SOME EFFECTS OF COLOR ON PERSONNEL
IN INDUSTRY

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SOME EFFECTS OF COLOR ON PERSONNEL
IN INDUSTRY

THESIS

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CHAPTER I

INTRODUCTION

Statement of the Problem

The problem of this study is to determine some effects of color on personnel in industry. Consideration is given to management-employee relationship, employee's physical and mental health, and the resulting increase of both quality and quantity of production.

Limitations of the Study

The implications in the statement of this problem are many. Therefore, certain limitations were deemed necessary. In the first place, industry was restricted to industrial plants alone. Management was limited to the individual or individuals who are responsible for the progress of the business, and personnel included the manager and the employees over whom he had supervision.

In the second place, the research was limited to data supplied by leaders in the field. No experimentation in the use of color was carried on by the investigator. Information used in the development of the problem was obtained from people who had experimented with color in industry or who were otherwise informed on the subject. Furthermore, since
there are many angles to the effects of color on personnel, it was necessary to limit the present investigation to three areas; namely: (1) the mental and physical welfare of employees, (2) the promotion of desirable management-employee relationships, and (3) the resulting increase in production.

Sources of Data

Both primary and secondary sources of data were utilized in the development of the present problem. Management, personnel, and color consultants who had experimented with color in industry were included in the primary sources. Books, periodicals, pamphlets, and reports comprised the secondary group.

Method of Procedure and Treatment of Data

The development of the problem required four definite steps. First, literature on the use of color in industry and other fields was reviewed. Recent books and periodicals were the main sources of information at this point.

Second, letters of inquiry were sent to the Pittsburgh Plate Glass Company, Pittsburgh, Pennsylvania; the E. I. du Pont de Nemours and Company, Wilmington, Delaware; the Glidden Paint Company, Cleveland, Ohio; and the Sherwin-Williams Paint Company, Dallas, Texas. From these sources data were obtained on the industries in this country which have experimented with color.
Third, leading plants and stores within a radius of fifty miles of Denton were visited by the investigator. Interviews were held with business executives, industrial engineers, personnel of paint companies, and decorators. Information was obtained from them relative to the seeming effect of color on the mental and physical welfare of personnel, on the promotion of desirable management-personnel relationships, and on the resulting increase in production.

Fourth, when the necessary data were obtained, they were analyzed. Then they were organized into the following sequential chapters: Introduction, A Review of Literature on the Practical Uses of Color in Various Areas, Some Reported Effects of Color on Personnel in Industry, and A Summary of Data with Conclusions.

Significance of the Problem

Color completely surrounds the inhabitants of the world and exerts a constant influence, either directly or indirectly. With these facts in mind, management recently has come to realize that an intelligent use of this phase of art means improved personnel welfare and relationships directly and increased profit indirectly. Since the problem has these social implications, it appears to be socially significant.
Related Studies

Management's interest in the use of color for developing personnel efficiency has increased in recent years. In an effort to improve workers and working conditions many studies have been made relative to the scientific methods of applying color to work areas and the actual effects of color upon workers.

The Jones and Laughlin Steel Corporation of Muncy, Pennsylvania, experimented with color dynamics in their wire rope plant. Some results of the experiment are contained in the following excerpt from a personal letter:

The results of Color Dynamics in our rope plant have been highly gratifying. Over a period of time during which other factors remained reasonably constant, improvement was measured in safety, morale and production. The number of lost time accidents was reduced by 38% following the inception of the program. Eye strain and mental fatigue required in the continuous attention to production units was greatly reduced. Improved employee morale was evidenced by reduction in absenteeism from approximately 5% to less than 2%. Labor turnover was reduced from approximately 4.5% to .4%. Machine efficiency increased from 86% in 1945 to 96% in 1948.1

Powdrell and Alexander, Incorporated, a manufacturer of curtain fabrics in Danielson, Connecticut, for the past five years have followed a modified plan of color dynamics in the painting of their mills. They followed the recommendations of the major paint producers in refinishing the ceilings and side walls. Prior to 1945, they painted all departments with

white ceilings and sidewalls and used a dark green paint for the dado. This scheme was used to present a neat appearance, but tended to be rather monotonous.

Since textile machinery generally is not hazardous to operate, the company has not adopted color dynamics in the painting of their equipment. They do not have a great amount of floor traffic and consequently have not gone into painting traffic lanes.

While the company has not made a detailed study of results obtained through the use of color dynamics, the following general statements were made by R. W. Gould, purchasing agent:

1. It has made our mills a more pleasant place to work and consequently it has improved the morale of our employees.

2. It has relieved the workers of the monotony of seeing the same colors throughout the entire plant.

3. Workers generally have taken greater pride in keeping their departments neat and clean, which has reduced the amount of maintenance necessary.

4. While we have no data to support this statement, we believe that it has improved the efficiency of our workers through less eye fatigue.²

The Crown Cork and Seal Company of Baltimore, Maryland, recently used color dynamics in their new building, which consists of an office, engineering department, cafeteria, and machine shop. R. B. Hoffmeister, chief industrial engineer, reports the following effects of the color program:

We have noticed fewer complaints of eye strain from our office and engineering force. In our shop, better housekeeping has resulted from the use of colors. We feel that fatigue has been lessened; the workers seem to have more pride in their machines and surroundings.

In closing, we might advise that we have been complimented on the appearance of our shop by visitors who have had a chance to observe many plants during their travels.  

The preceding studies are representative of many which have been reported. Although a large portion have had few, if any, specific statistics to prove their results, they are of the opinion, in general, that color plays a significant role in the field of personnel.

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CHAPTER II

A REVIEW OF LITERATURE ON THE PRACTICAL USES OF COLOR IN VARIOUS AREAS

This review of literature on the problem of color's use in various areas is included as a background for the present study of management's consideration of color in the field of personnel. Its purpose is to show that wherever people work or live together color can be an effective instrument for better relationships.

The Importance of Color

Since the world began, color has been an important factor with respect to its effects on man. A number of years elapsed, however, before man realized this significance and attempted to investigate the subject. Today color is no longer taking a back seat but is coming more and more to the forefront. People all over the country are becoming interested in the influence which it exerts. Numbers of books, articles, and pamphlets have been written regarding color theories. Many scientific studies and experiments have been conducted in order to determine the various aspects of color.

Since color has been recognized by eminent authorities as having definite effects on the individual, it is almost
a necessity for the leaders in commercial organizations to have some knowledge of its basic principles. By having such a knowledge, they will qualify themselves better for the job they assume in that they will be able to understand a little about how the different colors are made up and can know which colors to use in order to produce a specific effect or atmosphere.

