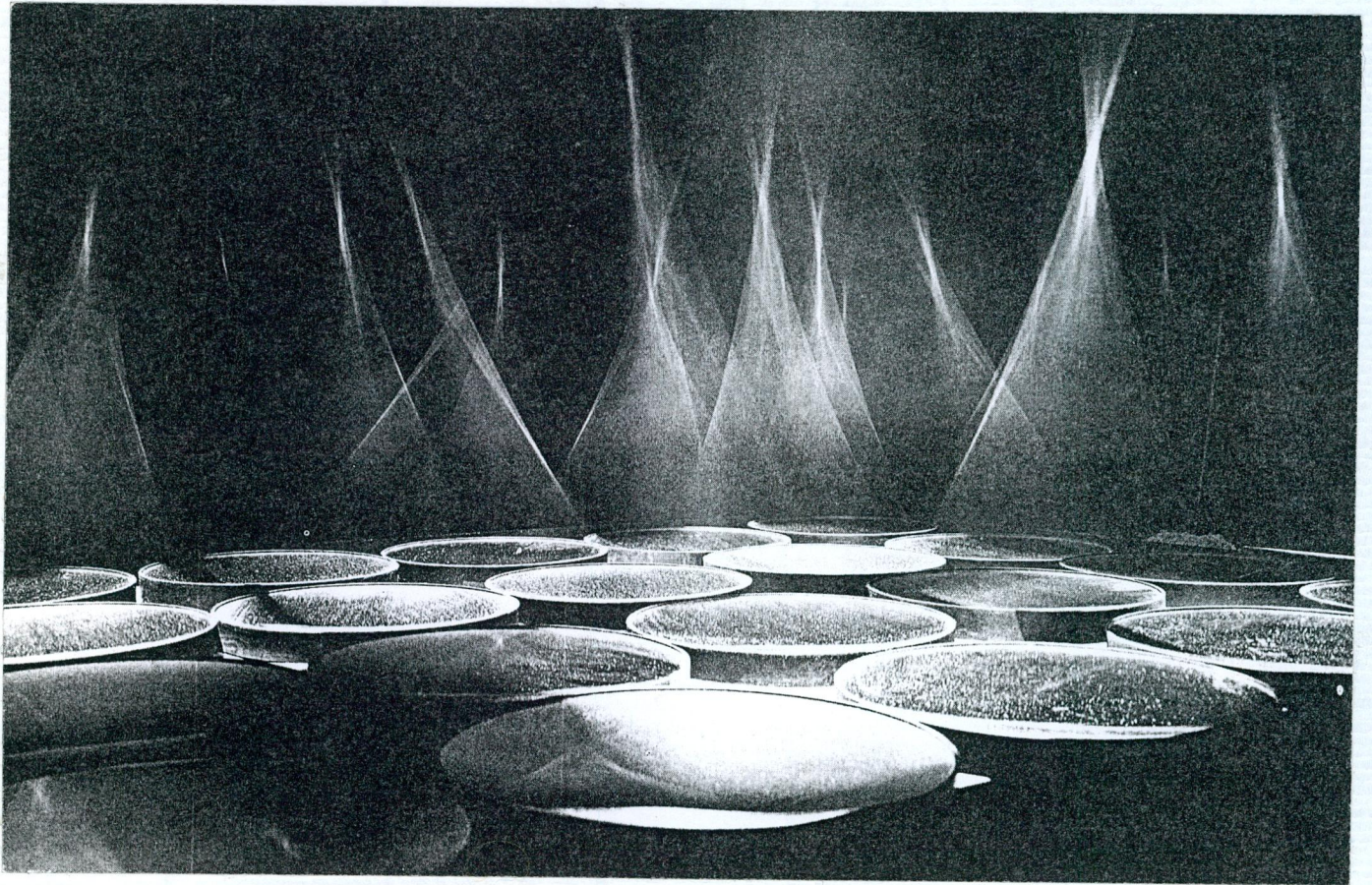
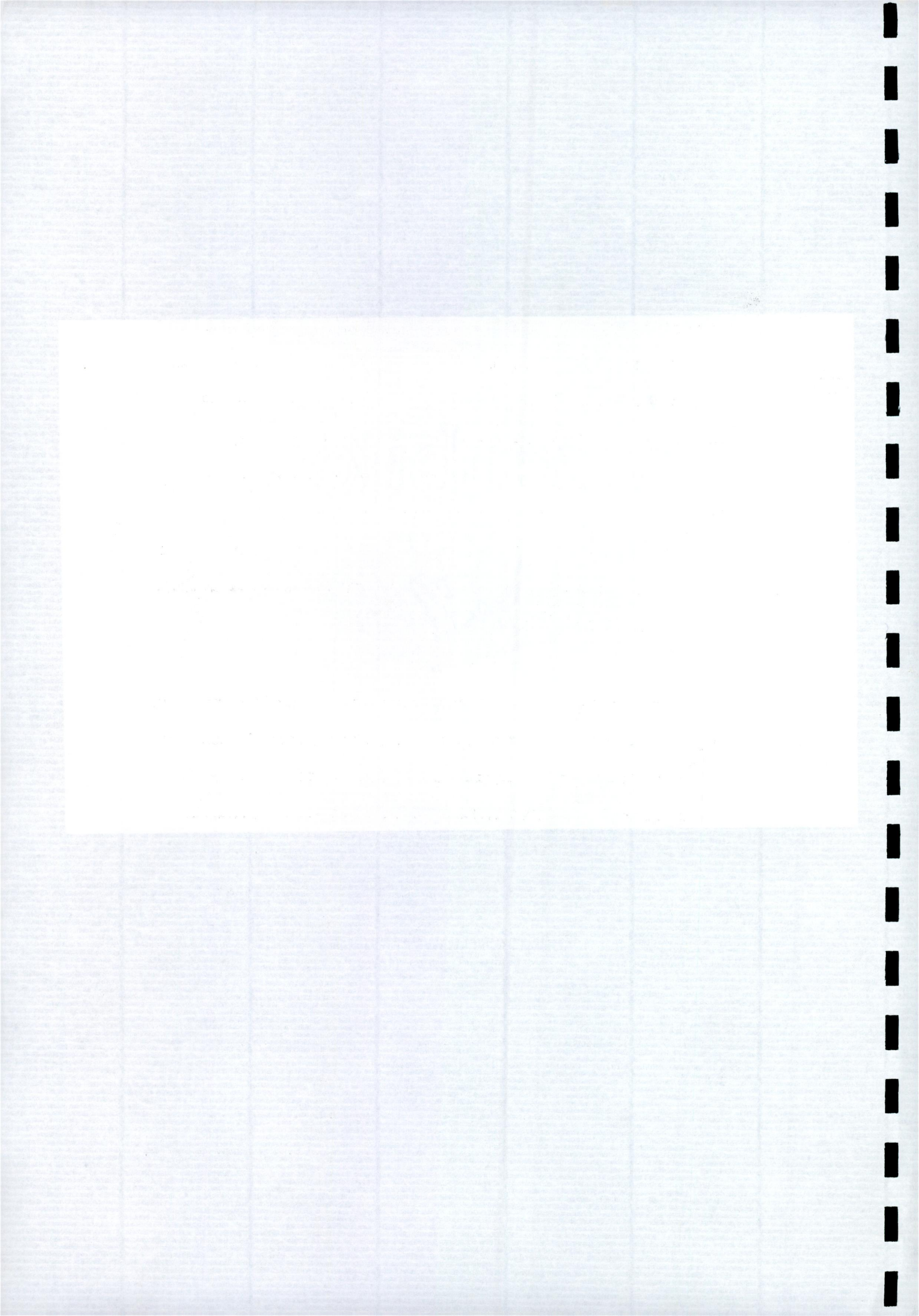


Fig 5: Adolf Luther (1912), Germany
Focussing Space (1976)



suspending light in space is recalled in his account of watching dust particles bounce off each other in projected lights.

In 1960s Paris, a movement called GRAV (Groupe de Recherche d'Art Visual) was founded for the purpose of research into light, illusion, movement and visual perception. Gruppo T, in Italy, was set up on a similar kinetic approach in the early '60s. Turrell feels that his work is in no way related to the light in motion constructions produced by the members of the Nouvelle Tendance (as they were collectively known) in Europe. These forms of Art are mentioned here for the sake of completeness in Turrell's work. John Coplans, in his early discussion on Turrell and two Contemporary artists argues;

"If there is any issue that is crucial to placing Turrell's work in some kind of perspective, it is the question of the relationship of his work to the fluorescent light sculptures of Dan Flavin."¹¹

The most significant similarity between Turrell and Flavin, involves their directness of statement and the unadorned demeanor of their work. Flavin's *Untitled Fluorescent Light*, (Fig.6 page 13) exhibited in Stedelijk Museum, Amsterdam in 1970, expresses his admiration for everyday combinations of bare tubular lamps. Dan Flavin uses fluorescent tubes of light to create an installation piece in which light is the medium. Three kinds of light can be seen, the gaseous light contained within the tubes, the aura that surrounds them, and their reflections on the floor. Donald Judd describes the installation;

"The increasingly distorted and imphemeral quality of the reflections seem to extend the work into a strangely unfamiliar reality in which light floats."¹²

Although Flavin does use light fixtures, he too firmly separates his approach from that of the European Tendance artists. In a certain sense, the very dumbness of the fixtures allow the light to be seen in and of itself, something that gives Flavin's work a perceptual dimension. Turrell's work, like Flavin's, manages to isolate light. Flavin does it by using physical elements

