THE NEW REALITY OF SPACE AS APPLIED TO PAINTING

by

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INTRODUCTION

Art, science, and philosophy are, basically, different approaches to the exploration of reality. They all attempt to establish a better understanding and control of our environment. Scientific research attempts to explain and control the physical world, whereas art strives to make us aware of and sensitive to the poetic, intellectual, and social aspects of living. Although research as undertaken by the artist is seldom as systematic and rational as the scientist, their fields of interest have paralleled each other, each concerned with life as a whole. There have been equivalent developments throughout history in scientific, philosophic, and artistic thought concerning concepts of religion, science, human development, the machine age, and--the comprehension of space.

Man has always tried to master space in one way or another: to penetrate it, expand it, enclose it. Today he is both mentally and physically committed to space. He is no longer earthbound, becoming more and more consciously a part of the universe. While the general public is willing to accept such a statement from a scientific or even philosophical viewpoint, they are disinclined to do so from an aesthetic one, clinging securely to the ideas of the past. However, it is the artist, most sensitive to the nature of his environment, who sees and feels things and interprets them. He restates the technical discoveries of the nature and construction of all things--restates the truths of our age through

painting, as well as architecture, music, the dance, and literature.

For centuries, the role of the painter was that of a documentarian. It was his task to record all events, people, landscapes, objects, and the passing phenomena of the day. When, however, photography took over this task--that of the reproduction of the naturalistic image, with greater precision--a new orientation for the artist became necessary. He had to find a new way of adjusting his own need for creative expression with the needs of a new technological society.

In 1914, the advocates of "Vorticism" announced:

> All art .... should speak for this present age of clashing machinery, of cities hard with masonry and asphalt, yet palpitating with a fierce vitality. To belong to this age, painting must be abstract. Only by renouncing art that represented old and outmoded ways of living would the artist discover forms that express his own day.[1]

Rules and precepts of the past, though sincere and profound experiences in their own time, are now void of their original meaning. This is a new era, involving man in new experiences--of movement, and time, and space. Unlike the world of yesterday, the world we live in today is no longer conceived of as static, but rather as in a constant state of transition. What one regards as realism is actually a convention, constantly subject to change. As Frank Lloyd Wright would have it: ".... Reality is not new

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1 "Manifesto of Vorticism", Blast, 1:5, June 20, 1914, as quoted in Frances Bradshaw Blanshard, Retreat From Likeness in the Theory of Painting, p. 5.

except as we are new to Reality."[1]

In order to express life in contemporary terms, the modern artist is no longer limited to depicting what he sees at the moment. He has been made aware of the profound rhythmic movement inherent in all things which were previously believed to be at rest. His vision has been extended, through technological advancement, into a new awareness of reality, resulting in a new art form as different from the past as has been our technological development.

The man of today strives for free expansion, light, air, and new spacial experiences. The artist, as "the seismograph of his time," attempts to interpret this new world visually. "Art becomes a living art when it is truly contemporary, when it uses fully the materials of experience unique to the present."[2] It is the purpose of this study to define and defend the contemporary painter's new interpretation of space visually as a reflection of our age.

SPACE

The defining, understanding, and controlling of space in almost every field: philosophy, physics, mathematics, art, and architecture, has been responsible for century long intellectual battles. The basic connection between space and design, for in-

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[1] Charles Biederman, Art as the Evolution of Visual Knowledge, p. 635.

[2] Lazlo Moholy-Nagy, as quoted in Herbert Read, Why Contemporary Art, p. 2.

stance, is one of the more important preoccupations of modern art and science, one that has brought about striking changes in the attitudes and methods of both fields.

Within every cultural period there have been unique conceptions of space. Much time must elapse, however, before later generations become aware of these concepts. This is no less true of our own time. Today one speaks of and deals with many different kinds of space in various fields, viz.: pictorial, architectural, one-, two-, and three-dimensional, lineal, as well as surface, cubic, spherical, Euclidian and non-Euclidian, imaginary, actual, infinite, positive, negative, universal, formal, abstract, relative, absolute, projective, inner, outer, dance space, and many others.

Being aware of the various kinds of space one speaks of and depicting or "experiencing" them, however, are quire divergent problems. Whereas one is purely intellectual, the "feeling" of space is psychological as well as physiological. Although the artist must consider all three realms, and although it is difficult to draw the line between the physiological and emotional (psychological), it is my intention here to primarily deal with the intellectual and physiological factors.

Man perceives space in many ways: through his sense of sight, hearing, equilibrium, and through various means of locomotion. Within such sensory experiences, accessible in varying degrees to everyone, space is as real as any other reality known to man. By grasping and understanding its fundamental laws, man can

use this "reality of space" to express himself, as he has used other realities in his experience to do so.[1]

In painting we experience space through various devices employed by the artist, some of the primary methods being:

1. overlapping of forms, creating an illusion of recession;

2. gradation of light and color;

3. the blurring of objects as they recede from the observer (aerial perspective);

4. creation of space by the relative position of things, e.g., axial relationship of planes, movement of compositional elements, use of line directions, etc.;

5. convergence of lines and diminution of objects as they move into depth (commonly referred to as one or two point perspective, or angular perspective).

Perspective and space are to some interchangeable terms, and have acquired the meaning of beholding a naturalistic scene photographically; that is, the view depicted is seen from a specific point, the eyes of the beholder, and everything represented is with reference to that particular point of view. This concept of space and perspective is most limited. Not only does it rule out much of the contemporary art scene, but Egyptian, Medieval, and Eastern art as well.

This device, of depicting three-dimensional space as it appears to the beholder from a specific point of view, usually referred to as "representative space," is regarded by many contem-

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[1] This reference to our biological endowment in experiencing space will be discussed later in greater detail.

porary painters not only as a device of another time, but also as basically "dishonest." Such a device, this group contends,[1] does not take into consideration the two dimensionality of the canvass, a space which can be respected while the painter is free to create the illusion of the infinite.

It is representative space with which we are bombarded daily. We are constantly looking at photographs in which geometrical perspective has been automatically incorporated by the camera. The results have been that many are so habituated to mathematical perspective, that most of us are distinctly disturbed when pictures deviate from the easily recognizable, accepted point of view. Such deviations are resented by the general public and are usually denounced as inaccurate, ignorant, and even degenerate.

Though mathematical perspective has been very dominant in painting, it is photography that has stamped our vision with the beliefs about the "real" appearance of things. As long as geometrical perspective is employed and does not involve unfamiliar viewpoints, it is "true" representation. It is interesting to note, however, that physiological optics and perspective are actually in many ways at variance with monocular optics: the perspective of the photographic lens. In other words, what we think our eyes see, when we are in unfamiliar situations that are not governed by conditioning, and the results that are recorded mathematically by the camera, are frequently quite different from one

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[1] Gauguin, Rousseau, Matisse, Miro, Stuart Davis, and Mondrian are among the outstanding advocates of this school of thought.

another. We are apt to think of distortion when a photograph presents an unfamiliar view, yet we so seldom realize that much of the "distortion" we actually see is blanketed by our mental and visual habits.

Oliver L. Reiser has substantiated that the unreflective person makes "no distinction between appearance and reality and a thing is asserted to be in fact what it appears to be." This attitude persisted up until the 5th Century B.C., when man first began to be concerned about "problems of reality."[1]

The concept of "scientific truth" underwent a complete change in ideas when "relativity" made its astonishing entrance in the beginning of this century. Students of religion, philosophy, history, and art are no longer concerned with pursuing "the truth," but rather, with the evolution and expression of thought.

In order to better understand the reasons which have brought about our present concepts of space (and therefore the types of paintings the author has submitted), I wish to touch upon those concepts, particularly of the last 40 years, which have influenced present-day thought in painting and therefore bear directly upon my work.

HISTORICAL ASPECTS

Spacial concepts in both science and painting have been the basis of the great revolutions of art history. ".... the artist

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[1] Oliver L. Reiser, Philosophy and the Concepts of Modern Science, p. 71.

explored the nature and possibilities of picture space just as the scientist explored the universe."[1] The systems of space organization established at various times by both scientist and artist, have been expressions of their knowledge of the contemporary world and their attitude toward it.

Today one realizes that depicting the third dimension on a two-dimensional surface, much more so than in sculpture or architecture, is unlimited .... from the near to the infinite, and the methods employed are likewise unlimited. Before this present conceptual level could be reached, however, the evolution of many principles on the effecting of a third dimension was necessary.

The earliest attempts of spacial representation did not observe any optical laws scientifically unknown at the time. Objects were painted as they were known to exist intellectually, with no foreshortening or overlapping of planes. This resulted in a two-dimensional decorative space, characteristic particularly of Egyptian, Medieval, and Persian art .... as well as the art of the 20th Century "primitives."