Color is used functionally today in an uncountable number of organizations and institutions, both public and private. That is to say, color has ceased to be thought of as merely "something pretty" or attractive to the eye. Modern designers and decorators use colors to arrive at certain effects or to eliminate effects which might be a handicap. Color can be made to work for anyone who knows how to use it correctly. Cheskin says that the elements which constitute an effective color plan are not determined by a decorator's personal taste but by scientific analysis.\(^1\) This idea is continually gaining a good foothold in the minds of many people who understand some of the ways in which colors work.

Color's Service to Man

Whether man is aware of it or not, color acts in such a way as to be continually serving him. It is helpful in

\(^{1}\) Louis Cheskin, *Colors: What They Can Do for You*, p. 160.
distinguishing one object from another. It can bring peace and contentment or cheerful stimulation when it is used correctly. On the other hand, it can produce an effect of discord, nervousness, and depression if it is used in the wrong way and in the wrong combinations. People select their furniture, food, clothing, and cars by what is known as "color preference." The meaning of this term is explained by the phrase itself.

There are innumerable ways by which colors can be utilized to serve man. They can cost him money or save him money. They can be used to advantage in his business and in his everyday life. His mental, physical, and spiritual well-being may, more than likely, be influenced by colors with which he comes in contact and which surround him. Truthfully, it has been declared that "if the color factor was eliminated from the scheme of things, mankind's colorful world would be transformed to the drab neutral tones of an ordinary black and white photograph."²

The Characteristics of Color

Color has three dimensions or attributes. These are called hue, value, and intensity.³ Hue may be defined as the name of the color, such as red, yellow, and green.

²Pittsburgh Plate Glass Company, Public Relations Department, Color Dynamics, Press Release 655, p. 47.

Hues may be broken down into three divisions described as primary, secondary, and tertiary. The primary hues are composed of red, yellow, and blue. Secondary hues consist of green, purple, and orange and are made by mixing equal parts of two primaries. Tertiary hues are formed by mixing one of the primaries with a secondary hue. Effects of various hues and combinations are described in the following quotation:

Hues have an effect ranging from warmth to coolness. Red, red-orange, yellow-orange, and yellow are warm hues, associated as they are with the sun, fire, and other sources of heat. Conspicuous, cheerful, and stimulating are the warm hues; they stand out prominently, having an effect of coming toward you and for this reason are called advancing hues as well as warm hues.\(^4\)

It stands to reason, therefore, that if the individual wishes a room to have a warm, cheerful appearance he will have the walls and furnishings keyed to a color scheme which contains predominately warm hues. Cool hues are designated as green, blue-green, blue, blue-violet, and violet. If quiet and restfulness are the prime purpose of the room, it would be logical, then, to use these colors which produce that effect.\(^5\)

Birren substantiates the current concept relative to color's effect on people's reaction to various environments in the following statement:

In looking at the spectrum, the average person will see its colors as warm or cool. This psychological

\(^4\)Ibid., p. 133. \(^5\)Ibid.
response is to be observed frequently in the reaction of people to an environment. An example of this influence is noted in an illustration which describes a restroom that was built for the employees of a certain firm. It was painted slate blue and gray and automatically was kept at a fixed temperature. However, the employees reported an uncomfortable coolness while in the room. The firm was advised to repaint the walls in warmer colors. When the re-decoration was completed in brown and orange, employees reported that the room was very comfortable. However, no change had been made in the temperature.

Any number of other instances may be sighted in agreement with the fact that colors have certain psychological effects on the individual. Therefore, it is a distinct advantage for the leaders and heads of industry, large and small business concerns, schools, hospitals, and various other organizations to have some knowledge of what color can do.

The second dimension of color is value, which refers to the lightness or darkness of a color, as light red or dark red. Lightness is sometimes called tint, whereas darkness is known as shade.

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6 Faber Birren, Selling with Color, p. 169.
8 Faulkner, Ziegfeld, and Hill, op. cit., p. 195.
Intensity makes up the third dimension of color. It consists of the brightness or dullness of a color. Intensity might also be thought of as the purity or pigment strength of a color. The term chroma is synonymous with intensity.

Pure colors are those as seen in the rainbow or through a prism. They are colors that are not diluted with white, black, or gray.

In order for a color scheme to be effective in a functional way, the correct hues, values, and intensities should be taken into consideration, along with the purpose the painting is to serve. Colors thrown together merely for personal taste can be detrimental. A well-planned business need not waste money, and that is one of the things which will occur if colors are not selected with care. Every error in color costs money because of the tremendous influence it exerts. This influence is described in the succeeding paragraph:

> Few people ever stop to think of its truly immense, earthly practical importance to the economics of daily living. Right color can make people happy; wrong color can make them sad or grumpy, or bore them to desperation. Properly applied in office or home, color can spare people eyestrain and needless aches that often go with it. Color may even prevent the loss of a finger, a leg, or a life.⁹

It is not especially essential that heads of organizations make direct or first-hand experiments to find out which

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⁹Faber Birren, "What Color Can Do for You," Pathfinder, (May 17, 1950), 44.
colors to use for the best possible effects when they find it necessary or advisable to set up a new color program. An abundance of experiments and tests have been made to discover the influence of various hues. The Pittsburgh Plate Glass Company, E. I. Du Pont de Nemours & Company, Incorporated, The Sherwin-Williams Paint Company, the Glidden Company, and a number of other concerns, as well as individuals, have published much material and information which can be of great help to those who start on a new color program.

Color Preference

Color preference has to do with the appeal of colors to the individual. Noted experts in the field suggest that preferences are influenced to a great extent by the individual's personality and temperament. Race also may have something to do with certain choices. The reliability of this concept is stressed in the following quotation:

At least fifty authoritative tests have been made of human color preferences. The literature is so complete and results are so uniform that one is hardly able to question the conclusions reached.  

Tests and observations show that, in general, blondes and Nordic people prefer blue and cooler colors, whereas brunettes and people of Latin blood prefer reds and other warm, vibrant colors. Individuals who are vivacious and

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10 Faber Birren, Selling with Color, p. 20.
energetic will, in all probability, show a preference for reds. Those who are more reserved and conservative will, more than likely, prefer cooler hues. Rich, pure colors are given preference over modified colors. These pure colors have a high degree of saturation of pigment strength, and for that reason are best liked in smaller areas.

Age is another factor that has some effect on the choice of hues. Faber Birren says that babies look longer at colors than at neutral tones. He judged their favorite colors by certain eye fixations and reaching efforts and ranked them in the following order: red, yellow, green, and blue. As the baby grows older, the preference rank changes to red, blue, green, violet, orange, and yellow. In the adult, the rank changes to blue, red, green, violet, orange, and yellow. Blue and red remain the two universal favorites throughout life.11

Color preference rules the selection of almost everything that is bought or sold. It is interesting to notice, for instance, the number of light-colored automobiles on the roads today. Not too many years ago, it seems that most of the cars were black, maroon, or some other dark shade. This condition indicates that sometimes color preferences undergo a change.