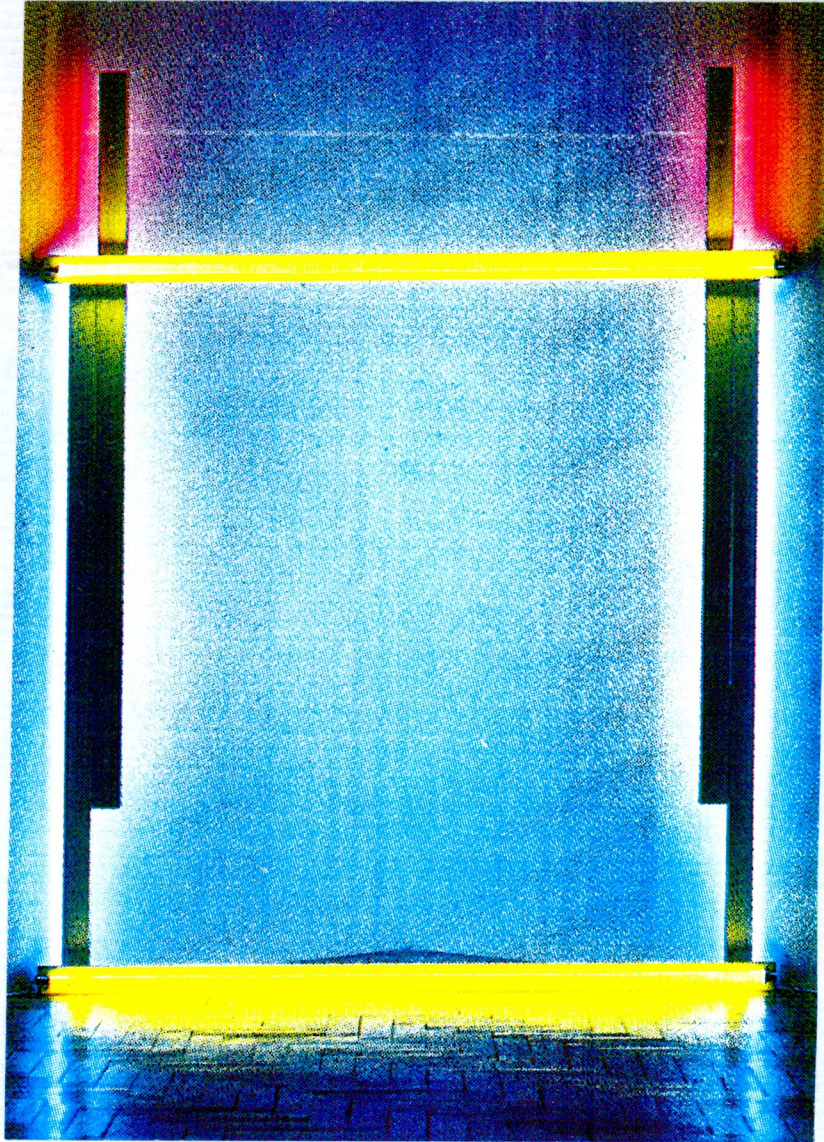
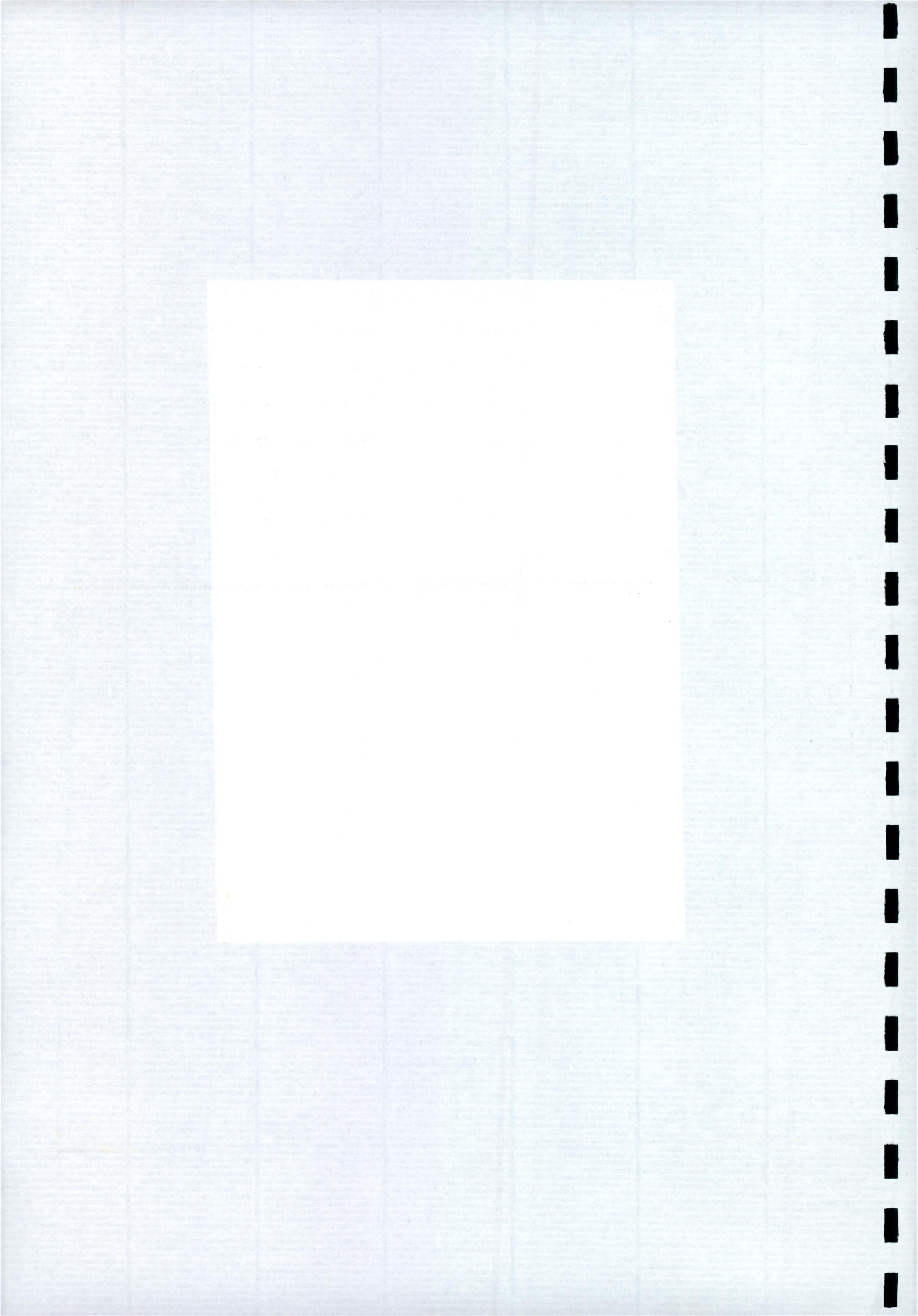


Fig 6: Dan Flavin (1933), USA
Fluorescent Light (1970)



so ordinary they virtually disappear. Turrell does it by using architectural elements so simple they go unnoticed.

Turrells' work is reductionist, just as the modernist practice has been. He makes Art out of light. It has become the Art, rather than illumination revealing Art, object or carrying iconographical messages. Edward Hopper, an American painter, painted people looking into light, whether looking from a balcony or lying in a deck chair, whether they are directing their glance out of a door or through a window, light has always been seen as the bearer of revelation and attracted our gaze. Turrell places the viewer in the same position as the figure who is sitting in Hoppers *Morning Sun*, painted in 1952, (Fig.7, page 14) where direct experience of light would be possible.

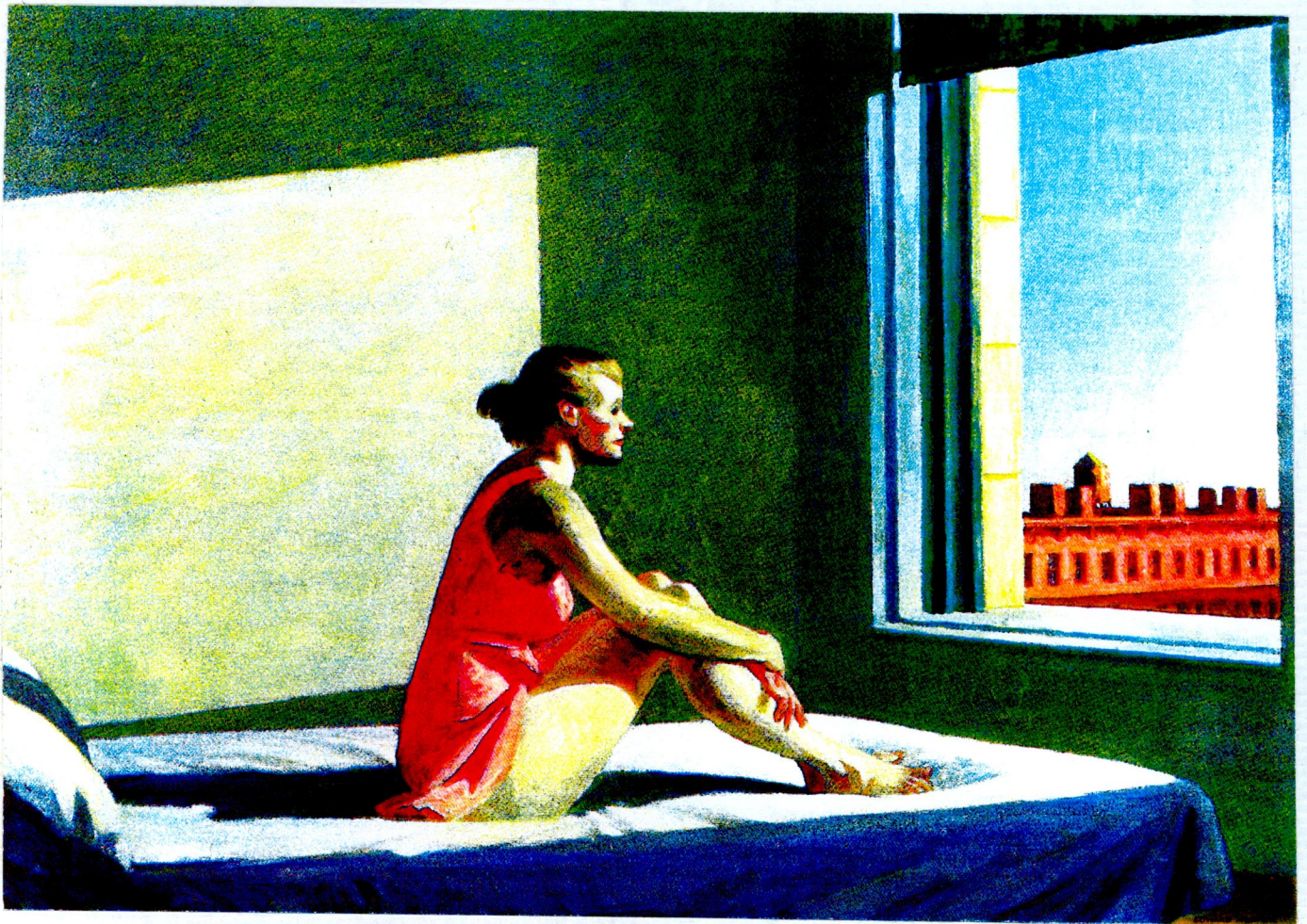


Fig 7: Edward Hopper, USA
Morning Sun (1952)

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Chapter Two:

Sensing Space

Tracing the roots of Turrells' Art from Suprematist spatial concerns to modernist reductive means;
Turrell in relation to his direct contemporaries ; How Turrell has gained access to direct perception
by using light as his material.

On Seeing.....and Believing

The ambiguous nature of Turrells work; How his light images disclose aspects of human vision

Focusing Space

Turrell carefully orchestrates perception to achieve maximum visual awareness; The interactive
structures in The Irish Sky Garden.

The Russian Suprematist painter Kazimir Malevich wrote in 1915:

" Over the past millenia, the artist has striven to approach the depiction of an object as closely as possible, to transmit its essence and meaning, then in our era of cubism the artist destroyed object together with their meaning, essence and purpose. A new picture has arisen from their fragments, objects have vanished like smoke for the sake of a new culture in art."¹

Over the centuries artists strove to create illusionary space within their art as the Cubists in the early years of this century created multiple perspective in both space and time. In 1914-15, influenced by French Cubism and Italian Futurism, the Russian artist Kazimir Malevich made spatial concerns the basis of his Suprematist ideas. The first non-objective paintings, as E.H. Gombrich points out, were "intended to reveal universal truths about space, forms were positioned without regard to the concepts of above and below which allowed them to soar in a universal space of independent structures."² Malevich's paintings abandoned their previous logic dictated by the laws of gravity.