The Chinese skillfully employed the overlapping of planes long before the western world used this device for depicting depth. It was not until the advent of Impressionism that the merits of the skillful manipulation of space through line and area direction, that of "laying up" elements in a painting, which the Chinese had mastered for centuries, was regarded as anything but primitive.

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[1] Aaron Berkman, Art and Space, p. 14.

"The discovery of perspective marks the dawn of the era of enlightenment when western man turned from theology to the study of natural law for verification of facts."[1] From the 14th Century to the 19th Century--over 500 years--perspective[2] was the dominant solution of presenting space in painting.

Attempts to first introduce three-dimensional space through form representation in painting during the 13th and 14th centuries, culminated with the work of Giotta (1226-1337). Previous to this work, religion was the only reality that men of that period were concerned with. There was no desire to create lifetime reality in painting, religion dominating all aspects of creativity. Giotto, however, made the transition. He recognized reality as being on earth as well as in heaven, and tried to bring a new living quality--a three-dimensionality through modeling form into his painting. The Medieval influence, however, was still present in the flat treatment of background areas; witness the essentially flat, "stage-set" backgrounds of Ascension of St. John Evangelist, or The Resurrection of Drusilla, typical of Giotto's work. Aside from the moulded figures, overlapping and "laying up" were the only devices used for creating depth (e.g., Disposition From the Cross).

It was Massaccio (1401-1428) who is mainly responsible for "aerial perspective": the creation of atmospheric depth by soft-

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[1] Berkman, op. cit., p. 54.

[2] Perspective in this sense encompasses the three principal types of perspective, namely, geometric, binocular, and atmospheric.

ened edges and diminished values with distance. Cheney[1] credits him with initiating Italian scientific realism, and being the first artist to define subjects by natural light and shadow, clearly indicated in The Tribute Money and Expulsion From Paradise.

Scientific realism found its culmination in the work of Leonardo d'Vinci, for "No one else so refined upon the methods of research and observation. No one else ever believed more firmly that laws could be discovered under every phenomenon--even art." Leonardo .... "completes the conquest of light and shade as a means of exact delineation."[2]

The illusion of depth by chiaroscurro (the representation of volumes through light and shadow), reached its most dramatic height, however, in the work of Rembrandt. Titian (e.g., Sleeping Venus), and more so, Tintoretto (e.g., Fight of the Archangel Michael and Satan), went on to creatively organize volume and light and dark patterning to achieve a strongly rhythmical spacial structure. Tintoretto was surpassed, in this respect, only by the virtuousity of Michaelangelo (e.g., the Sistine Chapel paintings), and the strong, "cosmic", spacial effects achieved by El Greco, as evidenced in View of Toledo and the variations of Christ in the Garden. El Greco "preserved and utilized the abstract and mobile elements in painting to become--so masterly is he in this matter of plastic creation--the god of the 20th Century moderns."[3]

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1 Sheldon Cheney, A World History of Art, pp. 509-512.

2 Ibid., pp. 528-530.

3 Cheney, op. cit., p. 566.

The introduction of angular (two-point) perspective during the 16th Century made it possible for painting to approach optical "reality" more closely than in any previous period. Peter Brueghel (1525-1569) was perhaps its leading exponent at the time, doing away entirely with the formal, symmetrically designed space of the Renaissance. Angular perspective now made it possible to paint vast areas of depth, as in Brueghel's A Dark Day and The Hired Shepherd, thus beginning the tradition of landscapes as the eye perceives them, rather than the heretofore "stage-set" background.

The artists who had employed chiaroscuro as a means of spacial representation had always thought of it as a technical device divorced from color. Titian, Velasquez, and Vermeer, sometimes referred to as the "Luminists," were among the pioneer painters to first use color to create forms and a feeling of light. They diffused edges and subtly blended backgrounds with broken tones, creating a luminous atmospheric effect. Daylight, which had been introduced into painting by the Flemish, was used as a spacial device by Vermeer (1632-1675), whose canvasses, as A Woman Weighing Gold and Girl Reading Letter by a Window, were saturated with the reflection of sunlight through color and the use of cast shadow. The English painters, Constable and Turner, further explored the potential of color to express atmosphere itself, e.g., Constable's Landscape With Windmill, and Turner's Ulysses Deriding Polyphemus, thus precluding the work of the Impressionists.

AGE OF TRANSITION

Impressionists

In the 19th Century, discoveries in physics of the effects of light on color stimulated the artist to a new theory concerning the depiction of reality. They strove to record what the eye actually sees, realizing that all appearances are conditioned by light and atmosphere. These artists painted the same objects as the light changed their color and appearance. They went out of doors to faithfully record nature as they believed they saw it. Though this was still the attitude of mirroring nature, the Impressionist's use of color in depicting space was revolutionary--even though their attitude concerning the conventional theories of space was unaltered. The Renaissance idea of "life as fact" had been enlarged to include various coincidences that were relative to the actual time and place of the subject that was being depicted. The Impressionists were attempting to faithfully copy what they believed they saw, directing their efforts according to the newest discoveries concerning optical laws. Actually, the Impressionists learned to see in a new way as a result of acquiring new knowledge. Biederman put this succinctly by writing: "Art .... is inseparably related to man's growing faculty to visualize and reason about himself and his environment in an ever more accurate manner."[1]

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[1] Biederman, op. cit., p. 25.

The Impressionists were, perhaps, the most important group of the 19th Century in contributing to the depiction of "The New Reality of Space as Applied to Painting." The Classic, Romantic, Realistic, and Impressionistic schools of painting were basically trying to render their own interpretations of reality by means of different approaches to the problem. The Classicists, e.g., Poussin, Ingres, and David, whose canvasses were "real" and correct in every detail, strove to secure the ideal, the higher reality, the perfection rather than imitation of nature. The Romanticists, such as Delacroix and Gericault, breaking away from the rigidity of classical subject-matter and composition, were concerned with sentimental realism and naturalism. Courbet, Millet, and Manet, among the Realist group, were searching for the "honest" vision of the camera through the direct observation of nature.

Degas advanced "realism" to new heights by promoting photographic accuracy of unusual angles into superbly arranged patterns. This new awareness was carried even further in the compositions of Toulouse-Lautrec.

The Impressionist's search for more scientific and exact "truth" of nature resulted in vague and atmospheric pictures, and, ultimately, completely devoid of structure. "Reality went into a luminous fog."[1] This was the zenith achievement of those painters who tried to depict "true reality" as it appears to the outward eye--the reality of the moment.

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[1] Cheney, op. cit., p. 829.

The Impressionists were the last pictorial link with the spacial concepts of the Renaissance and the "dynamic world of relativity" today.

The post-Impressionists--Cezanne, Seurat, Gauguin, and Van Gogh--tried to use pure color as a means of self as well as spacial expression. Cezanne and the fauves[1] went further by using the psychological qualities of color for spacial representation.

Cezanne

From the Impressionists, Cezanne formulated a new concept of form and space, interpreting them through color-plane relationship. Cezanne, making a definite break with the past, concerned himself with pure visual space. He was searching for the pictorial equivalent of a new principle of optics, concluding that what we see does not necessarily coincide with the laws of perspective. The form and space concepts which he expounded anticipated contemporary findings in science and psychology regarding vision, and contributed much to the new understanding of space as developed in our own time.

By studying the color-planes and movements of objects in relationship to each other, Cezanne perceived a harmony and vitality inherent in all things--a sense of universal order, which he strove to express pictorially.[2] Nature for him was not subject

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[1] In 1905, a group of unorthodox painters, among them Dufy, Rouault, de Vlaminck, Deraine, and Matisse, exhibited together and were labeled fauves, which is translated as "wild men."

[2] It is interesting to note that the work of the post-Impressionists coincided with the development of the Einstein theory of relativity, as applied to physics.

matter as such, but rather, a point of departure from which to take and interpret his own sensory reactions to color--color which he recognized as having spacial forces within itself. Witness the organization of color forms in space in the landscapes, L'Estaque and Mont Sainte Victoire. It was of little importance, however, whether he painted landscapes, such as The Pistachio Tree at the Chateau Noir, or apples, e.g., The Basket of Apples, or figures (Bathers), for his concern was representing a new conception of space through the advancing and receding properties of color.

In his studies Cezanne pioneered the new spacial awareness we are a part of today. Lines and planes, as well as color, freed from objects, were utilized abstractly (most notably in his water colors), as forces in themselves to express volume and space. The rhythm and harmony which were achieved through such means, was to Cezanne the language of the universe--encompassing all spacial reality. Thus it can be said that ".... his paintings contain the thought content, the metaphysics of our age."[1] After Cezanne, chiaroscuro as a means of modeling form and depicting space was an idiom of the past.