11Ibid.
Since color preferences are so influential in what a person buys, the manufacturer and the retailer should avail themselves of as much information along those lines as possible. One of the uses now being made of the studies of factual data on current color preferences is that of planning inventories and training buyers and sales personnel in order to reduce markdowns. Another use is the aid it gives color harmony guides which help the consumer make a better selection of goods styled to meet particular color appetites. Rahr says that a factual approach to color can save money as well as make it because it gives precedent to what will be the consumer's choice.  

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Non-industrial Institutions Using Color

The use of color in non-industrial institutions, such as hospitals, schools, and the home is discussed in the succeeding paragraphs because in these places many people work and live. In all probability an individual will be influenced by color whether he is employed in a non-industrial institution or in one of a purely industrial nature.

Color in hospitals.--In recent years, a great number of new cures and new medicines have been discovered to relieve some of the illnesses of the world. At the same time, new items of equipment have been invented and installed in hospitals to make it easier for the doctors to care for their patients. All of these improvements have, no doubt, taken

a number of years to be completed and put into use. Likewise, the use of color in hospitals has been years making progress.

Doctors were using color successfully in treating mental patients as early as 1875. The practice has been continued through the years. World War II accelerated the development of color therapy, and today it is proving its value in hundreds of medical centers throughout the nation.\textsuperscript{13} The Halloran General Hospital, Staten Island, New York, which is considered to be one of the most modern institutions of its type in this country, has followed the prescription of scientific color application throughout the building. Officials report that the color program has, as a therapeutic factor, definitely assisted in promoting the recovery and comfort of patients.\textsuperscript{14}

Years ago, it was almost traditional for interiors of hospitals to be painted white. One reason for this was that it seemed to be connected with the idea of sanitation. The white walls tended to produce a glare and may, at times, have given forth a feeling of coldness and depressiveness. In contrast, the modern hospital, with its cheerful, soothing colors, provides an atmosphere which ceases to cause it to be a place of dread and gloom.

Today it is known that certain shades of white reflect well over 80 per cent of all light falling on them.

\textsuperscript{13} Pittsburgh Plate Glass Company, Public Relations Department, \textit{Color Dynamics}, Press Release 655, p. 35.

\textsuperscript{14} Ibid.
Therefore, it is not necessarily wise to coat everything in white, although such a coating does imply cleanliness.\textsuperscript{15} Research workers for the Pittsburgh Plate Glass Company say that if white is not relieved by colors which are warm and cheerful, the interior will seem to have a discouraging bleakness which will not be conducive to high morale. There is also a danger of injuring the eye in a room that has too much natural illumination. Experiments show that white walls have lowered visibility as much as 25 per cent, even though foot-candles at working level were increased 5 to 10 per cent.\textsuperscript{16}

Different colors now are applied functionally and advantageously to the rooms of patients, offices, waiting rooms, corridors, reception rooms, lobbies, delivery rooms, and operating rooms. Staff members, as well as patients, react favorably to proper color stimulus.\textsuperscript{17}

Cheskin advises that for the best effect, hospital lobbies and halls should be painted in warm, delicate colors, which give a welcoming, comfortable atmosphere to visitors, patients, and employees. He proposes that reception rooms, on the other hand, should be painted in cool colors in order to calm nervous patients or worried visitors. He agrees with the DuPont and Pittsburgh Paint technicians who suggest

\textsuperscript{15}Ibid., p. 31. \textsuperscript{16}Ibid. \textsuperscript{17}"Use Color Scientifically," \textit{Institutions Magazine}, XXV (August, 1949), 18.
that operating and delivery rooms should be painted in a blue-green tone to complement the color of blood and for greater eye-ease to the surgeons and their assistants. They say that this hue will eliminate the possibility of green after-images on the wall when the surgeon raises his eyes from the patient's body.¹⁸

Another point to be kept in mind in choosing colors for the rooms of patients is the specific emotional needs of the individual. Recommendations have been made that soft, cool, restful colors should be used in physiotherapy rooms or wards where massage treatments are given. In orthopedic rooms where patients are encouraged to use their limbs, warm colors are best because they have a tendency to stimulate rather than relax the muscles.¹⁹

The position of the room is a factor of importance in applying color to the rooms of a hospital. It is not, however, of major importance, since the main concern should be the patient. Rooms which face the north are often beneficially decorated in warm colors, whereas rooms with southern exposures should have a color scheme based around cooler colors. It is well to remember that a good color scheme for use in any type of interior should have some basic plan and purpose.

¹⁹Ibid.
Color in schools.—The need for good seeing conditions in schools is paramount. A combination of proper lighting and functional painting can accomplish much in producing visual comfort and emotional relaxation for pupils and teachers alike according to experts in the field.\textsuperscript{20}

The value of color has been studied from the standpoint of both light reflectance and emotion. It has been found to be a measurable factor. Therefore, personal opinion and artistic feeling may be eliminated in the selection of colors to provide the best possible learning situation for the students in the schools.

Eyestrain is said to occur under the following conditions:

1. When illumination is inadequate
2. Where glare exists
3. When extreme contrasts in the brightness of various objects or surfaces in a given area cause the pupil of the eye to expand or contract constantly
4. When concentration is interrupted by undue visual distractions.\textsuperscript{21}

The Du Pont Company has shown by tests that when the eye is abused, unfavorable reactions are noted in the dilation of the pupil of the eye. Evidences of muscular tensions appear; blinking increases; and irritability in general shows an increase.\textsuperscript{22}

In child health experiments acclaimed by the scientific world, the following improvements were reported by

\textsuperscript{20}Du Pont, Color Conditioning for Schools, Pamphlet A-7915-4, p. 1.
\textsuperscript{21}\textit{Ibid.}, p. 2.
\textsuperscript{22}\textit{Ibid.}
Darrell Boyd Harmon through the proper use of light and color:

1. Children learned ten months work in six months.
2. Approximately two-thirds of the need for eye glasses was removed.
3. Nutritional problems dropped 44.5 per cent.
4. Thirty per cent of the signs of chronic infection disappeared.\textsuperscript{23}

Harmon's experiments had to do with providing the proper amount of illumination in the classroom through the use of lighting and color. Attention was also given to seeing that correct furniture was used and that its arrangement was to the best advantage for the student and the teacher. Several other factors which may have had effect on the health of the children were studied. Harmon is especially noted for his study of the process of growth and development which takes place in the school child. He places emphasis on the psycho-physiological and visually-centered aspects of learning, along with the effect that the environment has on those processes. His explanation of color's effect on the human eye is contained in the following quotation:

The human eye, unlike the modern camera, is not color-corrected. This lack of color correction is expressed in a number of ways—in some "seeing" situation to the advantage of the individual, but in many visual tasks to his distinct disadvantage. It is this lack of color correction which makes for the physiological processes expressed as the

\textsuperscript{23}Luminal Paint Company Circular, Form 1.
psychological effects of "warm" and "cool," "stimulating" and "relaxing," "approaching" and "receding" colors. It is through these psycho-physical mechanisms that people are conditioned to color likes and dislikes. But it is also through the magnitude of some effects of this lack of color correction that poorly chosen colors for classrooms, as represented by both color of background and color temperature of incident light, can hamper, if not damage, the development and achievement of children in school.24

Harmon has developed a technique for the proper decoration of classrooms. From scientifically performed experiments, he has evolved a series of ten sample room combinations. His technique is a method of coordinating the major physical factors in the classroom environment in such a way as to free the child from certain physiological stresses that such factors can cause.25 Harmon's theory is that these stresses cause, directly or indirectly, difficulties in vision, too great a demand on energy, skeletal distortions, muscular distortions, and other strains which are a hindrance. He says that they tend to obstruct or handicap growth, development, and performance in many school children.26

An example of the concepts advanced by Harmon has been reported in a large university in which it was necessary to divide a certain economics class. Half of the group met in the regular classroom, whereas the other half met in an old law school building. Soon after the change in rooms, the


25 How to Decorate Classrooms in the Harmon Technique, National Chemical and Manufacturing Company, p. 2.

26 Ibid.
students in the law school room began to drop behind. There was an unusual amount of inattentiveness and listlessness in the classroom. At mid-semester the reports showed a wide variance. An investigation of the past records of the two groups was made, but it failed to show any appreciable difference in earlier grades. The instructors were changed, but this did not help the situation. At the end of the second term, the final marks were even farther apart. An explanation of the situation is contained in the following paragraph:

Finally someone examined the two classrooms, and here was found the answer. The university classroom (where students had been doing good work) presented a cheerful, well-lighted appearance. Light yellow walls gave a pleasing contrast to dark brown seats. The law schoolroom had dark gray walls against brown woodwork, making it a drab, dull-looking place even on the brightest days. And as if this were not enough, it was also discovered that the professor invariably wore either brown or gray suits. When the students using this room tried to focus attention on the teacher, they were fighting a losing battle against camouflage, drabness, and visual monotony. 27

Another experiment with color in the classroom and the accompanying effects is described in the following excerpt:

The New York Public School System adopted pastel shades in the "unorthodox" colors of pale blue-green and peach about six years ago. In those schools which were redecorated in the functional color scheme, absenteeism decreased markedly, instructors reported a consistently higher level of interest, and both teachers and pupils were enthusiastic about the change. 28

27W. J. Malanson, "What Color Can Do for the School," Scholastic Teacher (September 28, 1949), 16T.

28Ibid.
In choosing colors for the average classroom, there are several things to consider. One of the most important is how much natural and artificial light is available. Other considerations are what subjects are to be taught, age of the student, and need for the focal wall. Since color in the school may be either distracting and annoying, or pleasant and delightful, the following recommendation has been made:

Preparing the right color values for schoolrooms is not work for an average house painter. Such a project should be handled by a color engineer, one who understands the physical, chemical, physiological, and psychological aspects of color.\(^{29}\)

Color can help to direct the pupil's attention to where it is most desired. Therefore, careful selections should be made. In most cases, the attention of the student is kept toward the front of the room. This wall should be either darker or lighter than the other walls and a color that will not cause undue eyestrain. Care should be used so that schoolroom walls will be neither too bright nor too rich in color. If the walls are too bright, a glare will be the result. They may also be too distracting, and make it a difficult task for the children to apply their attention to studies or activities which demand concentration. The walls should reflect between 50 and 60 per cent of the light. The ceiling reflects more light than the walls, and if the

\(^{29}\) Ibid.
ceilings are high and not within the direct line of vision of the occupants, white is a satisfactory color to use.\textsuperscript{30}

Every teacher is aware of the fact that blackboards are usually more gray than black from erasing. Therefore, the student is required to distinguish what is written in white on a gray background. There is little wonder that the students at the back of the room complain that they cannot see what is written. However, blackboards are no longer always black. They are being changed to green, and even white boards are being used. This change can be made either by painting old boards with a special paint or installing new boards.

In reading rooms, such as the library and study hall, restful colors should be used. These should allow much light but should not present a glare. For washrooms and restrooms, colors which inspire cleanliness will be needed. Offices of the school require dignity and conservatism. They should take advantage of all the light necessary for good vision and eye comfort of the occupants of the room. The reception and waiting rooms of the school should be painted colors that present a friendly and welcome feeling. Assembly rooms should be painted differently from the classrooms. Colors from the red-yellow portion are best for

\textsuperscript{30} Sherwin-Williams, \textit{Color Harmony Suggestions for Easier Seeing in Offices and Schools}, Booklet B.
hallways, inside rooms, and gymnasiums, where little natural light is available. These colors stimulate the student because they suggest sunlight. Where there is an ample supply of light from the outside, green is the best color to use, because green is considered the most soothing and refreshing hue of all besides being the most restful to the human eye. Colors for manual training rooms are important for two reasons:

In the first place, color, if correctly used will aid in preserving the student's well-being, both physical and mental. This is accomplished by the use of eye-rest colors on areas he will see when glancing up from his work, and by finishing the machines and other equipment in colors to promote safety and efficiency. Secondly, the manual training rooms or shop is, in miniature, the industrial plant which will be the scene of many of the students' life work. If the room is cheerful, restful, stimulating, safe, and efficient all at the same time, it will serve to make him approach his career with the right attitude and preparation.31

In many schools, safety color codes are adopted the same as by industries. A standard group of colors and symbols may be used to guide traffic, identify fire protection equipment and safety devices, and designate hazards.

The school's exterior also should be attractive because it will add to the pride of the community, and the children will take pride in its attractiveness. Color can do much to improve its appearance, but paint should always be used in a functional way, in order to get the best results.

Color in the home.--Color preferences show to a marked degree in the home with respect to the interior decoration and furnishings. It is, thus, necessary for the manufacturer to know what the public wants. If some knowledge of general color preferences is conveniently available, it will be an easier task to know what to make and what to buy for the benefit of the consumer as well as for the benefit of business. The home should create a comfortable and welcoming atmosphere. It is, therefore, a great responsibility upon the shoulders of the manufacturer as well as the consumer to choose color combinations which will produce the desired effects.

Colors are important in altering the apparent proportions and size of rooms. Cool colors make a room appear larger, whereas warm hues will have a tendency to cut down its size.\textsuperscript{32} To create an atmosphere of formality, either rich full-bodied colors or subdued colors should be used. Gold and black are conducive to creating such an atmosphere. Clear, bright colors should be selected for the design of an informal room.