It is these spatial concerns that provide a more important frame of reference for art as "Light in Space" than the history of light in art. James Turrell evokes a similar concern to Malevich, for the capacity of art to create an "ideal space", an environment which the viewer becomes suspended. Like Malevich, Turrell makes the invisible realm of space visible, giving form to volume, rather than creating form within volume. El Lissitzky, Malevich's Russian contemporary, began to develop what he called *Prouns* in 1920-23. *Proun* is an acronym for "Project for Affirmation of the New", which has been defined as the interchanging station between painting and architecture. El Lissitzky's *Proun Space*, originally constructed in 1923, was a room environment: light entered the 9ft cube through translucent panels in the ceiling. On the wall were different groupings of two and three dimensional suprematist elements. As the viewer moves around the room it becomes apparent that there is no one fixed position.

Boris Brodsky has claimed that "all subsequent experiments in modern art which include the viewer in relation to an environment derive from this first attempt."³ De Styl artists in Holland, led by Mondrian and Theo Van Doerburg, were attempting to create a new universal language of art,

each attempted to integrate art in all aspects of life. Both El Lissitzky and Mondrian created spaces that could alter the public mind. Lissitzky in reconstructing the gallery space made the first serious attempt to affect the context in which art and spectator meet. Jan Butterfield states in relation to Malevich, Lissitzky and Mondrian that "such early room environment works clearly have links to the site-specific, architecturally involved work created by the Light and Space Artists"⁴

James Turrell is one of the most prominent figures in the group, known as Light and Space Artists, mentioned above. Turrell in the mid 1960's was actively involved in finding new ways of making light visible. His approach helped to inspire a loosely defined direction in Southern California Art that has been called the Light and Space Movement. Turrell himself feels that there really was no Light and Space Movement because there was no real cohesion among the participants and very little critical writing surrounding the work. But despite the fact there was no formalized movement, the existence of a body of shared interest among a number of diverse artists working in California in the late 1960's and early 1970's was clearly there. The artists who were most involved with using light, in addition to Turrell, were Robert Irwin, Douglas Wheeler and Maria Nordman. Turrell, Irwin and Wheeler were associated with one another personally and directly during the late 1960's. The three artists were connected together in critical literature that emerged during this period, particularly in the writings of John Coplans.

In 1967 and 1968 just when Turrell was producing his *Projection Pieces*, Wheeler was creating plexiglass paintings equipped with light sources (fig 2, page 17). The paintings emitted light and engaged the walls and spaces of the gallery rooms in which they were displayed. Wheeler extended his panel approach to include the entire end wall of a room in the Flow Ace Gallery in London. The untitled work was among the earliest light environments exhibited commercially.

The pieces share visual characteristics with Turrell's *Shallow Space Constructions*. In these constructions, which were initially mocked-up inside Turrell's Mindota studio in 1968, a secondary wall was positioned in front of an existing wall at the far end of the room. The secondary wall is constructed so that slits occur at one or more edges of the partition. The partition wall is then backlit

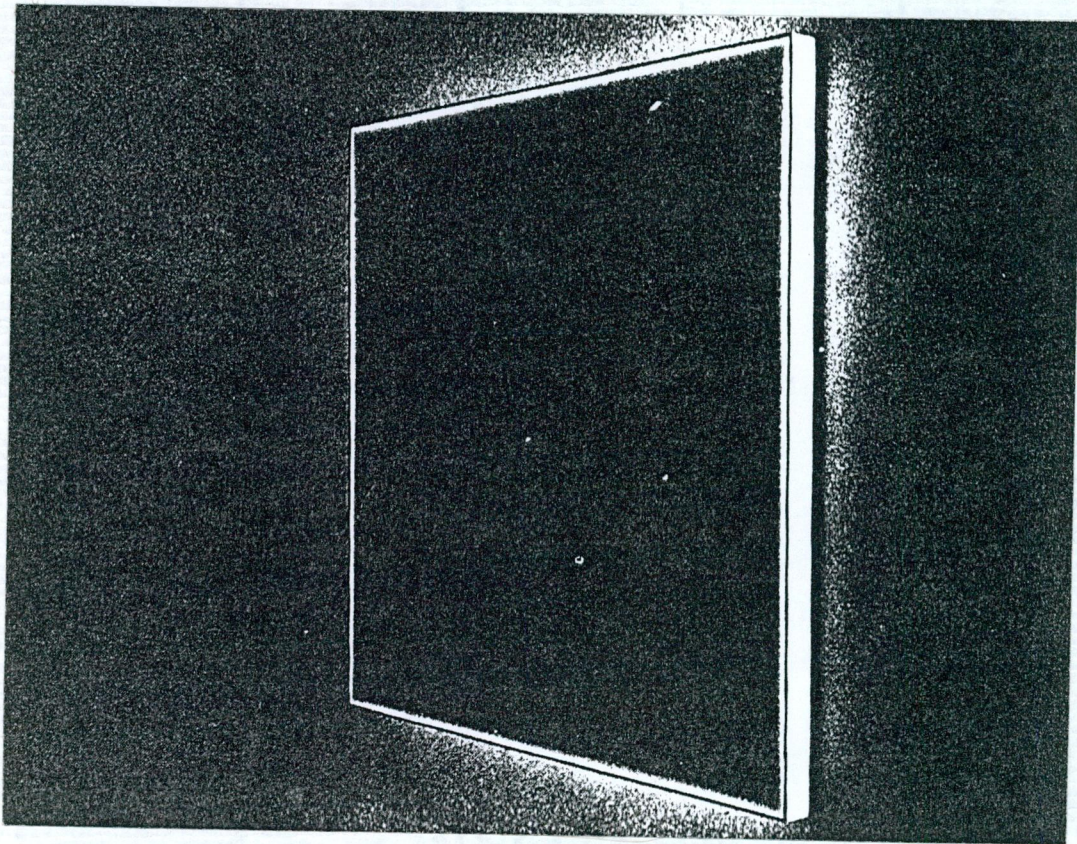


Fig 1: Douglas Wheeler
Untitled, (1967-70)
Installation Ace Gallery, London

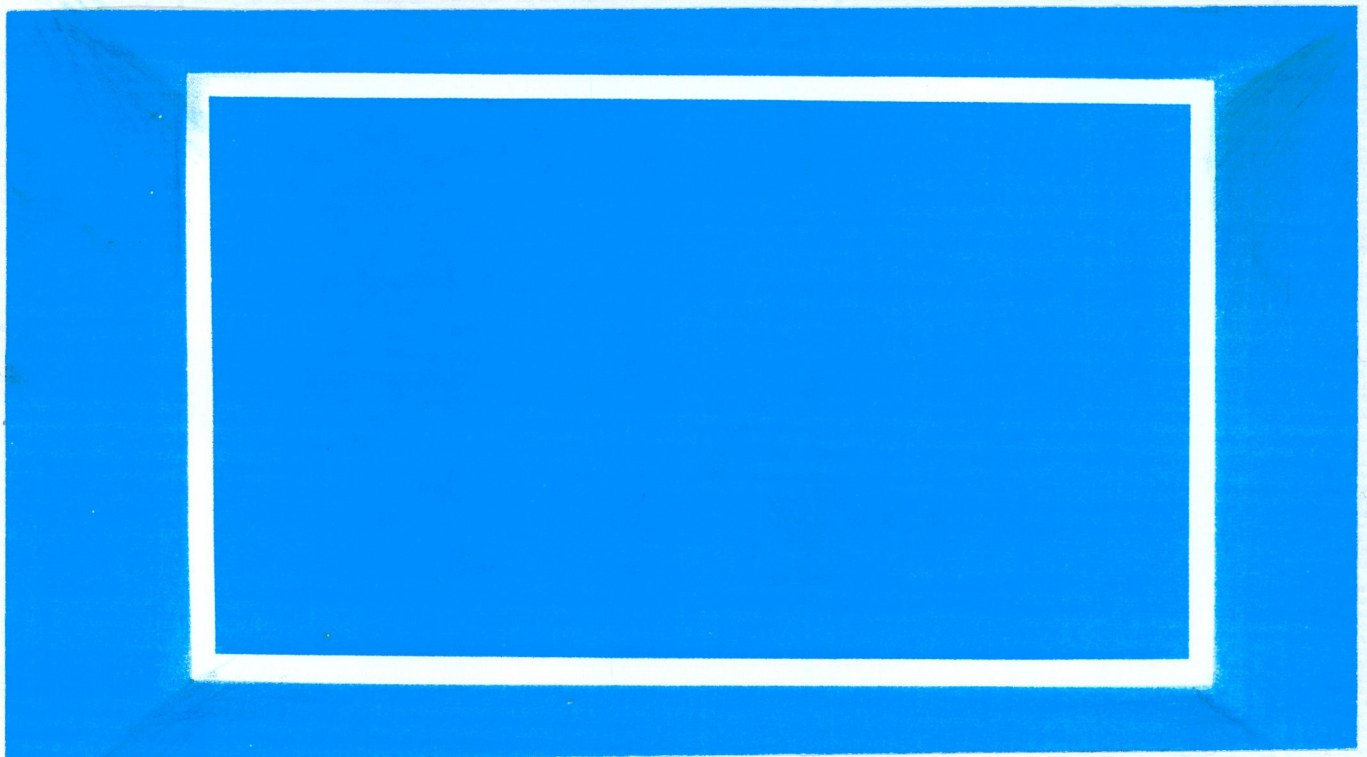
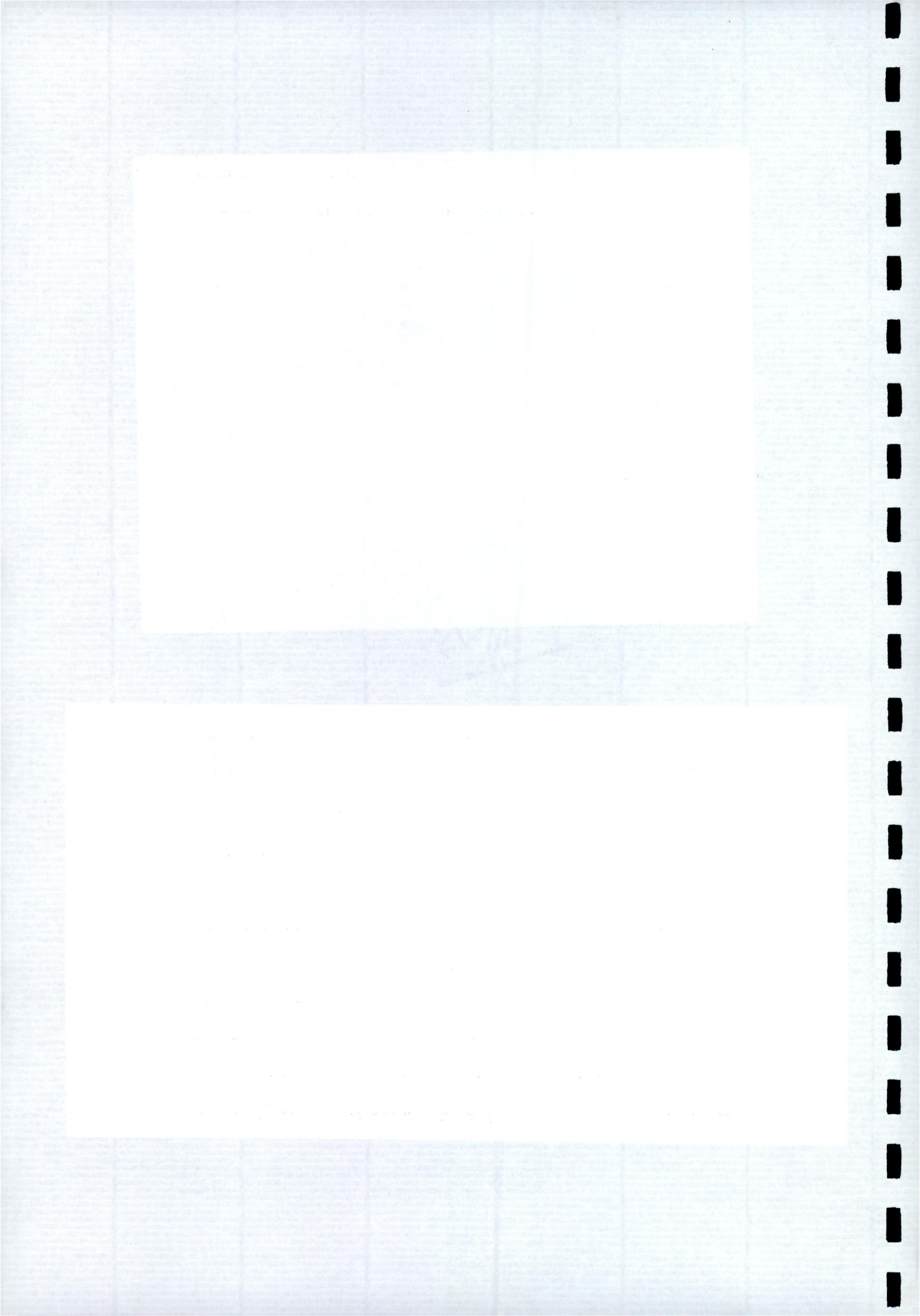