As science advanced, the linear perspective of the Renaissance became very limiting to the artist. In using perspective, representation of objects is valid only from one fixed, unalterable point of view, following the rules of the vanishing point. At the beginning of this century, however, there was a new space

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[1] Berkman, op. cit., p. 112.

consciousness--that of movement in space experienced in the train and automobile and, later on, the airplane. Man saw objects in rapid succession. In order to describe this newer reality, which his Renaissance predecessors had not experienced, the painter felt the need for a more basic method of representation. This need developed into a school of artistic thought--the Cubists.

Cubists

The Cubists tried to translate into visual terms the "inner reality" of nature which science had revealed. Just as in the Renaissance, painters found it necessary to penetrate the surface of the figure in order to fully understand it, so the Cubists found it necessary to break the surface of objects in their paintings in order to study their underlying structure--to get at the energies which made them (the objects) exist.

The academicians regarded as "realistic" the photographic descriptions of the surface of objects, but what could be more realistic than depicting the forces which underly and play upon a structure.

The previous concepts of spacial representation were primarily based upon size differences, e.g., Gozzoli's Journey of the Kings; surface divisions, e.g., The Emperor Wen Meets the Sage Tzu-Ya, of the Sung Dynasty; linear perspective, such as in Bellini's Sacred Allegory and Giorgione's Gypsy and Soldier; aerial or atmospheric perspective, e.g., Lorrain's Marriage of Isaac and Rebecca and the landscapes of Corot; and chiaroscuro, as in the

work of Rembrandt and Vermeer. The Cubists, however, introduced a new system of organizing planes moving in space. Their problem was to represent the idea of multiple space on a two-dimensional surface. They explored the "multiple aspects" of an object and attempted to combine several simultaneous viewpoints into a single structure. By breaking objects down to their basic geometrical elements, dissected into planes, the internal make-up of the objects were thus revealed. The external aspects would frequently disappear in this process, e.g., Picasso's Ma Jolie, though occasionally some surface characteristics, such as texture, were retained for aesthetic as well as descriptive effects, as in Braque's Le Violon and Picasso's Still Life Vive La.

> Their (the Cubists) manner of work is better characterized as the resolution of the objective world into its elements, into dissected and newly organized planes which produce subtle but very definite articulation of the surface.[1]

By showing the elevation, plan, and sections of an object as seen from many viewpoints by the spectator, the illusion thus created of moving around an object broke the previous tradition of a fixed viewpoint. The Cubists were not interested as much in the description of objects, as they were in representing the objects' existence within space. Pioneers, such as Braque and Picasso, in order to find a new language capable of expressing the mind's reaction to forms moving within space, explored the possibilities of Cubism. This was the first time another dimension--that of time, was consciously involved in painting. The

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[1] Lazlo Moholy-Nagy, The New Vision, p. 70.

Cubists became aware (as did Einstein) that there was a fourth dimension; that motion through space precluded the existence of time.

The Cubists attained space by superimposition of the various views of a subject: top, side, bottom, and cross-section, etc. The presentation of simultaneous views in this manner, involving the concept of time, foreshadowed the coming of the motion picture, as did the work of the next major group in contributing to spacial representation: the Futurists.

Futurists

The original program of Futurist painting, in the early part of this century, involved the expression of the sensations of movement, energy, color, shape, and light, within inner and outer space. To this they also added the expression of emotions and memory images in order to fuse the objective and subjective, and also the past and present, into a single canvass.

Their work was influenced by the color spot technique of the French Neo-Impressionists, such as Seurat (e.g., Fishing Fleet at Port-en-Bessin), and by the fragmentation of form practiced by the Parisian Cubists, whom the Futurists (primarily an Italian school) tried to surpass.

The Futurist painters in their Manefesto of 1910 proclaimed their intention to paint ".... the frenzied activities of great capital cities, ... to render and glorify the life of today, incessantly and tumultuously transformed by the victories of science."

> Everything is moving, everything is running, everything is whirling. A figure never stands passively before us, but appears and disappears constantly. Thanks to the persistence of images on the retina, forms in movement are multiplied, deformed, follow one another like vibrations in the space through which they pass. Thus, a running horse does not have 4 legs, he has 20, and their movements are triangular....
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> We proclaim....that universal dynamism must be rendered as dynamic sensation: that movement and light destroy the substance of objects.
>
> We are fighting....against the superficial and elementary archaism based on the flat tints which reduce painting to an impotent synthesis, infantile and grotesque;....[1]

Boccioni, one of the leading exponents of Futurism, proclaimed that art should bring to life the objects by "making visible its prolongation into space." The circumscribed lines of the object, whether painting or sculpture, should be abolished and the figure opened up and fused with space, e.g., Balla's Speeding Automobile and Severini's Dynamic Hieroglyphics of the Bal Tabarin.

By means of abstracting line and color mingled with fragments of reality, the Futurists tried to suggest both motion and emotion--a complex of external and internal sensations and emotions as revealed in inner (internal) and outer (external) space. The clearest example of this can be found in Boccioni's three States of Mind: The Farewells, Those Who Stay, and Those Who Go.

The Futurists employed the Cubists' device of simultaneity, but whereas the Cubists applied this device to a static object--

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[1] From the Technical Manifesto of Futurist Painting, drawn up by Russolo, Carra, Marinetti, Boccioni, and Severini, in April, 1910.

in other words, having the spectator move about the object--the Futurists used simultaneity (different aspects of the same object) to depict kinetic and dynamic forms. This time the objects themselves, not the spectator, were in motion.[1]

By using lines to express forces rather than objects, and by painting impressions of motion itself, thus evolving new forms, such as created in Balla's Swifts: Paths of Movement--Dynamic Sequences and Severini's Armored Train, the Futurists further broke down the static concepts of the past and put forward movement as the "dynamics" of our century.[2]

The Impressionists had tried to record a fleeting moment within a given time and space, but the Futurists tried to represent time and space by a series of instantaneous occurrences. This analysis of multiple vision opened up new fields for the artist to explore, including the motion picture--which is but a series of pictures flashed in a sequence, giving the illusion of movement in space.

The Futurists were the first group of painters to use subject matter other than the traditional landscapes and figures and still-life, as did the Impressionists and Cubists. The Futurists painted the new world of machinery and the frenzied activities of

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[1] The most simple explanation of this concept can be seen in Balla's painting of Dog on a Leash, where the running dog is represented as having dozens of legs, giving the illusion of actually being in motion.

[2] For a detailed and exciting account of the activities and accomplishments of the Futurists, see Soby and Barr's Twentieth-Century Italian Art, 1949, a book published in connection with the exhibit of modern Italian painting held at the Museum of Modern Art, Summer, 1949.

night life; they drew their inspirations from

> .... the tangible miracles of contemporary life, from the iron net of speed that envelops the earth, ... dark daring of underwater navigators, from the anguished struggle in the conquest of the unknown.[1]

This was the incorporation of the "kinetic" into painting.

From the Futurists the artists around 1920, notably Leger, became aware of the aesthetics inherent in the work of the engineer: bridges, machinery, stairways, etc. It was the first time that they realized the creative and emotional qualities of technical structures. These new explorations of the artist introduced a period of simplification, first in works of art and then into all types of designed goods.[2]

The Cubists and Futurists had also discovered the sensuous and emotional qualities of textures, which took the place of ornament--textures containing within themselves a unique spacial quality of surface treatment.[3] The DaDaists (Arp, Duchamp, Grosz) went even further in their awareness of textural qualities by incorporating the actual textures themselves, i.e., sand, feathers, rope, paper, straw, etc., into their canvasses.

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[1] "Manifesto of Futurist Painters" of February 11, 1910, Ibid, p. 8.

[2] In an effort toward purification, deornamentation of appliances, furniture, and architecture followed suit in the late 1920's.

[3] The interest in Stone Age (submitted painting) is primarily the subtle quality of textural relationships, with the play of line and plane unifying the composition.

> The practical consequence of the Cubists' discoveries could not at first be properly appraised. Today we can see that through them space relations, material and surface treatment have experienced a vitalization which in its application to our daily life .... has at least shaken us from a lethergy.[1]

New Schools

The new concepts of the schools of Neo-Plasticism, Suprematism, and Constructivism have followed Cubism and Futurism in the advancement of spacial reality in painting. The Neo-Plasticists (van Doesberg, Mondrian), Suprematists (Malevich), and Constructivists (Lissitsky, Moholy-Nagy, Gabo, Pevsner) completed the gradual attempt to strip art of all extraneous subject-matter. They wanted to get at the basic elements of a new order, expressing the underlying structure of the universe through the new language of pure color and line and planes. They believed, as has been verified from a scientific point of view, that the true meaning of what we see is obscured by the psychological associations we attach to familiar objects. Therefore, they relied on lines, planes, and color alone to create a space of integrated

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[1] Moholy-Nagy, op. cit., p. 80.

harmony, a symbol, they felt, of the "dynamics of the universe."[1]

On the contemporary scene, Picasso, Braque, Kandinski, Klee, and Mondrian, have continued the search for a visual language capable of expressing the 20th Century. Just as the anthropologist turns to studying the primitives for fundamental facts concerning the basic characteristics of man, so the contemporary artist has turned to the art of prehistoric man--the African, the Indian, to better understand what is fundamental and what is superfluous.