In choosing colors for the home, the sex and personality of the occupant should be given some degree of consideration since these have certain influences with respect to

\textsuperscript{32}Hazel K. Rockow and Julius Rockow, Creative Home Decorating, p. 36.
color preference. Mature people do not always have the same tastes for color as children.

If the room is to be used for recreation, stimulating, cheerful colors are appropriate. A room to be used for study or quiet relaxation requires soft, cool colors. As in hospitals and schools, the exposure of the room should be treated to gain the best possible advantage. Warm, sunny colors are suggested for rooms with northern exposures, whereas cool colors would be in order for rooms facing the south.

Birren offers a list of helpful suggestions on correct coloring in the home in a functional way. His recommendations include the following:

1. If you want a room to stimulate people, make them talk, and be gay, use a variety of strong colors.
2. If you want to concentrate on mental work, use cool, quiet colors.
3. If you want to bring attention to details in a room, keep the background toned down.
4. If you want the children to behave, give them a playroom full of colors that will help release their energy.
5. If you want to lighten a room shy on natural light, use a lot of yellow.
6. If you want to sleep late in the morning, avoid aggressive tones and big patterns in bedrooms.
7. If you want to instill habits of cleanliness, use white where finger smears accumulate.
8. If you want to save your eyes, avoid strong contrasts in light and color. 33

McDonald sums up the problem by saying that color appears to have personality, just as people do. It appears depressing

33 Faber Birren, "What Color Can Do for You," Pathfinder (May 17, 1950), 44.
or cheerful, according to its handling. Any color used correctly becomes a pleasant part of a whole color scheme, but it will be disagreeable when it is out of scale.34

In addition to decorative purposes, effective use of color can be employed in the home as a factor in reducing accidents. The importance of this reduction is emphasized in the following report:

Accidents in the home rank eighth in the cause of death. In one year, over 30,000 persons were killed in the home by accidents, 375,000 permanently disabled, and approximately 3,000,000 meeting with mishaps of all types.35

The National Safety Council has compiled statistics which show that falls were the cause of 92 per cent of home accidents during one year. Twenty-one per cent took place on outside stairs or porches.36 If color had been properly used, perhaps a number of these accidents might have been eliminated. In homes where a small amount of light is afforded the stairways, it is advisable to use light reflecting colors. Painting the bottom step yellow also is helpful. Bright colors are suggested for handrails on steps leading to cellars. Closets and shelves in the house should not be forgotten when the interior is painted.

34 Sterling B. McDonald, "When Color Goes Courting," National Furniture Review (June, 1950), 84.
35 Pittsburgh Plate Glass Company, Public Relations Department, Color Dynamics, Press Release 655, pp. 53-54.
36 Ibid.
Light colors are well suited to such places in order to provide the greatest amount of illumination.

Color in Miscellaneous Areas

Color not only has made much progress in hospitals, schools, and homes, but it also has made tremendous gains in other areas as well. Some of the miscellaneous areas in which color plays a part are hotels, apartments, and restaurants. Each of these places is discussed briefly in the succeeding pages.

Color in Hotels and Apartments.—Color in hotels and apartments follows to a certain extent the pattern set by the home because one of the main ideas in the commercial establishment, as well as the private home, is to obtain the right note of appeal, friendliness, and comfort. The commercial organization also must keep profit in mind. The benefits which are derived from the use of the proper color program are explained in the following excerpt:

In hotel and apartment management, maintenance painting is a regular and necessary cost item. An added plus of Color Conditioning is the fact that color schemes with universal appeal can be standardized. By so doing, management measurably reduces its investment in paint stocks, both initially and over a period of years. And the use of color schemes with highest popular appeal will invite hotel guests to return, help apartments to be rented—and stay rented.37

Color in Restaurants.—Most authorities agree that color tests indicate that peach is the most appetizing color.

Hence, the profit-seeking restaurant proprietor will capitalize on this fact and use it to the greatest advantage in the decoration of his establishment. Cheskin sets forth the idea that when certain colors are used, the salad will look fresher, the meat will appear richer, and the waitress will seem more attractive. He also advises that scientifically planned colors can be used to create a friendly mood and a festive spirit. Certain colors applied to the restaurant kitchen will make the employees feel cooler and more comfortable. Form and light work hand in hand with color. Hence, good illumination should always be considered. The importance of proper environmental effects is expressed in the following quotation:

Elaborate gingerbread carvings, like meaningless color patterns, create cumbersome optical and mental disturbances. They draw attention away from the food and the service. They clutter the mind and burden the emotions.

Color in Industry

Before discussing the reactions of various business executives to the use of color in personnel, it seems advisable to review some opinions on the subject as expressed in the current literature. Such a review is contained in the succeeding discussion.

In recent years, the use of color in industry has taken on a new importance. Interest has been shown by management

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\[38 \text{Ibid., p. 161.} \quad 39 \text{Ibid., pp. 161-162.}\]
in using color scientifically and functionally for the advantage of the employees and the increase of sales and production. This interest is evidenced by the fact that management has begun to study the actual effects of color programs on the workers. Some of these studies are results of direct application of a color program to their own establishment, whereas other studies are reviews of experiences of different companies.40

Color in the stores.—Retail stores, as well as hospitals, schools, hotels and apartments, and restaurants may be classified as a type of industry, since industry is defined by Webster as "any department or branch of art, occupation, or business, especially one that employs much labor and capital."41 Retail stores are many in kind and number. Drug stores, clothing stores, furniture stores, department stores, and hardware stores are among hundreds which could be mentioned. Each type of store may have a different set of problems to be dealt with in regard to the colors used for the interiors. Probably the best rule to follow is to decide upon a color scheme which will be inviting to the customer. Let the color scheme serve as a


"welcome mat," since the store that has customer appeal will attract more of the buying public.

The colors used in retail stores should be planned so that they will "play up" the merchandise to be sold. They should be designed to present an attractive background to the goods which are stocked. The buyer in the retail store should know something about color preferences in order that he will be able to select merchandise which will sell and not be dust collectors on the counter or floor.

Lighting in retail stores is a problem since it has much to do with consumer satisfaction. Many times people have been heard to say, "In the store this hat or this dress looked black, but out in the natural light it is really dark blue." The customer does not like to be fooled, and often certain types of lighting, along with certain background colors, will create a wrong impression as to the actual color of the article purchased. Kurt Versen, lamp designer, says that there are still serious deficiencies of red and yellow in fluorescent lights and that they distort subtle color combinations.42

Furnishings in the retail store also have some effects upon the appearance of color. Versen says that wood tones, especially blonde woods, suffer from the use of certain types of light and, therefore, detract from the merchandise.43

43 Ibid.
Cheerful, but not too loud, colors will benefit the attitude of the employee as well as that of the customer in relation to the effects they will have upon employee morale. Management knows that if his employees are in good spirits and have a good attitude toward their work, the customer will receive more courteous service and more merchandise will be sold.