Fig 2
James Turrell, *Rayzor*, Fluorescent and natural light,
National d'Art Moderne Paris 1982



with fluorescent features and the light shines through the seams around the partition, In perceptual terms, the light tends to disintegrate the true characteristic of both the partition and the space around it. The forward wall appeared to be translucent, the perspective of the room is obscured by the light. The spatial manipulation in the *Shallow Space Constructions* is more fully realized when the slit is extended all the way around the partition wall as it is in *Rayzor* (fig 3, page 17) The light in *Rayzor* changes the way depth is, the three dimensional space appears two dimensional. John Coplan says that "perceptually the entire space seems to fold up into a shallow space"⁵. *Rayzor* was constructed in front of a large window in Turrell's studios. The piece was thus generated by a combination of fluorescent and natural light.

The *Shallow Space Construction* were not formally exhibited until Turrell's exhibition at the *Stedelijk* Museum in 1976. Turrell's earlier *Projection Pieces* are visual counterparts to the impression of two dimensionality perceived in *Shallow Space Constructions*. In the *Projection Pieces*, which Turrell was working on in the early 1960's, creates a sense of three-dimensionality out of empty space. Turrell's highly finished walls enable him to dissolve them using light. Craig Adcock attributes Turrell's experiences in building boats and restoring classical automobiles and has been central to his development as an artist. She compares the amount of energy taken to "make old automobiles and aircrafts as good as new, to expending extra amounts of energy required to get the walls and other physical components of his work to disappear so that the light could be seen"⁶

Like the perceptual concerns close to those that inspired Turrell, Irwin's paintings led him to perceptual concerns largely through the consideration of surface finish. For Irwin's paintings were not simply objects. Irwin himself says of his Dot paintings: "When viewed from a distance, the dots themselves could not be resolved, and they created a mist or haze of colour that seems to float in an indeterminate space"⁷ These paintings, which were exhibited in 1965 marked the beginning of Irwin's light and Space involvement. The first year was spent developing a canvas that is almost imperceptibly bowed to form a convex square set out slightly from the walls. At first glance, these paintings appear to have no image, but when the viewer allows his focus to soften, they begin to

throb with energy, created by thousands of small red and green dots placed side by side, moving out from the centre. In viewing these paintings it is not what is seen, but how it is seen that becomes critical. Irwin's paintings were intended to intensify the viewer's awareness of his active role in the perceptual process - Something that could be said about Turrell's light pieces. Craig Adcock makes the comparison: "Turrell objectifies light and Irwin dematerializes objects. For both the subject is seeing."⁸ Irwin and Wheeler, as well as Turrell, reduced things to almost nothing, unlike their contemporaries who still incorporated various materials in their work. John Coplan reviewed Light and Space artists: "In the nascent and essentially undeveloped-Light and Space Movement, Turrell was one of the artists who most clearly seized the opportunity of using light as a "material" and visual perception as a medium. He understood light's power."⁹ More than any other artist working in perceptual directions during the late 1960's Turrell has remained committed to using light in space. In comparison to his contemporaries Turrell took the process of finely crafted surface one step further by getting rid of the object altogether. Willoughby Sharp, points out how important Turrell's decision to use only light was:

"Turrell's breakthrough - and it was one of the major achievements of the decade - was that he has broken out of the need for material objects to create highly intense aesthetic experience which transformed the spectator's apprehension of environmental qualities"¹⁰

The directness of Turrell's work can trace its roots to Suprematism and they develop through cubism, constructivism and minimalism particularly in the reduction of images to geometric abstraction. Turrell says that he was never directly influenced by minimalist Art. Craig Adcock in a critical discussion of Turrell's work attributes the similarities as more a matter of shared historical background than direct influences. The frankness of his approach is comparable to minimalism and he acknowledges that he appreciated the directness of such sculpture, particularly as it was practiced by his teachers Tony De Lap and John McCracken in the late 1960's in LA. Both Tony De Lap's and John McCracken's work had been described in terms of their directness. John Coplan points out that their work "gains power through their directness and refinement of their surface finish", that the "observer is forced to see relationships and surface effects not only afresh but in a totally new way."¹¹

The term "minimal art" was first used by Richard Wollheim in Arts Magazine, 1966, New York, to describe works which were minimally conceived; Duchamps readymades, Robert Rauschens combines and Ad Reinhardts non referential paintings. For Wollheim, the historical importance of minimal works "is largely given by the way in which they force us to reconsider what it is to make a work of art". Turrell's relationship with minimalism can be articulated in Wollheims terms: as an artist he is willing like Duchamp to stretch the boundaries of art and to incorporate traditionally non-artistic categories of experience, such as breathing , listening or seeing in the art process. In a discussion on the *Art and Technology Program* in Chapter three, aspect of Turrells' work will be discussed in these terms.

Time is a third factor in Turrells' work after Light and Space. In Turrells' *Dark pieces* he creates darkened chambers which the viewer enters. In works such as *Plaedis*, *Juditos Night* and *Thought when Seen* the viewer is placed in darkness, it is only after a certain length of time that the viewer will be able to distinguish projected lights on the walls of the space. This means the viewer must make a commitment of sustained viewing over time. This is a characteristic that Turrells' work shares with the paintings of Ad Reinhardt. Reinhardt may be seen as taking painting to similar thresholds of perception with his black paintings, such as *Abstract painting* (1963) . These are works of extreme reduction , they reveal themselves only after a period of close looking . At first the canvas appears as a black monochromatic square. Within the square as the eyes adjust to the field, various tones of black gradually disclose the form of a Greek Cross.

This involvement of the viewer over a period of time is not without criticisms. Michael Fried in his discussion on *Art and Objects* considers that minimalist preoccupation with time is its primary weakness. He suggests that a great work of art can be recognised instantaneously and does not involve occupying the viewers interest over a long stretch of time. Philip Leider isolates a characteristic of Irwins work - and one equally intrinsic to Turrells' - that was central to Fried negative categorization. Leider points out that "A certain measurable duration or time is necessary before one can even see what there is to be seen, so that the viewer will either see the painting the Irwin wants him to see it or he will not - quite literally - see the painting at all"¹²

In Turrells' *Dark pieces*, which will be described in more detail in chapter three, it takes time to adapt to the light conditions, and Irwins *Disk Constructions* . To distinguish between the effects of the shadow on the walls from the colour of the disks. In relation to the time it takes to appreciate these works, Craig Adcock suggests that , "Once the eye has become fully sensitized the immediacy of these works is more powerful than instantaneous stimulus"¹³

ON SEEING.....AND BELIEVING

Turrells work goes beyond Minimalism by dealing with the complexities of seeing; they are not objects in space but light in space. Mauric Merbeau Ponty questions the tangibility of such works, "How can anything ever really and truly present itself to us, since its synthesis is never a completed process, and since I can always expect it to break down and fall to the status of mere illusion."¹⁴ In dealing with immaterial phenomena and the act of perception, Turrell dispenses with the need for tangible objects. In a discussion with Clare Farrow, Turrell says, "I dematerialize the physical walls and I materialize the things that we tend to think of as being intangible"¹⁵

Turrells work has often been described in terms of illusion and has been variously termed in relation to "illusions of depth", light that seems to float walls that "appear to dissolve". The word illusion is unavoidable in this respect. Language can often be a barrier as well as an aid to communication, the word "illusion" being a case in point. Turrell himself says that "it is not exactly correct to speak of images as illusion, they allude to what they are. People have talked about illusions in my work but I don't feel it is an illusion because what you see alludes to what in fact it really is - a space where the light is markedly different."¹⁶ Turrell works with and pushes at the physical and cultural limits of perception. As a result, the workings of his light and space often seem mysterious. Turrells' earliest works consisted of high-intensity beams of light projected onto flat walls or into corners. The visual effects of Turrells *Projection Pieces* as they were collectively