Mondrian has gone farthest in stripping art of superfluous subjectmatter, concerning himself solely with elements of painting itself, e.g., Composition in Black, White, and Red. Kandinski (Landscape, 1909), Braque (Road Near Esaque), Picasso (Card Player), on the other hand, have borrowed what they felt was essential from the visual world and transformed these elements into design, creating always a new spacial order--of fluctuating planes,

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[1] The following quotation from Willard Huntington Wright's Modern Painting (1915) is quoted in Blanshard, op. cit., p. 6:

> The subject matter of modern painting--that is, the recognizable object, the human obstacle--must be forced out.... A picture in order to represent its intensest emotive power must be an abstract presentation expressed entirely in the medium of painting (color).... So long as painting deals with objective nature it is impure art, for recognizability precludes the highest aesthetic emotion.

Though Wright's statement draws the line too sharply in its elimination of all subject matter, it does, in part, explain some of the motives behind the serigraph The Infinite (submitted), wherein, without the use of any subject matter or symbols of space direction (e.g., planes), I attempted to create the feeling of unknown, infinite space.

colors, surface textures, and tensions.[1]

In discussing the work of Braque, Douglas Cooper has said:

> A painting by Braque has its own reality: it is not a copy of but a rival to nature. And so, from the lowliest object Braque extracts a new poetry as he paints, and the outer world takes on for us a fuller, more exciting appearance. If we look, he will teach us to see, and this after all is the highest function of the true artist.[2]

NEW CONCEPTS OF SPACIAL DISCRIMINATION: THE SENSES

All of man's major conceptions are derived from premises suggested to him by what he sees and by what he feels. "The true artist is the grindstone of the senses; he sharpens eyes, mind, and feeling; he interprets ideas and concepts through his own media."[3]

Each of our sesnes is the means by which we can comprehend the position and relationship of bodies to ourselves and to one another, therefore enabling us to grasp and experience the con-

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[1] Most of the paintings I have submitted live in an infinite plane of which the dimensions of the canvass are merely a part, as for example, In and Out; a Study in Planes; or they are completely within the border confines, such as, After-Image in Blue and Through the Inner Air. The painting Lebensraum, however, is meant to depict what its title implies--bursting at the confines of the canvass's dimensions, setting up tensions through means of compositional arrangement as well as planes and colors. (Each painting does not illustrate any one point, however, but rather encompasses several of the visual elements discussed in creating spacial illusion.)

[2] Hope, Georges Braque, p. 90.

[3] Biederman, op. cit., p. 29.

cept of space.[1]

Visual Discrimination

The primary sense man relies upon for his knowledge of space is that of vision. Sense of movement (including locomotion and equilibrium), touch, hearing, etc., also play a part in sensing the relationship between bodies, but it is with the sense of sight that painting is concerned.

Through sight, man perceives space by means of interpenetration of objects, relationships of mass, light, shadow, transparency, reflection, mirroring, the meeting and cutting of surfaces, etc.--all of which can be expressed visually on a two-dimensional surface.

There is a definite distinction between how we see and what we see.[2] How we see involves the mechanics of perspective. What we see depends on psychological conditioning, which is a learned process. Through training, predilection, etc., we learn to recognize--and recognition is a psychological process. To recognize something requires the summing up of all our previous knowledge

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[1] Physics' definition of space is the relationship between the position of bodies. It therefore may follow that spacial creation is the creation of the relationship between bodies.

[2] A great conflict exists between the conceptual and the optical in vision--that is, between the real and the apparent. Conceptual is the "real" (tactile) form of an object; optical is the apparent (or visual) form. For example, we know that the top of a bowl is a circle, yet only if we are standing directly above it do we see it as such. Hence, the difference between what we know we are seeing and what is actually seen.

and experiences, whether consciously or unconsciously.

The mind interprets all the images which are mechanically focused on the retina and thus enables us to perceive the picture as a unified whole. When we view objects, it is the mind that must instantaneously recognize shapes and relationships in order for us to perceive space. The eyes enable us to recognize "objective phenomena" through color-light sensations, but it is through the mind that "reality" is interpreted and recognized. Seeing, therefore, is both a physical and mental process. "The strictest realism," said Butler, "ought to be that which gives the closest approach to the effect produced upon the mind by vision."[1]

Awareness of the distortion of the factual (that is, recognizing that seeing is both a physical and mental process) is of prime importance in interpreting life as we really experience it. Interpreting spacial experience, therefore, cannot be based on mechanistic principles alone, such as perspective.

Cezanne is credited with first introducing into modern art the concept of psychological-physiological awareness of perceiving visual space. He recognized, which was later verified scientifically, that the eye cannot see more than one object at a time, and can focus upon only one particular point of that object at a time. What we perceive as a whole is actually a series of individual views--memory determining to a great extent what we perceive. In this respect, the camera differs markedly from the

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[1] Howard Russell Butler, The Painter and Space, p. 64.

eye, since the camera records everything within its field of vision instantaneously.[1]

Normal vision is binocular; that is, we see with two eyes. Therefore, we receive two views which are unified in the brain as one image. While we are focusing our eyes at a point, the surrounding areas are actually seen as a collection of separate images that are not properly synchronized in the cerebrum. The farther away things are from the focal point, the more out of focus they will appear. Since the artist executes his painting on a flat plane, the observer cannot throw the backgrouns out of focus and concentrate on the foreground or center of interest; therefore, the artist must do this for him. In order to further the illusion of space, the painter also accounts for the observation that areas out of focus tend to become uniform in value and color. As objects recede into space they not only become smaller and lose their detail, but become less brilliant as well, tones subtly blending into one another.[2]

Psychologists have been thoroughly interested in the con-

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[1] The subject of physiological optics and its difference from mathematical or camera optics is little known to the world in general. Much work on it has been done, but many questions remain unsolved. It is not improbable that the most important work on the subject since the days of Helmholtz is that now being done at Dartmouth by Adelbert Ames and his colleagues.--William M. Ivins, Jr., Art and Geometry, p. 129.

[2] This device is incorporated into the paintings submitted, both deliberately and unconsciously. Architectonic, After-Image in Blue, and Through the Inner Air, are conscious incorporations of the focus-out of focus concept of experiencing visual space; whereas The Infinite is an example of its unconscious incorporation. One is not always aware of his visual knowledge until he must express himself verbally.

ditions of binocular vision, especially the fact that our minds are so little concerned with the innumerable images that are constantly produced by objects near or far from the focal point. William James explains this[1] by saying that we have trained our vision to the habit of inattention in regard to perceiving double images. He believes that as long as things interest us we will turn our fovea (spots of acutest vision in the retina) on them and see them as single.

Because we are also in the habit of constantly moving our eyes without being aware of it, we are not conscious, visually, of any breaks in the continuity of seeing things, except of course, when we select an entirely different view or consciously move the eye very rapidly.

We are not aware, as well, of the very gradual way in which things come into our consciousness as they move into the field of vision. Ivins[2] points out that if, for example, we extend our hand at arm's length in back of the shoulder line and gradually move our hands forward, we are conscious of their existence long before they move into the field of vision. If there is motion in the fingers, this is even more acute.

The angle of sharp vision in itself is quite acute.[3] If, for instance, one stares at a short word on this page, he can become

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[1] See Butler, op. cit., p. 51.

[2] Ivins, op. cit., pp. 3-4.

[3] At a point $2\frac{1}{2}^{\circ}$ from the point of greatest sharpness of vision there is a 50% decrease in acuity, and at 45° the acuity has fallen to $2\frac{1}{2}\%$. See "Wertheim's Curve" in W. S. Duke-Elder's Textbook of Ophthalmology (St. Louis, 1930), p. 942.

aware of the way in which words to the right and left quickly lose definition, though one is still aware of them.

It is generally agreed that one-eye perception of distance is very imperfect. The use of both eyes[1] for perceiving distance is accurate owing to the fact that the two images seen converge on the object in the field of vision, giving it a three-dimensional form existence in surrounding space. The nearer the object, the greater the convergence and therefore the more defined the form.

In the early experiments conducted by psychologists concerning the capability of the eye to perceive space, the general conclusions reached are still valid today, though further investigation has clarified or somewhat revised the earlier findings. Rouse[2] has concluded that:

1. There is a strong tendency to underestimate visual distances.

2. The illusion of judging a large object to be nearer and a small one farther is less common in binocular than in monocular vision.