**Color in the office.**--The use of color in offices is closely related in some ways to the use of color in schools. In both places, proper illumination is important, and eye-strain and eye fatigue should be cut to a minimum. Since much reading and writing generally take place there, thought should be given to the comfort of the worker. Birren says that too much light and too much brightness of color happens all too frequently in illuminating engineering.\(^4\)

Personnel department employees are influenced by many of the same things that affect their superiors in the industrial organization. If the offices of both groups are painted in colors that are harmonious and suited to the purpose of the room, their attitude toward each other will be better and a spirit of cooperation will exist. Should an executive's office be done in a color which he personally dislikes and which in some way may be irritating to him, he

may be hard to get along with and not too easily pleased with the work done by those employees under his direction. The influence of color preference is asserted in this instance. Cheskin makes the statement that "color acts on the emotion, not on reason." If this is accepted as a true statement, it would be obvious that the colors used in the office of a plant executive should not in any way upset his emotions. Colors which might be disturbing or irritating to the subordinate workers should also be avoided.

A happy and comfortable employee will do better work, and if the employee's efficiency is increased, management will be benefited as is explained in the following excerpt:

An orderly environment inspires orderliness. Chaotic surroundings breed chaotic thinking and irrational behavior. The design of furniture pieces and their arrangement are as important as the right color combinations in creating a favorable environment. Furniture that is simple in form, smooth in finish and clean in line is best for an office. Furniture that is ornate, carved or cluttered with superimposed patterns distracts the worker and interferes with efficiency. A pleasing room arrangement is so proportioned that it has variety and harmony. In other words, the various objects should have a relationship to one another so that they have a common character or look as if they belong to the same family although they are varied in shape and dimension. An office that has modern, simple furniture proportionately arranged, with colors of the right hue and value, has an atmosphere conducive to clear thinking and efficiency.

In rooms where board meetings are held, harmonious and relaxing colors should be used in order to create an

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atmosphere conducive to cooperation among the members of the board. Everything possible should be done to eliminate working at cross purposes and bickering among those who meet in these rooms, because much valuable time may be lost because of disagreement over things of comparatively little significance.

Color in the plant.—The use of color in the plant or factory proper presents numerous problems. One of the important points to observe in choosing colors for the industrial plant is the nature of the work to be done. For example, a color conditioning program for a clothing factory would have problems of illumination different from those of a factory producing metal objects because of the amount of reflectance involved in each case. Attention should also be given in considerable measure to the type of workers employed.

The National Industrial Conference Board reports that results from a survey of about 350 companies applying a color program show that there are few statistics available on the use of color in industry. Upon being confronted with inquiry forms sent out by this organization, a number of these companies were unable to give an evaluation of their programs because of the difficulties involved in measuring the effects of a service as intangible as color. However,
favorable results were shown by most of the companies that were able to evaluate the program.47

The excerpt which follows offers further explanation with regard to the use of color in industry:

When intelligently utilized, color offers an unusual number of benefits. The technique of color, however, is not too well understood either in theory or practice. Color in industry has little to do with interior decoration as such. Appearance is purely incidental, a mere by-product of a job well done in relieving eyestrain and fatigue, promoting safety, in speeding production, and in otherwise safeguarding the efficiency and well-being of the worker. The technique of color is objective, direct, and scientific. Personal opinions do not count.48

The Du Pont Company has indulged in extensive scientific research with respect to color conditioning for industry. The following quotation contains some of their findings:

Maintenance painting, today appears in marked contrast to the painting practice of a few years ago. The former custom of painting all departments of a factory with white ceiling and walls, and dark gray dadoes is being discarded. Artists, architects, decorators, lighting engineers, paint technicians, and scientists are expounding their theories and spreading their colors across the industrial canvas. Under the spur of unprecedented demands for increased production industry is giving the acid test to all such theories.49

With so many theories being presented, it would seem advisable for management to consider carefully which ideas to

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use in coloring the plant. It might be beneficial for the manager to study a number of the suggestions made and then use those which are generally agreed upon by most authorities.

The use of color in industry might well be thought of as a rather new theory of lighting in which the quantity and quality of light and the color of objects are blended. This blend produces a three-dimensional effect to supplement the three factors of seeing, which are the eye, the object or task to be done, and the source of light. The blend also is used in an attempt to bring about certain desirable psychological effects.\textsuperscript{50}

A number of various factors greatly influence the efficiency of the factory worker. Many of these factors are directly or indirectly related to the way color is used in the plant. The effects of color on the mental welfare of the employees can aid or handicap his efficiency. Harsh, loud colors may create a nervous tension in the employee. Certain colors will have a tendency to become monotonous to the worker. Nervousness and monotony, in turn, may possibly affect his morale. Each of these factors might be a cause for decreasing the efficiency of the employee. They may also have something to do with his relationship to his fellow-laborers and the amount of cooperation he gives them.

\textsuperscript{50}Liberty Mutual Insurance Company, Loss Prevention Department, \textit{op. cit.}, p. 5.
Cheerful colors should be used to create an atmosphere conducive to improving employee morale and efficiency. Increased efficiency will stimulate an increase in production.

Comfort of the worker should be considered with respect to the mental and physical welfare, since one is no more important than the other. Probably one of the most significant contributing factors with regard to the employee's physical well-being and its effect on his efficiency is the element of eyestrain.

The following excerpt discusses one of the causes of eyestrain:

Glare, which is undoubtedly objectionable, is quite a relative thing. It can be reduced (a) by the actual elimination of it, or (b) by building up a balancing intensity and brightness. Window glare, for example, is best met by increasing the light intensity of the room. Use of pale colors alone may prove inadequate and may, in fact, interfere with a good seeing condition by introducing uncomfortably high reflectances.51

It is possible for some physical work to be done in an environment which is brilliant. Softer backgrounds are in order, however, for work that requires more visual and mental concentration.

Matthew Luckiesh and the late Frank K. Moss of the General Electrical Lighting Research Laboratories made exhaustive tests which substantiate the fact that a measurable

degree of eye fatigue is caused by the contrast between the working area and its background. They found that if the background was brighter or darker than the working surface, the lens of the eye contract when the workers look at a bright area. The lens expand when the eye is exposed to a dark area.\(^{52}\)

The succeeding quotation offers a further explanation concerning eye fatigue:

Since eye muscles, like any muscles, will tire from continuous flexing, seeing under conditions of marked brightness contrast is difficult and fatiguing. Under ideal lighting conditions . . . a well lighted working area is viewed against a background of equal brightness.\(^{53}\)

A point that might be stressed is that tired eyes will make tired workers and may often be reason for workers to be irritable and complain of headaches.