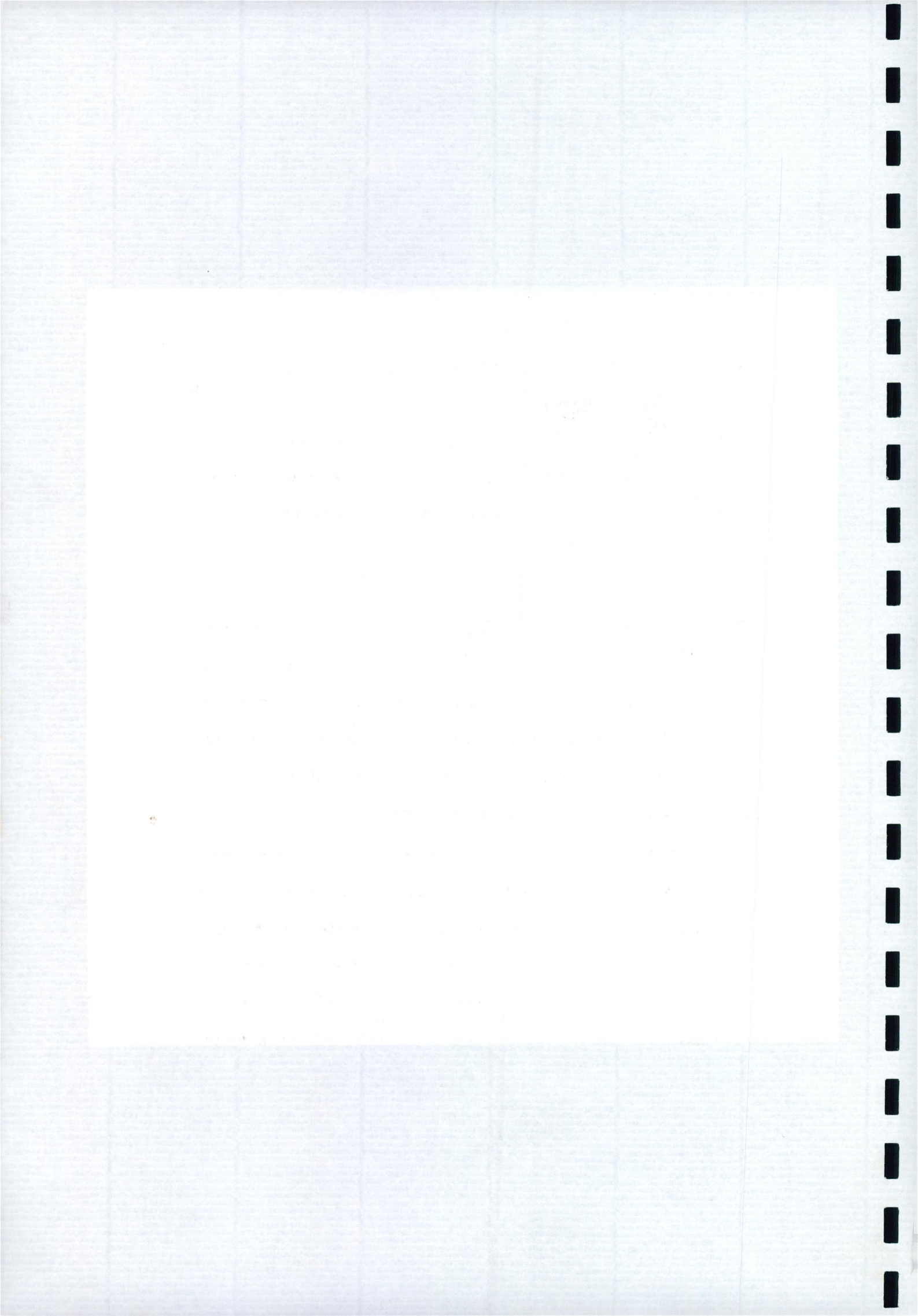
entitled, were varied. following Turrells departure from graduate school in 1966, he rented the old Mindota Hotel in Ocean Park, California. Over the next two years, he worked on his studio spaces, closing off the studio rooms from all external light, converting them into pure white boxes. It was in this space, Turrell created a series of *Projection Pieces* that developed out of *Afrum-Proto* (fig 3, page 22). Craig Adcock describes their varying effects. "Some seemed to float just in front of the wall, some seemed to be attached to the walls, and some seemed to penetrate the walls."¹⁷ In *Cross-Corner Projections*, slide-sized metal templates were used where Turrell cuts irregular hexagons into these templates and projects the light through them. Had light been projected through these holes onto a single wall surface, the light image would have been perceived as flat, two dimensional shape , But in the corners the ambient light illuminated the walls above and below the light projection. In works like *Afrum* the light created solid-like forms that seem to float in front of the walls. Craig Adcock continues to describe this piece:

"By approaching the walls near the corners, one could see that the images consisted of flat light on flat walls, when one stepped away from the corner, back into the centre of the room, the images again took on a kind of solidity. *Afrum* seems to be simultaneously flat and three-dimensional. They seemed to consist of energy fields."¹⁷

Part of the interest in Turrells' work involves looking versus seeing. His pieces force us to see the light because there is no object to look at. By presenting the viewer with conflicting information , questions about how space is perceived are posed. It is in these terms that Turrells' projections are capable of producing illusions: they contain information about the external world, ambiguous though that information may be. Turrell emphasises that the quality of illusion in his work is not intended to disorientate or confuse people, instead he wants to make people aware of seeing. Dr James J. Gibson, a perceptual psychologist, points out that, "the classical illusions familiar from perceptual psychology raise basic questions about the viewers' relationship to the world"¹⁸ By isolating light as his material , Turrell discloses aspects of vision that are normally taken for granted, basic questions about how we see, and does what we perceive to see , really exist or is it a construct of the mind. Turrell speaks about the light that is seen in dreams, that which is in the imagination.



Fig 3: James Turrell
Afrum-proto
Mendota Hotel Studio, California 1966,
Photo; James Turrell



"What takes place in viewing this space, is wordless thought, Its not as though its thinking and without intelligence. It is that it has a different return than words"¹⁹

Maurice Merleau Ponty, a thinker who was a very significant phenomenologist in the studies of perception, constructed his theories around the same kinds of perceptual issues that Turrell places at the centre of his art. In *The phenomenology of Perception*, the philosopher discusses the basic dilemmas involved in confronting the world with the senses,

"The difference between illusion and perception is intrinsic, and the truth of perception can be read of only from perception itself. If on a sunken path, I think I can see, some distance away, a broad flat stone on the ground, which is in reality a patch of sunlight, I cannot say that I ever see the flat stone in the sense in which I am to see as I draw nearer, the patch of sunlight"²⁰

Turrells' work reveals the intrinsic differences between illusion and perception. The light that creates the impression of a stone in Merleau Pontys' description could be compared to what appears to exist when viewing Turrells *Cross-Corner Projections* from a distance. When seen up close, in the case of Turrells *Afrum*, when you enter into the light, the truth becomes apparent. Merleau Pontys' example of the stone and the sunlight is an occurrence in nature; Turrells' is an interpretation of natural phenomena in art. The most impressive work, where Turrell alters our perception of space, is viewed from inside the "Crater" in Turrells most recent and ambitious project, *The Irish Sky Garden*. It is a long leap from the closed interior of Turrells *Projection Pieces* to the open-expanses of his sky observatories, but the perceptual focus is similar. By carefully orchestrating the interaction of light and space he intends to "form things which do not exist", as he noted in a conversation with Craig Adcock. The Irish Sky Garden and other exterior works of Turrells, like the *Roden Crater* in Arizona involve the action of natural light-shaping space.

The Irish Sky Garden, which is now in its embryonic stage (fig 6, pg 26), is located at Liss Ard one mile outside Skibereen, County Cork. Turrell has included existing features of the terrain in his overall plan. There will be four interactive structural elements; a crater, a tumulus-like

mound, a truncated four sided pyramid, and a rectangular inclosure. Each structure offers a different view. He points out that his "aim is to remove the beam in one's own eye and to teach sight seeing in quite a different sense"²¹ The sky garden will eventually be embedded in an environmental park.

When I visited the site in early January 1994, only the initial traces of the changes and structure were visible. Although the 'Crater' was not fully completed, it was in practical terms already "working". The 'Crater' is an elliptic mound, hallowed in the center and gently rising about thirty feet on all sides. Here, as from the Roden Crater, one is afforded a view of 180 degrees. Using a natural setting, Turrell has generated a *Ganzfeld*, a term I will define in chapter three.

Initially what struck me when I entered the 'crater' was its sheer scale, surrounded on all sides by sloping walls of upturned earth, my attention was drawn upwards into the sky. Framed by the craters rim, the sky departs from its otherwise flat and spatially undefined status and gains a new roundness: the edges of the sky seemed to be close to the upper margin of the crater extending upward like a dome. On leaving the crater the effect was even more impressive, as I became aware that the sky does have shape in open expanses, but more like a flattened soup bowl extending to the horizons. Turrells reason for using the shape of the crater was the "affect the perception of large amounts of Space"²². This work is informed by the unusual, or at least generally unnoticed impression of celestial vaulting, Marcel Minnaerts describes this everyday phenomenon in *The Nature of Light and Colour in the Open Air*²³

"The space above us does not generally give the impression of being infinite nor of being hollow hemisphere spanning the earth, it resembles, rather, a vault whose altitude above our heads is less than the distance from ourselves to the horizon"²⁴

Turrells "Crater" in a sense is a focusing device. The most important aspect of it is to renew the basic human urge us to consider things, to pay attention and become aware of seeing.