3. The greatest acuity of judgment is that attained in binocular vision, assisted by various cues, i.e., size of object,

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1 There has been a long-standing controversy among psychologists as to just why there is such a great difference between monocular and binocular vision; particularly: when two eyes look successively at the same point, and then each eye separately, the point does not appear to lie in the same direction in any of the observations. For an interesting discussion of this phenomena, see G. M. Stratton, "Visual Space," Psychological Bulletin, VIII (July 15, 1911), No. 7.

2 Rouse, "The Visual Perception of Distance," Kansas University Quarterly, Vol. 5, No. 2, 1896, pp. 109-117.

comparison of other distance, etc.

4. The distance of approaching objects is more accurately judged than that of receding ones.

5. As the true distance increases, the error steadily increases also.

6. Distance perception has little dependence upon the time consumed in the process.

7. Movement of the head to give motion to the eye appears to be a factor in distance perception.[1]

Bishop Berkeley's[2] theory of perception of space was that distance, rather than being a visual experience was a tactual one, suggested by visual signs. Though his theory is not generally accepted, Berkeley's belief that "visual perception of distance is the acquired interpretation of light and color differences in terms of distance already gained by skin and muscle,"[3] has an interesting relationship to the work of the already mentioned Collagists (Picasso, Braque, Nicholson) and Dadaists (Arp), who used actual materials in their colleges to depict reality rather than attempt to simulate the real thing. Perception of such work was definitely tactual memory as well as visual experience.

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[1] Could this, perhaps, be an unconscious factor in the stereotyped action of the artist to tilt his head when studying his work?

[2] With the exception of Descartes, Berkeley was the first to study the perception of distance scientifically.

[3] Joseph Jastrow, "The Perception of Space by Disparate Senses", Mind; a Quarterly Review of Psychology and Philosophy, Vol. XL, January, 1886, p. 539.

Whereas Locke had once stated that "either sense (sight and touch) gives an adequate idea of space; and the two ideas are in perfect agreement,"[1] Berkeley felt that "It is a mistake to suppose that we see and feel the same object."[2] Feeling and seeing an object, quite distinct from one another, he believed, were regarded as one only because they were constantly experienced at the same time.

The interest still present in the investigation of spacial perception is evidenced by a recent article in Life magazine[3], presenting the experiments of Professor Aldelbert Ames, Jr.,[4] of the Hanover (N. H.) Institute. It was demonstrated that, whereas vision is nothing more than the reception of images, perception involves a mental process, and therefore is subjected to our infallible interpretations. Perception of space is dependent upon the judgment of the size and relative position of objects. By experimenting with overlapping planes and relative sizes, whose true arrangements were at variance with what was perceived mentally, Dr. Ames successfully illustrated that what we think we see is greatly conditioned by previous experiences.

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[1] Ibid.

[2] Rouse, op. cit., p. 109.

[3] "Your Eyes Do Deceive You," Life, January 16, 1950, pp. 57-59.

[4] See footnote 1, p. 27.

Tactual Discrimination

Compared with visual sensations, those of the tactual-kinesthetic senses are much simpler, more definite, and more restricted in gamut. Whereas visual perception involves the fading in and out of our consciousness, in the tactual-kinesthetic senses we are either entirely in contact with an object, or not at all. When the hand touches an object we are convinced of its existence and texture, and we are certain it is not the product of an illusion. Objects known only through visual perception change shape with the shifting of position (of which the Cubists and Futurists were well aware). Objects known only tactually, however, retain their shape no matter what the position. Therefore, one might believe the sense of touch to be more dependable, since it is not as reliant on subjective interpretation as the sense of sight.

The hand as a space perceptor is more limited than the eye, since tactual awareness is confined to that which is reachable and touchable. The hand cannot be aware of large forms as a whole, nor be aware of the number or relationship of objects at any given time--a factor necessary in space perception. Conscious contact is necessary for tactual awareness, whereas it plays no part in visual perception.

Visually, space does not exist without perceiving the relationship of objects from a particular point of view (or several points of view). The hand has no point of view and consequently cannot perceive relationships. Tactually, however, the hand is

always aware of its own existence within space, whether or not it is in contact with anything.

Ivins points out that we frequently see objects at the same time that we touch them, and are therefore apt to associate the two sensations, actually entirely different from one another, as one. It is important to note that "we are constantly giving visual expression to tactual qualities, but rarely or never reverse the process."[1] For example, we never say anything feels red, though we say that something looks smooth or rough.

In many instances tactual and visual returns are in conflict with one another. For instance, if two finger-tips of one hand are crossed and a finger from the other hand run between them, tactually there is the sensation of two fingers being used from the other hand, whereas visually there is but one. "When this happens" (and this is why the point is made here), ".... it is necessary that we elect from one or the other as the test of 'reality'. As we habitually elect from one or the other so we make assumptions on which to base our philosophy and accounts of the world."[2] The western world is evidently a visual minded society.

These scientific findings concerning tactual awareness of space are important in interpreting the spacial concepts present in the work of the primitive artist, who is unaware of optical principles. Tactually there is no overlapping of objects, nor

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[1] Ivins, op. cit., p. 7.

[2] Ivins, op. cit., p. 9.

diminishing of size with distance. A square is always a square no matter from what angle it is seen. The child knows that. Objects, therefore, are arranged pictorially in non-overlapping rows, each separately, and relatively correct in size. The artist, therefore whether painting murals at a tomb in Thebes during the 15th Century, or a school child of any age, or the primitive artists of the 20th Century, e.g., Rousseau, Jungle with a Lion; Hirshfield, Tiger; Vivin, Church of St. Laurent and the Gare de l'Est, and Klee (particularly his line drawings), paint what their tactual minds perceive and not what they perceive visually.

Other possibilities of spacial experience lie in the organs of hearing[1] and other sensory centers, such as those involved in balance, located throughout the body.

Scientific reality today has made it possible to interchange sensory experiences. An olfactory experience of fragrance, for example, can now actually be photographed.[2] Sound waves can be experienced visually; and what had previously been delegated to the visual realm can now be transferred to auditory experience by means of a photo cell. Recent experimental films, such as

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[1] Intensity is the main criterion in estimating the distance of sound; i.e., nearer and louder, farther and softer are used interchangeably as adjectives. The Futurists, e.g., Balla: Automobile and Noise, consciously interpreted these adjectives visually.

[2] Refer to Moholy-Nagy, Vision in Motion, p. 182, for photograph of fragrance and accompanying explanation.

Fiddle-Dee-Dee, Dots, and Lines and Dots,[1] have produced actual sounds emanating from the scratches of design impressions made directly on the film strip, producing remarkable--and often delightful results.

This new sensory world, so recently opened, has resulted in new imagery and rhythmic structures for the artist, "the grindstone of the senses," to utilize in reflecting his own era.

NEW PLASTIC LANGUAGE

Color

New schools of painting, awakened to the inherent qualities of color: its visual "energy," illusion, and the heretofore unexplored after-image[2], coupled with a new concern for the "true" picture plane, begun with Cezanne, have changed the entire concept of depicting space on a two-dimensional surface.

The study of color has become a science within itself, and

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[1] All three films were produced in Canada by the International Film Corporation, under the direction of L. McLarin, one of the few pioneers in this relatively unexplored field.

[2] The Futurists were one of the first groups to become concerned with the persistence of images on the retina, but they did not conceive of the after-image as an independent visual experience. My interpretations in the paintings Yellow After-Image and After-Image in Blue, are far from scientific explanations of this phenomenon. They attempt to convey, visually, the indefinite color image that we are uncertainly, at some time, aware of; an image which slips in and out of our experience and make us aware of an unexplainable spacial consciousness. After-Image in Blue is also an attempt to evoke psychological sensations other than that of the after-image, which Yellow After-Image does not include. Though the image in Yellow After-Image exists within a space, the painting is also concerned with preserving the two-dimensionality of the surface.

has been thoroughly investigated by the physicist and psychologist, as well as the artist. Many systems have been evolved for the study of color, including graphic representation, registration by formula, and standardization by means of color cubes, spheres, or spindles. It was not until after the experiments of the Impressionists and the work of Cezanne that color was understood as an independent spacial element in painting.

The properties of color[1] make it possible to locate color three-dimensionally on a flat surface, eliminating the need for any linear perspective to create the illusion of depth. It has been ventured by Butler[2] that changes in value are generally visualized as vertical, changes in intensity are horizontal, and changes in hue affect the depth, or advancing and receding factor of color. Thus it becomes possible to produce the most subtle or powerful spacial illusion through sensitive manipulation of one or more color properties. The artist can penetrate the canvass by creating infinite space or mere surface oscillation through the use of color alone.