Color and lighting may also have an effect on the safety of the employee. In an attempt to eliminate some of the disasters that have taken place in factories in past years, color safety codes have been developed by a number of companies, thereby protecting the physical welfare of the worker.

A safety color code has been developed by the United States Gutta Percha Paint Company. They use yellow for indicating hazards because of its great visibility and


\(^{53}\) Ibid.
carrying power. They also use color to separate walking areas from those used for the movements of material. Orange has the advantage of being the color of greatest attention value; therefore, it is used for hazardous parts of machines or equipment which might cut, crush, or otherwise injure the worker if handled carelessly. Red is restricted to items related to the fire-fighting system. Green is associated with medicine and first aid. It is ideal for marking safety equipment such as first aid cabinets, stretchers, and wall or floor spots where these are located. Blue is considered by colorists as a "thoughtful color"; therefore, it is used to indicate caution. White has a very important place in the plant's health and safety program. It is associated with cleanliness and good housekeeping. In poorly lighted places it reduces eyestrain as well as the number of accidents by furnishing more light.54

The Pittsburgh Plate Glass Company has a safety color code corresponding to that explained in the preceding discussion.55 The Du Pont Paint Company also has a safety color code which is similar.56

In industry, color plays a role in good housekeeping by encouraging better morale and increased pride among the employees of the organization. It also will aid to a certain extent in safety. If the aisles are kept clear and work tables are uncluttered, accidents may be reduced. Tones of gray and white are recommended for promoting good housekeeping.57

The following chapter contains data on the extent to which the preceding concepts, relative to the role of color, appear to be effective. Special attention is given to colors formerly and presently used, effects of the color program upon the quantity and quality of production, and specific effects of color upon employees.

Summary

Color is used functionally in practically all areas of living today. It serves mankind in various ways, all of which are related to his mental or physical health or both.

Color has three attributes: hue, value, and intensity. Management should be familiar with the significance of each of these factors in order to use them effectively in the color program.

Color plays a significant role as a therapeutic in hospitals. It provides good seeing conditions in the school.

Color preferences are noted in the color schemes used in the home, hotel and apartments, and restaurants. In each of these areas the color program is designed to produce relaxation, harmony, and a feeling of comfort.

Industry uses color in the office, in retail stores, and in plants of various types. In all cases, its purpose is functional to serve both management and employees.

Proper use of color in offices is imperative for good seeing conditions. In these places color conditioning can aid in reducing eyestrain and fatigue. It also can promote a better spirit of cooperation between employees and management.

Since retail stores employ much labor and capital, they are classified as a type of industry. Correct color conditioning in the retail store will tend to raise employee morale and to create in them a better attitude toward management. If the employee is mentally satisfied in his work, he will show more courtesy and give better service to customers. Management will benefit because pleased customers will return to make additional purchases.

The following benefits may be derived from correct color tuning in the plant: reduction of eyestrain and fatigue; raising of employee morale; better housekeeping; fewer accidents; increased pride among workers toward their jobs; and better attitude toward management.
CHAPTER III

SOME REPORTED EFFECTS OF COLOR ON PERSONNEL IN INDUSTRY AS OBTAINED FROM PERSONAL INTERVIEWS

Interest in the use of color for its functional effect on employees has increased in recent years. Management is reviewing the experience of color users and color authorities so that it can reduce eyestrain, fatigue, accidents, and eliminate other factors which may have a handicapping influence on the employee and his work. New trends in production emphasize the need of maintaining the highest possible standards of employee relations in addition to operating with modern, efficient equipment. Therefore, when remodeling old plants or building new ones, management, in many instances, is giving special attention to color conditioning.

In the past, the functional and scientific use of color in industry has been seriously neglected to a certain extent. It has been treated as an intangible factor with no direct costs attached, but in this atomic age progressive thinkers are learning to treat many intangibles with new respect. Improper color conditioning in the plant can, in many instances, cost management a considerable loss in profit and
production. For these reasons, management is endeavoring to become familiar with correct color conditioning.

In the review of literature concerning color conditioning in the industrial plant and other places, numerous reasons for using color programs were presented. The reasons most frequently reported were as follows: reduction of eyestrain, accidents, fatigue, nervousness; improvement in morale; good housekeeping; efficiency in production; and employee relationship.

After making a study of available literature relating to color conditioning and its proposed effects on the worker, a number of industrial plant executives were interviewed. Leading paint companies of Dallas and Fort Worth, Texas, were requested to furnish a list of industrial organizations which were known to have applied color conditioning. Each company was cooperative in supplying this list. The names of other industrial plants were obtained from some of the executives who were interviewed. Other establishments were visited for the purpose of finding out if they were using a color program.

Twenty-five business executives in separate plants were interviewed. Seventeen of the plants which these executives represented had taken steps toward color conditioning, and eight had not initiated this program. Three of the seventeen plants were in the process of applying a
program or had not had their program in operation long enough to report a change. One plant had used the same color scheme since it was built. In Tables 2, 3, and 4, numbers from one through seventeen are used to identify the seventeen companies which have initiated a color program either partially or completely. These numbers are used so as not to show a reflection or to give information about any particular industrial establishment.

Various types of manufacturing and industrial plants were contacted in the survey. The types of establishments and the number of each are shown in Table 1.

**TABLE 1**

<table>
<thead>
<tr>
<th>Type</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automobile repair and replacement material</td>
<td>3</td>
</tr>
<tr>
<td>Gin machinery</td>
<td>1</td>
</tr>
<tr>
<td>Stoves</td>
<td>1</td>
</tr>
<tr>
<td>Oil field equipment</td>
<td>1</td>
</tr>
<tr>
<td>Iron and steel products</td>
<td>3</td>
</tr>
<tr>
<td>Bottle crowns</td>
<td>1</td>
</tr>
<tr>
<td>Fabrics</td>
<td>4</td>
</tr>
<tr>
<td>Kitchen equipment</td>
<td>2</td>
</tr>
<tr>
<td>Metal display properties and frames</td>
<td>1</td>
</tr>
<tr>
<td>Stationery</td>
<td>1</td>
</tr>
<tr>
<td>Household cleansers</td>
<td>2</td>
</tr>
<tr>
<td>Airplanes</td>
<td>1</td>
</tr>
<tr>
<td>Food products</td>
<td>3</td>
</tr>
<tr>
<td>Furniture</td>
<td>1</td>
</tr>
</tbody>
</table>

**Total** 25

*Source: Industries within the Dallas-Fort Worth area.*
Types of Industrial Concerns Visited

An analysis of data in Table 1 shows that twenty-five establishments were visited. Among them were the following types: automobile repair and replacement material, three; gin machinery, one; stoves, one; oil field equipment, one; iron and steel products, three; bottle crowns, one; fabrics, four; kitchen equipment, two; metal display properties and frames, one; stationery, one; household cleansers, two; airplanes, one; food products, three; and furniture, one.