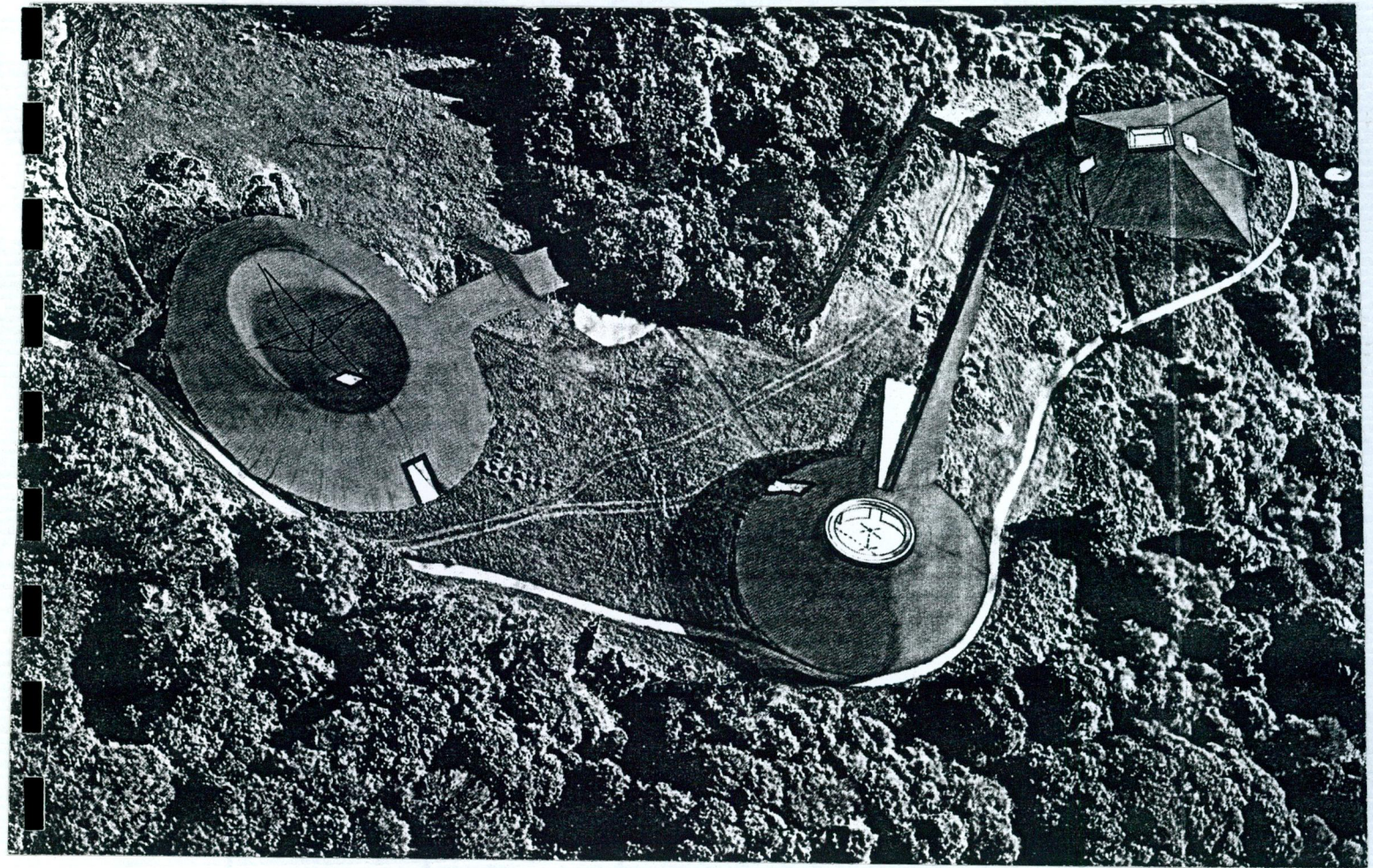
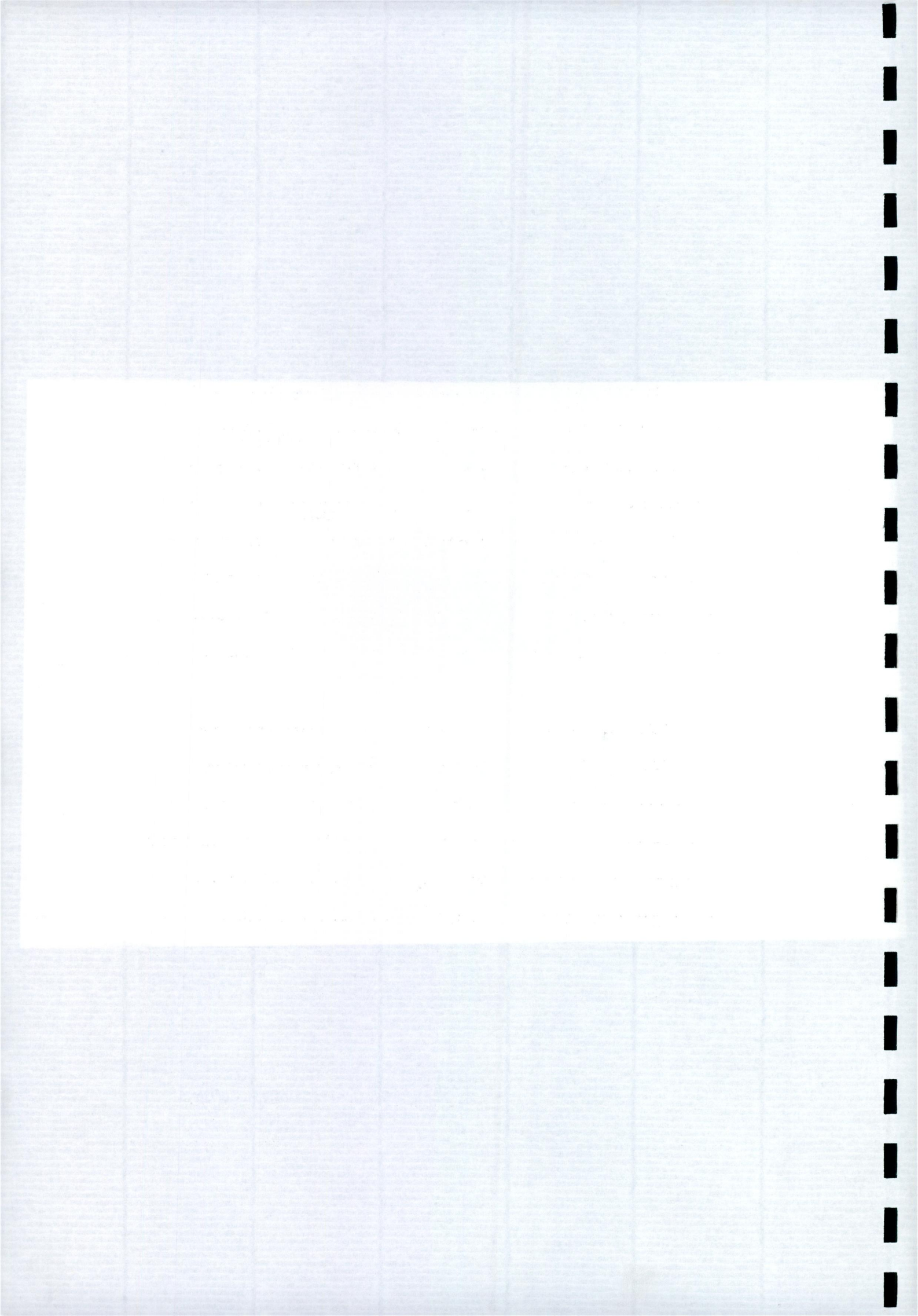


Fig.6: James Turrell
The Irish Sky Garden, Skibereen, Co. Cork
 Overall site plan



Focussing Space

In Turrells' *Sky Garden* there will be no actual paths to guide the viewer. A system of walls gently dictates the direction of our gaze and obstruct a panorama view. As Brian Hennessy, the project co-ordinator explained to me, on my visit to the site, that "View-points and perspectives exert an irrepressible attraction that serves as a guide."²

The visitor is received at a dolman-like portal, which signals isolation from the outside world. Before reaching the entrance, the visitor is confronted with a high stonewall structure that obstructs the view. The unexpected opening frames a breathtaking panorama, a clear contrast to the obstructing wall. Depending on personal feeling the visitor can move first to the nearby elliptical *Crater* or to the more distant *mound*. Entrance to both the *Crater* and the *mound* is afforded through dark corridors, the full force of daylight within these structures is only experienced at the last few steps. The impact of the light in these spaces is made even greater because the visual system has adapted to low light levels in the entrance.

Using clear and descriptive terms Brian Hennessy enabled me to envision, how Turrell wishes to carefully orchestrate perception in the *Irish Sky Garden*. On seeing the features that already exist and, my discussion with Brian Hennessy, the following description could be ascertained. One leaves the *mound* via a funnel-shaped ramp, a wall rises on the left blocking any view. Proceeding down the decline, one notes there is a wall on the left, too, and in the distance yet a third wall, enclosing the meadow like a yard. This gives a sudden feeling of enclosure. Only the sky is seen. A flight of steps will hint at the way over the wall. Reaching the top of the steps, an unexpected and dramatic view overwhelms the visitor.

A longer steeper flight of steps leads down to the lower rear side of the *Pyramid*. Within the cubic chamber of the *Pyramid*, a section of the sky is framed, rendering a flat sheet of sky, in contrast to the celestial vaulting above the *Crater*. The exit from the *pyramid* is an ascent. The

steps lead to a terrace, for the first time an unobstructed view of the landscape is visible. Here, as it has always been, the view is breathtaking, a full view of the reed encircled Lough Abisdealy Lake, can be seen, above and beyond the green undulation of the west Cork Landscape, stands the peak of the mystical mountain, Corrig Fada. At this point a stone bench will invite the visitor to engage in quiet and remote contemplation.

In the *Irish Sky Garden* Turrell offers the observer the possibility to enter a state beyond mere looking at the world. The inner volumes of the chamber thus shape our perception and awareness of light and space as they link earth and sky in the neat frames of their openings, by gently ordering peoples confrontation with visual experience, the act of looking becomes compelling.

Chapter Three

"Intranaughts exploring inner space"¹

Turrells collaboration in *The Art and Technology Program*; His investigations of perception that are outside normal perimeters.

Perceptual Edges

Turrells Art operating between the learned limits and physical limits of seeing. Through the controlled use of light and space, he has continued to define his work in terms of direct perception.

" The sciences of life have need of the artists' intuition, and , conversely, the artist has need of all that these scenes can offer him in the way of new materials on which to exercise his creative powers."² Aldous Huxley suggests here that there is a circle of mutual interdependence between Art and the sciences. Through the ages artists have appropriated technology whenever it helped them to make the jump from fantasy to fact with greater ease. In Chapter One, I have mentioned how Edison's invention of the incandescent lamp offered new possibilities for the artist. In any age the artist of genius usually finds his proper materials. For Turrell light is his material, he is not interested in using high-tech hardware in creating his images. It is more in the field of research that Turrells appropriates modern science, in investigating aspects of human vision and spatial perception.

Relationships exist between the creative aspects of both Art and science, and Turrell makes use of such relationships. Turrell however, states that his works are not demonstrations of scientific principles, that his investigations are perceptual in nature. He maintains that thought itself can expand and modify space, even in the world of sciences that attitudes, desires and values can affect understanding. Turrell studied Perceptual Psychology at Pomona College, California, and received a degree in 1966. From this intellectual basis, he operates in the gap between knowledge and intuition. Robert Shapley, discussing the similarities and distinctions between the two disciplines, uses terms that are applicable to Turrell;

" I believe that science and Art are the modern intellectual descendents of magic. All these human activities are intellectual ways of dealing with and perhaps understanding the mysterious world outside our heads. Magic is the most ancient method of controlling nature. Science and Art are the magic of modern man."³

In late 1968, along with his contemporary Robert Irwin, Turrell was given an opportunity to participate in the *Art and Technology Program*, as initially conceived by Maurice Tauchman in 1966, in association with the LA Museum of Art. This program was intended to put high technology corporations in contact with artists and enabled Turrell and his associates to

explore perceptual matters without conceptual or financial restrictions. Turrell and Irwin were put in contact with Dr. Edward Wortz, a physiological psychologist who headed the life-science division of the Garrett Corporation, an aerospace team that was doing research for NASA's Apollo program. Dr. Wortz was trying to find out more about the problems that astronauts were likely to encounter in the environment of outer space or on the surface of the moon.

Both Irwin and Turrell had already been pursuing perceptual matters in their work, and they believed that the research being done by the aerospace team was relevant to their Art. For the artists "all information where man's sensual awareness are tested"⁴ was potentially interesting. Jane Livingston remarks in the catalogue about the program, that: "It was immediately evident that Dr. Wortz interests and field of research was precisely parallel to those of the two artists."⁵ The scientists and engineers were using sensory deprivation chambers to test visual and aural perception in the hope of a better understanding of what was likely to occur in outer space. Turrell had been attempting to close out all light and noise from his Mendotta studio in order to create a space where he could make the light visible. Turrell, in an interview with Julia Brown, explains his reasons;

"Where there is an abundance of light coming from various sources, it is like trying to make music where there is a lot of sound, only in silence can music bring out other sounds. Light can only be created in darkness."⁶

What Turrell and Irwin were interested in was what the scientists and engineers were learning about perception in the process of designing spacecrafts and spacecraft instrumentation. In the weightlessness of outer space, what happened to things like knowing which way is up or down in terms of sound, how much sound was needed to maintain a sense of well being; these were among the questions the aerospace team were investigating. Like Dr. Wortz, Irwin and Turrell were interested in situations that were outside normal perimeters. Irwin had been pushing physical objects to a point where they appear unsubstantial and

unreal. Turrell had been pushing the limits of perception further by making insubstantial light appear physically present.