There are definite visual relationships that exist between color and form. Hues of short wavelength (e.g., greens, blues, violets) are not easy for the eye to focus sharply. They appear blurred at a distance and therefore do not lend themselves to

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[1] The three basic properties of color are usually referred to as hue, the property which distinguishes one color from another; chroma or intensity, the degree to which a color is saturated with its hue; and value, the degree of blackness or whiteness, sometimes referred to as luminosity (though this later term may be confused with intensity).

[2] Butler, op. cit., pp. 69-72.

detail. Colors of short wavelength, on the other hand (e.g., reds, oranges, yellows), are sharply focused on the retina of the eye and therefore are capable of communicating pattern, sharpness, and more intricacy. Pale colors (e.g., yellow, ivory) appear lighter in "weight" than dark colors (e.g., maroon, black). Ornament and texture suggest nearness; plainness and "filminess" of color suggest distance.

These observations have been set forth by researchers in the psychological aspects of seeing. But even before science had categorized such information, Cezanne was aware of the interrelatedness of form and color. Cezanne contributed his own method of creating a new and exciting illusion of space by using form and color as inseparable. He modeled objects with planes of color, creating volume by building each object up, through gradual steps, from cool (receding) to warm (advancing) color. No matter what the subject employed (e.g., Still Life With Apples, House Among Trees, Pines and Rocks), Cezanne was concerned with building a spacial arrangement of color and form complete within itself as an abstract design. (This is particularly true and most evident in his watercolors.)

Gauguin and Van Gogh were dissatisfied with using color restrictively to merely record effects on the eye. They employed color--differing greatly from one another, to include the recording of the emotions. Blanshard[1] points out an affinity between Gauguin's work and the writings of Schopenhauer who instructed

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[1] Blanshard, op. cit., p. 99.

young painters to look for reality in dreams and try to express the "unconscious."[1]

Gauguin was also aware of the "musical" qualities of color (anticipating the work of Kandinsky) and the similar, direct impact of sounds and colors on the senses. In his Letters to Ambrose Vollard and Andre Fontainas, Gauguin wrote: "Think .... of the musical role color will henceforth play in modern painting. Color, which is vibration just as music is, is able to attain what is universal yet at the same time most elusive in nature, its inner force."[2]

Gauguin's colors and patterns respected the two-dimensionality of the picture plane. His spacial order, e.g., The Moon and the Earth, was achieved by the balancing of the advancing and receding properties of color in so harmonious and skillful a way that the flat surface of the canvass was not destroyed by the illusion of depth.[3] Rousseau, and later Matisse, also became masters of this kind of decorative space.

Picasso's paintings, particularly those of the 1920's and 1930's, also transformed three-dimensionality into elements of a

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[1] The painting, Through the Inner Air (submitted), depicts the spacial consciousness of dream reality with its personal distortion of forms moving in space--with which the Futurists were also concerned.

[2] Gauguin, Letters to Ambrose Vollard and Andre Fontainas, as quoted in Blanchard, op. cit., p. 99.

[3] In the painting, In and Out; a Study in Planes (submitted), the primary spacial factor is transparency, but it is handled in such a way as not to destroy the two-dimensionality of the picture plane, thus producing an essentially flat, but fluctuating, space.

two-dimensional plane. By forcefully advancing rear planes and recessing frontal ones, aided by subtle use of color values and intensities and free line directions, he achieved a counterbalance of spacial forces, producing a kind of two-dimensional equilibrium (e.g., Jazz Musicians and Girl with Mirror).

Rouault achieved a two-dimensional quality in his paintings by other means. He was apparently aware of the optical law that the nearer one color is to another, the greater is the contrast between them and therefore the greater is the resulting spacial interaction. By introducing black lines between colors, the distance between them is increased--the thicker the line, the greater the distance between colors, and therefore the less contrast. When such contrast is held at a minimum, the spacial illusion becomes two-dimensional.[1]

The black lines with which Rouault surrounded his colors, as in Christ Mocked by Soldiers, also served another purpose. By using such a device, his colors appear more intense and luminous, for it has been verified scientifically that colors appear most intense when surrounded by black. Rouault thus was able to achieve an exciting, fluctuating, luminous surface quality while still respecting the two-dimensionality of the canvass.

Rouault and Van Gogh were aware of the power of color to suggest what is beyond an immediate visual experience. Kandinsky went even further by using color in an effective existence of its own. This became the purpose of the Synchromists. Kandinsky

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[1] The introductory panel of color confined in black (submitted) demonstrates this point.

created amazing similarities to musical compositions by using the light and heavy, advancing and receding qualities of color in a harmonious whole, e.g., Improvisation No. 30 and Little Dream in Red. In both these compositions, all the elements employed play their parts individually, but all are part of the whole "symphony."

Based on intricate physiological as well as psychological reasons, the interrelatedness of hue and value and intensity seems to be the basis for spacial experience through color. The sensations of advancing, receding, floating, falling, etc. depend not only on these properties' relationship to one another, but on relative size and area of each as well. The Suprematists concerned themselves with this particular problem of spacial illusion. They often played one value against another, varying the area of each so that sometimes one value would appear to be receding, and, with slight variation in either value or area, it would appear to advance. Malevich, the founder of Suprematist painting,[1] produced such compositions as White on White and Black on Black, creating space by playing one area of subtly differing value and size against another. Colors were also balanced in intensities that in one instance a color could be regarded as advancing, and then, simultaneously, receding--thus creating an exciting, fluctuating spacial effect.

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[1] Wrote Malevish in his autobiography: "By Suprematism, I mean the supremacy of pure feeling and perception (Empfindung) in the pictorial arts." From Alfred M. Barr, Jr., Cubism and Abstract Art, p. 65.

The new significance attached to the interrelatedness of colors, that is, that each color is relative, being modified by the surrounding hues and values and intensities, perceived in the work of Cezanne, Gauguin, and Matisse, reached its fullest development in the work of Malevich and Mondrian. Both these men explored to the fullest the inherent space dimensions of color on a flat surface.

Mondrian used pure unadulterated primary color in a composition stripped to the most basic line and plane arrangements, e.g., Composition With Blue and Yellow, White, Black, and Red, and Opposition of Lines, Red and Yellow. By playing simple black lines against white squares with the most controlled addition of one or more primary colors, he created an illusion of optical tension and "dynamic" movement.[1]

Mondrian, writing about his own work, asserted:

> The appearance of natural forms changes but reality remains constant. To create pure reality plastically, it is necessary to reduce natural forms to the constant elements of form and natural color to primary color. The aim is not to create other particular forms and colors with all their limitations, but to work towards abolishing them in the interest of a larger unity.[2]

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[1] Mondrian's pure geometrical relationships of lines and planes has formed the basis of contemporary design. Modern architecture, interior and product design verify his own premise of the utilitarian application of such "aesthetic" experiments to functional design. Says Berkman, op. cit., p. 168: "The concept of the modern world is found in his (Mondrian's) naked abstractions which, to him, were not so much pictures as expostulations of a philosophy."

[2] Piet Mondrian, Plastic Art and Pure Plastic Art, p. 10.

Line

Not only color, but also line has been freed as an independent element capable of evoking spacial experience. Line is no longer used to merely define shapes, but rather, to organize the relationship of planes and create depth through rhythm and movement. By building up a continuity from one surface to another, lines lead the eye in and out and behind and over the planes of the picture, creating an extremely flexible kind of space.[1] By changing the weight of a line, for instance, infinite depth can be suggested.

Paul Klee, a master of all the elements of the new plastic language, used line in incredible variety to create lyrical, imaginative depth. His spontaneous linear technique, e.g., The Mocker Mocked and Slavery, and his subtle inventions of subjective images in infinite space, as in Fairy Tale and The Mount of the Sacred Cat, greatly influenced the later Surrealists.

Although there is a sense of infinite space in the work of Surrealists Tanguy (e.g., Slowly Toward the North) and Dali (e.g., The Persistence of Memory), it is literal space; that is, the space created could actually exist. On the other hand, the space creations of Klee, Kandinsky, Mondrian, and the microscopic views of Miro[2] are imaginative space, effecting a much richer spacial

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[1] Refer to the two introductory paintings (submitted) which demonstrate the moving and unifying quality of line as an independent element.

[2] Refer to own interpretation of Microscopic Space (submitted painting). Though the motif or subject has form, its spacial existence is in the flat of the picture plane.

experience. Such space is suggestive rather than the fixed concept of spacial reality as in the Renaissance. By subtle use of color, weight, and line direction, suspension and movement of all elements in space, the painter today is capable of rendering infinite, cosmic depth, thus reflecting the concept of a constantly fluctuating world.

It is the new technological inventions and discoveries that are primarily responsible for freeing the artist and layman alike from the fixed, static, horizontal view of depth. The vanishing point and horizon need no longer be fixed and constant, as any photographer or pilot may verify. The "bird's-eye" view[1] and the "fish-eye" (or frog's-eye) view, for which the camera is primarily responsible, are now accepted visual, spacial experiences.

It is interesting to note that Malevich's compositions are greatly influenced by airplane views of landscapes and cities, which he studied intensively. Some of the subtitles of his work, too, are interesting to note: Sensation of Metallic Sounds-Dynamic, Feeling of Infinite Space, and Feeling of Flight.

New forms have been found in the relationship of measurements: in movement, speed, intersection, penetration, interpenetration, and telescoping. By contrasting, varying, deviating these forms--through shifting, repetition, turning, and mirroring

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[1] Though the black-and-white study Downunder (submitted) employs textural and value contrasts, and plane and linear direction to create the effect of space, the primary device of interest is the lack of any vanishing point, though one is conscious of a definite point of view--similar to the structure of a "bird's-eye" view.

them (doing away with the fixed, static, conventional viewpoints--new spacial effects have been created.[1]

In the last 30 to 40 years, there has been a new interest in the positive (full) and negative (empty) play of elements in a painting. Though positive and negative space were present in the painting of the Renaissance and the work that followed, Cezanne was the first to really evaluate the full and the empty parts of a painting. In the canvasses he left "unfinished" (e.g., House Among Trees), Cezanne introduced a new suggestive pictorial space (in some ways similar to the Chinese technique) to western art, with the structure of the areas left empty of equal importance to those painted in. The supposedly incomplete canvasses of Picasso, e.g., Still Life with a Calling Card, and the "sketchy" work of Matisse, e.g., Bather, are likewise important contributions to a new, freer-flowing spacial representation.

The collages of the Cubists and the paintings of Braque and the Constructivists consciously employed the concept of positive-negative interplay--thus creating spacial tensions and "activating" the picture plane. The linear drawings of Ozenfant (Linear Diagram of a Painting) and Le Courbusier (Drawing: Schniewind Collection) are excellent examples of the fluctuating illusion of simultaneous positive-negative space. When photography made possible the interchangeability of positive and nega-

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[1] Leaves (submitted painting) represents in part the intersecting, overlapping and constant repetition of the subject matter in varying ways so as to create a fluctuating spacial surface treatment with regard to the picture plane.

tive space in solorization photographs[1], photograms[2], and photo-montage[3], a new type of spacial rendering was revealed.

Light

Present-day efforts of the avant-garde in the visual field, notably the late Moholy-Nagy and Charles Biederman, are tending to subordinate pigment in preference to using direct light as a media for producing pictorial space; in other words, "painting with light." New knowledge of light, both natural and synthetic, brought about by scientific and technological advancement, have awakened the artist to the wealth of inherent possibilities in using light as a direct means of creative expression. Instead of trying to emulate transparency, reflection, refraction, illumination, mirroring, etc., he can use light itself to create the desired spacial effect.

For example, experiments have been made by spraying polished surfaces of metal and other synthetic material with thin, iridescent layers of paint which allow the underneath layers to reflect through, creating a fluctuating spacial effect. Other experiments with transparent materials (e.g., celluloid sheets) and the use of transparent dyes on plastic, have shown the great variety of

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[1] In this process, negatives are printed negatively, creating an entirely new spacial effect in contrast to the usual positive printing.

[2] A type of cameraless photography, using light on sensitized paper.

[3] The cutting and rearranging of one or several photographs or their parts to construct a new image from the reassembled parts.

spacial effects possible with the most subtle change of lighting conditions (e.g., Moholy-Nagy's Light Painting, 1936). The possibility of such continuous change in itself is rich in spacial experience.

The use of light is not new. It had played an important part, in the form of light and shade, in creating three-dimensional illusions of objective reality. But the "new reality" is using light itself to represent light and shadow and space.

To Gyorgy Kepes color and light are interchangeable terms:

> The experience of light--in other words, the sensation of colors--stands for the organisms security and thus has a quality of affirmation. To experience color is to interprete the very core of physical reality in terms of sensory qualities.[1]

Moholy-Nagy has pointed out:

> Most of the visual work of the future lies with the "light painter." He will have the scientific knowledge of the physicist and the technological skill of the engineer coupled with his own imagination, creative intuition and emotional intensity.....
>
> In the coming experiments, research in the physiology of the eye and in the physical properties of light will play an important part.[2]
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> This stage (use of light properties) in a manner marks the close of impressionism; it represents the mastery of the surface, not for plastic but for clearly spacial ends.[3]

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[1] Gyorgy Kepes, Language of Vision, p. 134.

[2] Lazlo Moholy-Nagy, Vision in Motion, pp. 166, 168.

[3] Lazlo Moholy-Nagy, The New Vision, p. 86.

Influence of Photography

It is evident that photography has done more to reveal the new reality of space of our time than any other discovery or invention. Not only has it given us a different point of view physically speaking, but it has also revealed the inner structure of objects through the introduction of transparency.[1]

Transparency first appeared in X-Ray photographs and photographic superimpositions. The Futurists constantly referred to X-Ray pictures as an outstanding informational source for understanding the workings of inner and outer spacial structure.

Photograms, which I believe come under the contemporary concept of painting (specifically, painting with light), afford another method of rendering imaginative space. For the catalogue of his first photographic exhibition in 1923, Moholy-Nagy wrote:

> The concretization of light phenomena is peculiar to the photographic process and to no other technical invention. Cameraless photography (the making of photograms) rests on this. The photogram is a realization of spacial tension in black-white-gray. Through the elimination of pigment and texture it has a dematerialized effect. It is a writing with light, self-expression through the contrasting relationship of deepest black and lightest white with a transitional modulation of the finest grays. Although it is without representational content, the photogram is capable of evoking an immediate optical experience, based on our psycho-biological visual organization.[2]

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[1] Transparency itself is a characteristic of our age. Witness the new advances made in architecture and industrial design that have tried to eliminate the static and opaque, and reveal the inner makeup of structures. For further information see Gideon's Space, Time, and Architecture, which includes a discussion of the important influence of the Industrial Revolution on such concepts.

[2] Sibyl Moholy-Nagy, Moholy-Nagy: A Biography, pp. 27-28.

The advent of the double exposure--either taking or later printing one photograph over another of the same or an entirely different subject, opened the way for the depiction of new and strange dreamlike spacial experiences. Photomontage also lent itself to delving into the realm of the unconscious. From these experiments the painter took his cue of revealing heretofore unknown or unnoticed spacial structure and spacial experiences. He also realized how limiting the depiction of reality from a "logical" point of view had been, and plunged further into the psychological and emotional.

"Emotional space," though playing an important role in the contemporary art scene, is not the purpose of this paper, which deals primarily with the scientific (intellectual) aspects of revealing space perception through painting. Hence the neglect in mentioning works such as Van Gogh's Starry Night, de Chirico's Nostalgia of the Infinite, Chagall's Time is a River without Banks, Shahn's Handball or Spring, and Munch's The Cry, whose contributions to the new reality of space are primarily based on psychological subject matter, using the accepted devices of the past. An attempt, however, to draw a line between those painters who are emotional and those who are scientifically inclined would be futile. Mondrian, for example, is considered highly emotional by some, and purely scientific by others, either group sanctioning his work.

CONCLUSION

Artist and Nature

Today, due to the pioneering efforts of Picasso, Braque, Matisse, Cezanne, Malevitch, Kandinsky, Moholy-Nagy, and Marin, painting is no longer involved in the recording of the visual world as reality. The artist, now free from his impulses to record for its own sake, has gone on to create his own art content. Lines, color, form, planes, texture, and light, are now elements in their own right, rather than a means to an end--confined to a subject. This is the new plastic language to express a new awareness of the age in which we live.

The use of this new plastic language, however, does not imply that the artist no longer has any relationship to or need for nature. On the contrary, nature is the exploration ground for "secrets" of reality. Though there is now no need, with the advent of photography, to compete with nature as artists have done since the Greek age, there is less justification for the condemning of nature as chaotic. The artist is still dependent upon nature, only in a different way. Science has greatly widened our comprehension of nature as reality, revealing the fundamental underlying structures of our existence. Nature contains the creative process itself; and the "true" artist, rather than ignoring nature today, attempts to integrate his own existence with it. Witness the words of the artist himself:

Charles Biederman:

The attitude of the developing future will be one of non-compromise with the art of nature, but natural environment. This is not a denial of nature but a recognition between the art of the Machine and that of unaided nature.

In the future ....man will no longer be struggling with the forces of nature, as in the past, but will be striving to his utmost to preserve great areas of nature's world which offer him experiences indispensable to his continued well-being.