There existed a complementary source of information between the two artists and Dr. Wortz. Jane Livingston says of the collaboration:

" Turrell having had a considerable training in psychology at Pomona College, had more direct access to literature in the field and had a greater understanding of experimental methodology than Irwin. Bob, however, had for years been intuitively dealing with certain subtle aspects of psychology of perception through his work."⁷

Dr. Wortz was conversant with both Art and perceptual psychology; therefore the communication barrier that exists between Art and science did not become an obstacle. The fact that psychology is in between the physical and social sciences also contributed to a successful interaction.

One of the most interesting projects that Turrell, Irwin and Wortz discussed involved combining a *Ganzfeld*, (a total visual field), with an *Anechoic* chamber (a total aural field). Dr. Wortz is cited by Jane Livingston in her discussion on the *Art and Technology Program*, in defining the term *Ganzfeld*, "which is a visual field in which there are no objects you can take hold of with your eye, its' a complete 360° field, or at least it has to include a total peripheral vision, its unique feature is that it appears to be light filled. That is, light appears to have substance in the *Ganzfeld*."⁸ The proposal for the museum was drawn up by Turrell, outlining procedures to focus the viewer's awareness back onto his or her own perceptions.

An ordered sequence of spaces through which the viewer would move was proposed. First a waiting area where subtle sounds and variation in illumination were used, this space was intended to engender a lingering anticipation and a form of participation. In the second

darkened space, the viewer would have no sense of space or arrangement. Under these controlled conditions of "sense isolation", the viewers focus would fall back on his/her own ability to see or hear. Seated in a reclining position in this space, the participant would by hydraulically lifted up into a third upper chamber; here, at first, there would be no light, sound stimuli; gradually light and sound stimulus would be introduced. The viewer would descend back into the *Anechoic* chamber, which contains no sound, and exit through a tunnel.

Perceptual Edges:

The sequence of experiences was intended to lead the viewer through "a state of personal awareness, where they were paying attention to the sight and sound of their own perceptual systems."⁹ The manipulation of perceptual states using dark *Anechoic* chambers is significant to the direction Turrell himself was to take in later years. During the 1980s, Turrell embarked on a series of *Dark Pieces* which recall some of the early proposals that were made for the *Art and Technology Program*, in Pomona. In one of these Turrell proposed that he would;

"investigate the experience of gradually introducing very low light levels into an *Anechoic* space, after the person has been in total darkness and soundlessness, [we want the] light to border on its questionable existence."¹⁰

In Turrell's *Dark Pieces*, there is almost no light present, the visual systems ability to adapt to low light conditions are central to their appreciation. The *Purkinje shift*, as the phenomenon of light and dark adaptation is known, is just one of the unusual aspects of human vision that informs Turrell's *Dark Pieces*. The basic theory of the *Purkinje shift* is described by William M. Dember in *Psychology of Perception*; "Sensitivity to light is not an invariant quality of rods and cones; it also depends upon prior activity of the visual system. Thus under stimulation by light, the visual system progressively loses its sensitivity, while sensitivity is restored during periods of non-stimulation."¹¹

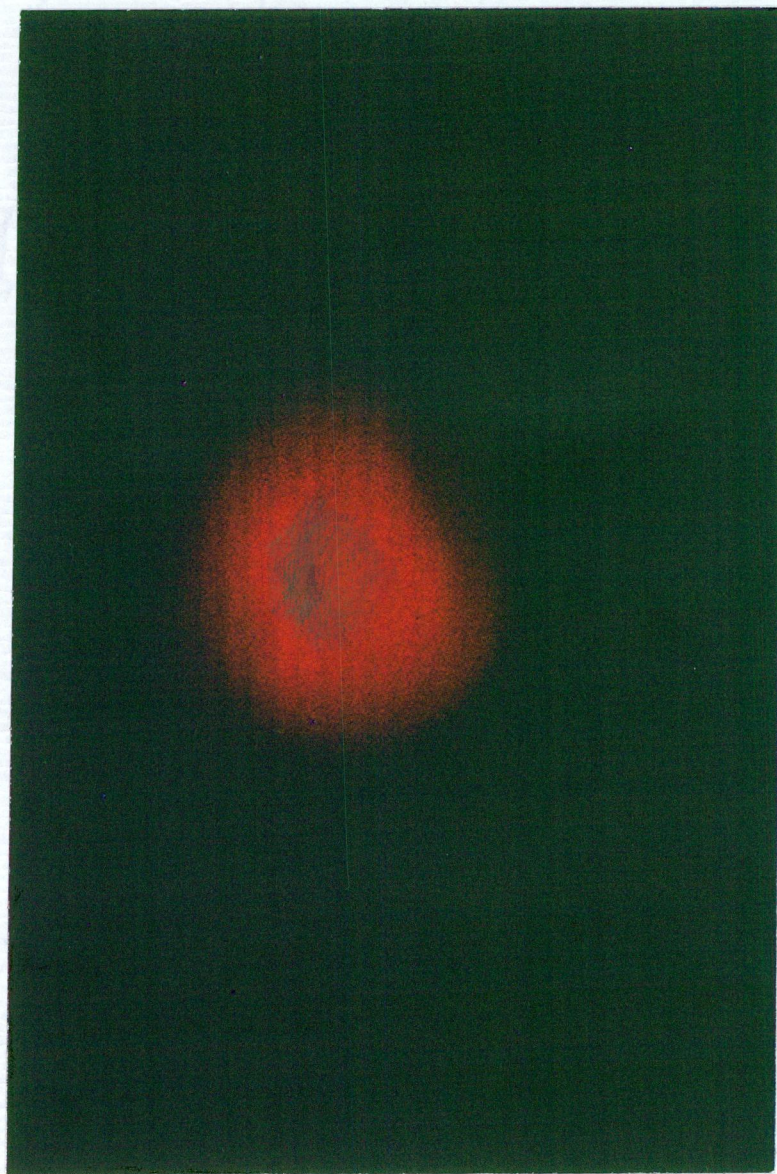


Fig 1: James Turrell
plaedis, Mattress Factory, Pittsburg (1983)



Within a dark, quiet room Turrell wants his viewer to wait patiently and remain open to the experience. In *Plaedis* (Fig.1, page 33), one of Turrells' *Dark Pieces* , which was permanently installed at the Mattress factory in Pittsburg in 1983, he projects a dim area of blue light surrounded by a dim area of red light onto the far wall of a darkened chamber. The juncture of blue and red light overlaps, gradually the colour shifts and becomes more blue while the red moves towards the edges of the globular shape, this perceived colour change is also a factor of night vision, that in darkness, as Dember explains "maximal colour sensitivity is 60 nanometers towards the blue." Kenneth Baker, in a review of this piece, offers a description;

"Compulsively you focus on what light you can see.... it starts to pulse, it moves towards you and, loses its definition as something distinct from the activity of your own sensory apparatus. Gradually aided by the total silence of the soundproof space, it dissolves your normal sense of your body as a boundary dividing what you see from what enables you to see it."¹²

The pulsating effect of the light that Kenneth Baker describes is not a physical change in the intensity or colour of light. It is the visual system's reaction to low light situations. In the darkness that enfolds Turrell's dim projections, viewers cannot distinguish between the random flashes of light within their own visual systems and the actual light coming into those systems through the eyes. In the *Dark Pieces*, Turrell explains that what is seen is similar to perceived "colour that buzzes and then disappears" ¹³ when our eyes are closed. It is this internal light that Turrell evokes.

One of Turrells most recent works is at the Henry Moore Sculpture Studios in Halifax in Yorkshire, *The Gasworks*, which was installed in December 1993 engages the viewer on similar thresholds of perception. In contrast to *Plaedis*, *The Gaswork* addresses this threshold on the other end of the scale, where the viewer is immersed in coloured light. *The Gasworks* consists of a *Ganzfeld* the spectator lies on a platform and is manoeuvred into

the interior of a sphere. Charles Hall, in his review of this work, describes the first experience as: "breathtaking - you slide into a space expecting to see an arched ceiling above you, but you are confronted with a blue so pure and delicate it seems as though it might be twenty feet above your head or it might actually be the sky."¹⁴ As the colours change and intensify, he describes a "sense of timelessness."¹⁵ Eventually the cycle of colour-bathing returns to blue. This return to the soothing atmosphere of blue light is broken by a flash of light; the occurrence of flashes gradually increases. As the light intensifies, swirls of movement emerge. Hall continues to describe the experience in less than glowing terms: "It's as though someone has fed Islamic tile designs into a kaleidoscope and injected the results into your eyeballs."¹⁶

The inspiration for this work has been attributed to Turrell's experience while suffering from cancer, from a series of scans. This work shows Turrell's eagerness to stretch the boundaries of perception to its limits. Charles Hall entered into the experience as he admits himself with some skepticism when he speaks of "transcendental revelations", "intimations of the existence of God", "a new religion".¹⁷

Many of Turrell's spaces are contemplative in nature. The *Space-Division Pieces* and *Dark Pieces*, the *Projection Pieces* and *Skyspaces* all house unusual qualities of light that can be taken as exemplifications in modern terms of the age-old associations of light with transcendence. Turrell argues that: "It is unnecessary to bring specific symbolism to light installations since light itself carries considerable powers."¹⁸ Despite Turrell's own non-religious intentions, it is nevertheless understandable that critics have sought spiritual rationales for his light images. Leah Levy, for example, has suggested that Turrell's upbringing in the Quaker traditions provides an important background to Turrell's work. She argues that: "The spiritual focus of Turrell's work is influenced by his upbringing as a Quaker. In the society of friends, one goes into meditation to greet the light."¹⁹ Turrell admits that Quakerism may have some effect on his ways of thinking that their "directness of expression and straightforward approach are attitudes that I admire."²⁰

It is the tradition of Zen Buddhism that provides a more obviously important state of consciousness for Turrell. During the late 1960s he was personally involved with Zen and practised meditation. Turrell's own belief would seem to be somewhere between perceptual psychology and the life set down by some Eastern religions. In Buddhism, by cutting away all distractions for long periods of time, a meditative state or dream state can be reached.