Through the proper study of nature man can make a world of art which he need not be ashamed of in the face of nature's art.[1]

Gordon Onslow-Ford:

The emotions evoked by the forms and colors of its (an apple) image, no matter how well they were reorganized, changed or distorted, have always in my experience fallen short of the emotions evoked by the apple itself. Or if I were to use this apple as a jumping-off point from which to express some idea in light or space-time, the apple becomes unimportant or replaceable by a red ball of similar dimensions.

A painter cannot hope to compete with the fruits of nature by trying to imitate them, but he can follow nature's process and create with her aid his own fruits.[2]

Francis Bradshaw Blanshard:

Neither purity nor unity counts without truth. A painting is "true" if it gives insight into reality, reality which transcends the material world and can be known only by the artists who have escaped from the prison of physical nature. Artists must free themselves from human limitations in order to find traces of the truth that is more than human. Their quest for truth, when it succeeds, always brings them something new, since reality can never be discovered once and for all, and continually reveals itself in fresh insights.[3]

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[1] Biederman, op. cit., pp. 650, 651.

[2] Gordon Onslow-Ford, Towards a New Subject in Painting, p. 22.

[3] Blanshard, op. cit., pp. 125-126.

Piet Mondrian:

> It is....wrong to think that the non-figurative artist finds impressions and emotions received from the outside useless, and regards it even as necessary to fight against them. On the contrary, all that the non-figurative artist received from the outside is not only useful but indispensable, because it arouses in him the desire to create that which he only vaguely feels[1] and which he could never represent in a true manner without the contact with visible reality and with the life which surrounds him. It is precisely from this visible reality that he draws the objectivity which he needs in opposition to his personal subjectivity. It is precisely from this visible reality that he draws his means of expression: and, as regards the surrounding life, it is precisely this which has made his art non-figurative.[2]

Thus, Biederman, Onslow-Ford, Blanshard, Mondrian, and other far-seeing interpreters of today's art predict the direction the contemporary painter is to take to be truly a product of his time and a reflector of this age.

Art and Science

The great technological and scientific interests of the 20th Century have produced the varied schools of painting which adhere to the style of geometric rigidity and the structural concepts of the engineer and architect: Neoplasticists, Suprematists, Constructivists, Constructionists, and Purists.

Through the use of geometric forms, Ozenfant, leader of the Purism movement, attempts to emulate the machine in scientific exactness (e.g., The Vases). Leger, too, has used the flat shapes of the machine to reflect this era, transferring its three-

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[1] See footnote 1, p. 35; (re: Yellow After-Image).

[2] Mondrian, op. cit., p. 62.

dimensional reality into the flat reality of the canvass. His paintings (e.g., Le Grand Dejeuner and Farm (Landscape) have the precision of a machine with each element perfectly and powerfully designed.

Herbert Read poses the question as to the reason this mechanic or geometric sensibility should have a special appeal today.

> There are .... two answers to the question, one obvious enough, the other involving rather complicated questions of social psychology. The obvious ground for the appeal of mechanical forms is the presence in our daily lives of so many machines: of so many objects, expressing in their lines and volumes a certain functional perfection to which we cannot deny the name of beauty. It is true....that all perfectly functioning machines are not beautiful: that the quality of beauty is perhaps confined to machines expressing some abstract notion like speed, power, or precision (the echo of the Futurists once again). But that does not alter the fact that we are surrounded by such examples of mechanical perfection, and that it would therefore seem legitimate to attempt to transfer to painting and sculpture the same qualities of perfection which we find expressed in Machines.
>
> We must look for some wider explanation in the spiritual life of the peoples concerned--for the science of art is finally the science of human psychology....[1]

The contemporary painter, Hilair Hiler, expresses the desire to eventually paint scientifically, "....taking from chemistry a new palette of brilliant colors, and from psychology and optics the measurements of the impact of colors and forms on the eye and the emotions."[2]

Biederman, the Constructionist, contends that eventually the

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[1] Read, Art Now, pp. 100-102.

[2] Blanshard, op. cit., p. 110.

new art will become a full-fledged major branch of science.

Although I believe these to be extreme points of view (valid as they may be to those painters who follow them), such trends--or the prediction of such trends--nevertheless tends to point out the close affinity of art and science, each field reinforcing the other in the revelation of "reality."

The general public is usually unconcerned and ignorant of the experiments and discoveries of the art world; yet within such experiments, as within the "pure" fields of science and mathematics, lies the extension of man's knowledge about himself and his environment. Art as well as science has always played a fundamental role in the investigation and understanding of human experience--and therefore man's concepts of reality.

The advanced products of art and science are usually condemned as useless by the general public who harbor a hostility to change and anything they regard as non-utilitarian. Because of this attitude there is little sympathy toward the work of the truly contemporary artist.

There is a story about Michael Faraday, the scientist, who was demonstrating the principles of the electric current when he was asked: "'But, Professor, of what use is all this?' Faraday, without looking up from his demonstration, shot back, 'Madame, of what use is a new born baby?'"[1] The paintings of the contemporary art world are equally new born, their worth to be evaluated in later years.

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[1] Willy Ley, "The Latest in Science: Magnetic Current," PM, January 26, 1944, p. 13.

The new concepts of reality--relativity and time, matter continuous and in a constant state of flux, microscopic and telescopic space, transparency, psychological and physiological optic, etc., coupled with new materials, techniques, and forms, such as light, color, X-Ray, structures of a technological society, and photography, discussed in this paper, have equipped the painter of today with new tools for the exploitation, realization, and expression of his spacial environment. The subjective reality of the past is giving way to a more objective, scientific approach. I have attempted to show that through a new understanding of free lines, pure color, and basic structure in interrelationship, the contemporary artist is expressing, as directly as possible, the basic "universal reality" he is a part of today.

As Mondrian effectively wrote:

> .... "art" is not the expression of the appearance of reality such as we see it, nor of the life which we live, but that it is the expression of true reality and true life .... indefinable but realizable in plastics.[1]

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[1] Mondrian, op. cit., p. 60.

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THE NEW REALITY OF SPACE AS APPLIED TO PAINTING

by

MILDRED S. LUBROTH

B. A., University of Southern California, 1947

AN ABSTRACT OF A THESIS

submitted in partial fulfillment of the

requirements for the degree

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Department of Architecture and Allied Arts

KANSAS STATE COLLEGE
OF AGRICULTURE AND APPLIED SCIENCE

1951

> An artist's statement about his own work is often of less value than one would expect, Frequently it is only vague adumbration; sometimes it is a collection of misleading aphorisms which, lifted out of context and exaggerated beyond intent, boomerang back to plague the artist and to confuse the spectator.[1]

I have submitted several paintings as the major creative work of my master's thesis. Because I am in thorough agreement with Miss Louchheim's statement, I have chosen to write a paper containing supplementary material to the understanding of these paintings, rather than attempt to explain the paintings themselves, specifically and individually. If the concepts contained in the paintings could be adequately expressed in words, there would be no reason for having painted them.

Today we find ourselves within a new spacial order which science has revealed. One can sense the infinity of space and the processes of which he is merely a part. It is this thought-provoking space which I have concerned myself with producing; space which makes the spectator feel he is part of a more complicated universe.

Depicting space of an apparent existing reality has been a well-known experience since the Renaissance. My purpose, therefore, is not to represent visible space as such. Lines and planes and the spacial properties of color, extending into depth and changing their positions, create movement which results in an extremely flexible kind of space. Space so represented is much more evocative than a naturalistic rendering completely stated, to

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[1] Paul Klee, On Modern Art, p. 9.

which the spectator is firmly bound.

In order to express life in contemporary terms, the modern artist is no longer limited to what he sees at the moment. His vision has been extended, through technological advancement, into a new awareness of reality, resulting in a new art form as different from the past as has been our technological development. Equipped with the knowledge of what has gone before as well as with the advanced theories and new materials of today, the artist can venture on to new paths, valid or not, as they may appear to his contemporaries.

Each painting which I have submitted is an entity within itself, though all share in common a personal interpretation of the thesis: The New Reality of Space as Applied to Painting. The introductory panels serve to illustrate particular points, whereas the paintings involve several of the points discussed. The following paper aims to justify the existence of these paintings from the standpoint of historical development and as a reflection of contemporary thought.

I find the poetic words of Paul Klee most akin to my feelings at this point, when, lecturing at the opening of his exhibition in 1924, he said:

> Speaking here in the presence of my work, which should really express itself in its own language, I feel a little anxious as to whether I am justified in doing so and whether I shall be able to find the right approach.
>
> For, while as a pointer I feel I have in my possession the means of moving others in the direction in which I myself am driven, I doubt whether I can give the same sure lead by the use of words alone.

But I comfort myself with the thought that my words do not address themselves to you in isolation, but will complement and bring into focus the impressions, perhaps still a little hazy, which you have already received from my pictures.[1]

[1] Paul Klee, On Modern Art, p. 9.