In the *Art and Technology Program*, both Dr. Wortz and Turrell introduced meditative techniques in their investigations on alpha conditioning. This last part of their collaboration was the most controversial. Hal Glickman underlines his reservations: "The scientists were studying meditation in a very scientific way, almost trying to put Zen Buddhism in a test tube."²¹ In the *Art and Technology Catalogue*, Turrell states that he and the other members of the team were not interested in imitating the methods of science; "We want results, not explanations."²² Despite the sophisticated accoutrements they used and the scientific approaches they employed, their venture into high technology was primarily concerned with Art and their discoveries were essentially artistic. Turrell states their position at that time: "This project we believe is an extension of our work, just as our work is an extension of some mainstream of modern Art. A problem may arise with this project in the minds of the Art community who may regard it as non-artistic, or as being just outside the arena of Art."²³

The collaboration of Turrell, Irwin and Wortz had a considerable impact on each of them, but no actual work of Art was produced for the *Art and Technology* exhibition. For Turrell, the results of the collaboration had to do with strengthening the work of each member of the team. They each individually brought their own art into the collaboration and in the end they left, with their own Art. In terms of Turrell's own work, he says; "I have found out [largely through the collaboration] that you can order people's experience. There is really a lot you can control in making people confront something."²⁴

All of Turrell's subsequent works have involved the ordering of people's confrontations with visual experience. The *Art and Technology* program gave him a way of confirming his belief in the centrality of perception for Art. Through the controlled use of light and space, he has continued to define his work in terms of direct perception.

Conclusion:

Turrells statement on Light and Space have resulted in a variety of works employing both natural and artificial light: *Projection Pieces*, *Shallow Space Constructions*, *Wedgeworks*, *Skyspaces*, *Space-Division Pieces*, *Mixed Light* works of the *Phaedo series*; *Dark Spaces* and *Perceptual Cells*. He has exhibited in cities around the world from Los Angeles and New York to Paris, Madrid, Dusseldorf, Jerusalem and London, more recently at the Henry Moore Sculpture Studio at Halifax, Yorkshire. His most spectacular project, *The Roden Crater* and the *Irish Sky Garden* are situated far away from the worlds cities, museums and commercial art galleries. Turrells diverse works are closely related in terms of perceptual focus, and one category informs the other.

Turrells' works are works of art. Their simplicity and directness align them with modern traditions, particularly the more rarified lineages of geometric abstraction. But they are also works of pure vision, almost pure thought. They seem to bring into view, the processes of thinking, the capacity for thought in the human organism. Their perceptual complexities distinguish them either from the depiction of light on a flat surface or from the three dimensional objects, that are revealed by light.

Turrells Art requires cutting away all distractions so that a confrontation can be forced with the means by which we acquire our perceptual information. Though that attitude may initially be the same as the one that creates minimal Art, its goal is vastly different. Reductionism eliminates all distractions in order to pare down the object to its essential objectness, its materiality. Turrell rids light of its materiality to free it from its physical encumbrances, to assert its connection to consciousness. By using light as his material and perception as the medium, Turrell gains access to the imagination, his work evokes the light that we see in our dreams.

References

Titles and Introductions

1. Turrell, interview by Paola Iglion in *Entrails, Head and Tails*, James Turrell. (Rizzol International publications 1992) p. 44.
2. William Wilson, "Two California Artists Are Busy Exploring Inner Space", *Arts Magazine*; 11 May 1962, p.2.
3. Turrell, interview with Gablick Suzr. "Dream Space", *Art in America* ;15 March 1987, p.132.
4. Turrell, interview by Clare Farrow, "Painting with Light and Space", *Art and Design Magazine*; May 1993, p.23.
5. Ibid. p.22.
6. Stecker, Raimund, quoted by Luhrs.
Luhrs, Otton, *Art in Light*. Kluwer Technical Books. 1985, p.42.

Chapter one

1. E.C. Krupp, "Footprints to the Sky", in *Mapping Spaces: A topological Survey of the work of James Turrell*, New York; Peter Blum Edition, 1987 ,p.37.
2. Turrell interviewed by Janet Saad-Cook, "Touching the Sky", *JamesTurrell, Leonardo*; Vol 21, 1988, p. 133.
3. Jahndsen, Johan, "Light in Literature " *Light in Art*, Kluwer Technical Books, 1985, p.101.
4. Polyack , Stephen L., *The Vertebrate Visual System*, University of Chicago press, 1957, p.52, p. 11.
5. Turrell, Ibid, "Painting with Light and Space" (cited no.4), p.21.
6. Schone, Wolfgang, *Light in Painting*. Berlin Gebr. Mann, 1954, p.2.
7. Luhrs, Otton, *Art in Light*, Kluwer Technical Books 1985, p.42.
8. Ibid , p.43.
9. Stecker, Raismund, quoted by Luhrs (Ibid) p.30.
10. Coplan, John, "Projected Light Images", *Artform* Vol.5, Oct 1967 p. 48.
11. Ibid, p.47.

Chapter Two

1. Malevich, quoted by Jan Butterfield. *The Art of Light and Space* (Abbeville Press 1993), pg 9.
2. Gombrich.EH, *Art and illusion* (London. Phaisdon Press© 1960) pg 32.
3. Broadsky, quoted by Jan Butterfield [cited n.1] pg.11
4. Butterfield Jan, "The state of the Real". Part 1, *Art Mag*, 1972 pg.47
5. Coplan, John, "James Turrell: Projected Light images," *Art forum* 4 (October 1967) pg.47
6. Adcock, Craig, *James Turrell, The Art of Light and Space*; (University of California Press ©1990) pg. 201
7. Irwin quoted by Jan Butterfield [*Ibid* 1], ph.68
8. *Ibid* n.6, pg.84
9. John Coplans, *LA Sculptors at Irwin* " (*Art Forum* 4 February 1966) pg.35
10. Willoughby sharp quoted by Craiig Adcock [*Ibid*.6] pg.53
11. *IBID*.n.9, pg.36
12. Leider, quoted by Jan Butterfield [*IBID* 1] pg.42
13. Adcock, Craig. *Occulded Front, James Turrell* (Museum of Contemporary Art and the Lapis Press, © 1985)pg.36
14. Porty, Maurice Mevleau, *Phenonomenology of Perception*, trans, Colin Smith (New York: The Humanities Press 1962) pg.330
15. Turrell, interview by Clare Farrow, "Painting with Light and Space." *Art and Design Magazine*; May 1993 pg.23
16. Marmer Nancy, "James Turrell: The Art of Deception, *Art in America*, Vol 69, No 5, May '81 pg. 28
17. Adcock, Craig, "Light and Space at the Mendota Hotel: The early Works of James Turrell. *Arts Magazine* 61 (March 1987) pg.48
18. Gibson, James T., *The Senses considered as Perceptual systems* (Boston: Houghton Muflin 1966) pg.246
19. *IBID* 15. pg. 25
20. *IBID* 14. pg. 330
21. *IBID*13. pg.12

22. Turrell quoted by Petra Kipphoff, "James Turrells Spaces for Daydreams and Lightdreams", Article on the Irish Sky Garden, pg. 5
23. IBID pg.8
24. Minnarets Marcel, The Naature of Light and Colour in the open Air (New York: Dover 1954), pg.153
25. Hennessy, Brian, conversation with the project co-codinator at the Irish Sky Garden, January 1994

Chapter Three

1. William Wilson, " Two California Artists Are Busy Exploring Inner Space", Art Magazine; 11 May 1962, pg.2
2. Huxley Aldous, quoted by Robert E. Mueller, (Art and Science, © 1967) pg.32
3. Shapley, " The Visual Sciences", (Lonardo vol 6, June '82) pg.17
4. Adcock, Craig, " The Art and Technology Program, Art in Light and Space", (University of California Press © 1990) pg.68
5. Adcock, Craig (IBID 4) cites Jane Livingston
6. Brown, Julia. Interview with James Turrell. In Occluded Front, (Museum of Contemporary Art and the Lapis Press 1985) pg.8
7. Livingston, Jane. "Robert Irwin/James Turrell". In Art and Technology (New York:Urking Press, 1971)pg.36
8. Wortz, quoted by Livingston (IBID 7) pg.12
9. Turrell, quoted by Livingston (IBID 7) pg.46
10. IBID
11. Dember, W.M. in The Psycholgy of Perception, (Holt, Rinehardt adn Wilson © 1979),pg.204
12. Baker Kenneth, " Meg Webster and James Turrell at the Mattress Factory " Art in America 14 May 1985): pg.179
13. Turrell, interview with Paola Iglori in Entrails, Heads and Tails (RIZZOOOL INTERNATIONAL PUBLICATIONS © 1992) pg.45
14. Hall, Charles, "Unkindly light", Art Review Jan. 1994, pg.32
15. IBID pg.33
16. IBID pg.33
17. Turrell, interview with Julia Brown Sensing Space, (Henry Associates 1992) pg.4

18. Levy, Leah, quoted by Craig Adcock. in James Turrell, *The Art of Light and Space*. (University of California Press © 1990) pg.115
19. IBID 13, pg. 40
20. Glickman Gal, quoted by Jan Butterfield, *The Art of Light and Space* (Abbeville Press 1993) pg.15
21. Turrell, quoted by Livingston. (IBID n. 7) pg.35
22. Turrell, quoted by Craig Adcock [IBID n. 4] pg.70
23. IBID

Bibliography

- Adcock, Craig; James Turrell, *The Art of Light and Space* (University of California Press; 1990)
- Adcock, Craig; *Occluded Front*, James Turrell, (Museum of Contemporary Art and The Lapis Press 1985)
- Adcock Craig, *Mapping Spaces*, James Turrell, New York: Peter Blum Edison, 1987
- Battcock, Gregory, ed. *The New Art; A critical Anthology*. New York: Dutton 1966
- Brown, Julia ed. *Occluded Front*, James Turrell. Museum of Contemporary Art and the Lapis Press, 1985.
- Butterfield, Jan. *The Art of Light and Space*. Abbeville Press, 1993
- Coren, Stanley, and Joan Stern Circus. *Seeing is Deceiving: The Psychology of Visual Illusions*. Hillsdale, N.J. Erlbaum, 1978
- Dember, William N. *The Psychology of Perception*. Holt, Rinehart and Winston, 1979
- Gibson, James T. *The Senses considered as perceptual systems*. Boston: Houghton Mifflin, 1950.
- Gombrich, E.H. *Art and Illusion*. London: Phaidon Press 1960
- Gregory, R.L. *Eye and Brain; The Psychology of seeing*. New York: McGraw Hill, 1966
- Jahsen, Johsen, "Light in literature", *Light in Art*. Kluwer Technical Books, 1985
- Krupp E.L. "Footprints in the sky" in *Mapping Spaces*. Garden City NY, Doubleday 1977.
- Livingston, Jane. "Robert Irwin/ James Turrell." In *Art and Technology*: Los Angeles Museum of Art; New York: Viking Press, 1971
- Luhrs, Otton. *Art in Light*. Kluwer Technical Books. 1985
- Merleau-Ponty, Maurice. *The Phenomenology of Perception*. Translated by Colin Smith. New York: The Humanities Press. 1962
- Mainardi Marcel. *The nature of light and colour in the open air*. New York: Dover 1954
- Polyak, Stephen. *The vertebrate Visual System*. Ed. Heinrich K. Kupper. University of Chicago Press 1957
- Schone, Wolfgang. *Light in Painting* - Berlin Gebr. Mann. 1954
- Turske and Turske, James Turrell. *Long Green. The Irish Sky Garden*. 1990.