Table 2 contains information relative to colors formerly and presently used by seventeen of the companies under consideration. Data are included also on the part of the plant to which the color was applied, whether to the entire plant or to departments only.

Colors Formerly and Presently Used

Colors formerly used.—An analysis of the data in Table 2 shows that of the colors which were formerly used, gray was applied to the walls and machinery in ten of the seventeen establishments. White was used by three; cream by one; black on the floor by one; brown by one; and light green by one. One building was constructed of aluminum, and one employed wainscoating. Two of the plants were not painted. Of these two plants, one was a new building, and the delay in painting was because a study of correct color conditioning was being made by the industry's executives. The other factory was an old building constructed of sheet iron.
TABLE 2
COLORS FORMERLY AND PRESENTLY USED
BY SEVENTEEN COMPANIES*

<table>
<thead>
<tr>
<th>Company</th>
<th>Colors Formerly Used</th>
<th>Colors Now Used</th>
<th>Parts of Plant Where Applied</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Entire Plant</td>
</tr>
<tr>
<td>1</td>
<td>Gray with red</td>
<td>Green, beige, orange</td>
<td>X</td>
</tr>
<tr>
<td>2</td>
<td>Not painted</td>
<td>Green and safety code</td>
<td>X</td>
</tr>
<tr>
<td>3</td>
<td>White</td>
<td>Green, peach, yellow, blue, gray, rose-wine</td>
<td>X</td>
</tr>
<tr>
<td>4</td>
<td>Gray</td>
<td>Green and safety code</td>
<td>X</td>
</tr>
<tr>
<td>5</td>
<td>Cream, white, black</td>
<td>Green and gray</td>
<td>X</td>
</tr>
<tr>
<td>6</td>
<td>No color (sheet iron)</td>
<td>Safety code</td>
<td>X</td>
</tr>
<tr>
<td>7</td>
<td>Gray</td>
<td>Green, orange, red, white</td>
<td>X</td>
</tr>
<tr>
<td>8</td>
<td>Aluminum, gray</td>
<td>Vista green, eye-rest green</td>
<td>X</td>
</tr>
<tr>
<td>9</td>
<td>Gray</td>
<td>White</td>
<td>X</td>
</tr>
<tr>
<td>10</td>
<td>Gray</td>
<td>Yellow, green, cream</td>
<td>X</td>
</tr>
<tr>
<td>11</td>
<td>White, brown</td>
<td>Green, white, black</td>
<td>X</td>
</tr>
<tr>
<td>12</td>
<td>Light green</td>
<td>Green</td>
<td>X</td>
</tr>
<tr>
<td>13</td>
<td>Gray</td>
<td>Green, white, yellow, orange</td>
<td>X</td>
</tr>
<tr>
<td>14</td>
<td>Gray</td>
<td>Green, yellow, safety code</td>
<td>X</td>
</tr>
<tr>
<td>15</td>
<td>Gray</td>
<td>Gray, red for fire fighting equipment</td>
<td>X</td>
</tr>
</tbody>
</table>

*Interviews with an executive of seventeen separate industrial firms within the Dallas-Fort Worth area.
### Table 2—Continued

<table>
<thead>
<tr>
<th>Company</th>
<th>Colors Formerly Used</th>
<th>Colors Now Used</th>
<th>Parts of Plant Where Applied</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Entire Plant</td>
</tr>
<tr>
<td>16</td>
<td>White, wainscoating</td>
<td>Turquoise blue, gray, blue</td>
<td>X</td>
</tr>
<tr>
<td>17</td>
<td>Gray</td>
<td>Orange, yellow, Vista green, red</td>
<td>X</td>
</tr>
<tr>
<td>Total</td>
<td>...</td>
<td>...</td>
<td>11</td>
</tr>
</tbody>
</table>

**Colors now used.**—The data in Table 2 also indicate that when color conditioning was applied, green was used by thirteen of the organizations. All or some of the safety colors, which are yellow, orange, red, blue, and green, were used by each company. Other colors used are beige, peach, rose-wine, white, black, gray, and turquoise. Black may seem to be an unusual color to use for color tuning a plant. However, Company Five applied black to the ceiling, which was very high, and used indirect lighting. The green color was applied to the machines and walls. This color was used more than any other color in the industrial organizations.

**Color conditioning applied to the entire plant.**—Eleven of the establishments had applied the color program to the entire plant. Company Three, which was a fabric manufacturing establishment, was among the number applying a new color
program to their complete organization. All of the colors used in the various departments were designed to meet specific operating conditions. The colors were selected after extensive investigation of actual experiences in factories producing similar materials. The industrial official interviewed stated the investigation convinced his organization that correctly used color was of definite significance to production. He also mentioned the fact that men and women who work with very fine yarns and high precision machinery require special visual conditions, which incorporate scientific illumination and harmonious color surroundings.

The modernized knitting room of Company Three was equipped with new long-section machines and had white enamel ceilings and pastel green walls. The dado in this department was blue-gray. These colors were selected for the purpose of avoiding extremes in colors, since too much color contrast may be harmful to the worker whose work requires close concentration. The plant executive stated that constant adaption of the eyes to light and dark might have a tendency to cause fatigue in the worker and result in a loss of efficiency.

Company Three's looping, seaming, and finishing department was painted in colors corresponding to those used in the knitting department. Variation in the boarding room consisted of the use of flat white on the ceiling, peach on
the walls, and rose-wine on the dado. A distinctive color scheme has been applied to the dye house. This color scheme was flat white on the ceiling, buff on the walls, and blue-gray dado. The same colors were applied to the ceiling and the dado in the shipping department, with the substitution of pastel green on the walls.

**Color conditioning applied to departments only.**—Six of the seventeen companies listed in Table 2 had applied a color program to departments only. Company Four had only a few machines in the shop painted. They were in the process of initiating a new color program. Company Six used it in the production shop only. Color conditioning was employed in the shop and stock room of the eighth concern listed in Table 2. Company Nine had painted traffic aisles only, but they plan to do more with a color program in the future. Company Fifteen had applied the color to fire equipment although the executive interviewed stated that they intend to color condition the entire shop. Equipment in Factory Seventeen had been color conditioned, but no special color program had been applied in the offices. From Table 2, it is found that gray is the predominate color formerly used, whereas green is the outstanding color in use at the present time.

Table 3 indicates the effects of color on the quantity of production and the quality of the product for the seventeen
### TABLE 3

**THE EFFECTS OF COLOR ON THE QUANTITY OF PRODUCTION AND QUALITY OF THE PRODUCT**

<table>
<thead>
<tr>
<th>Company</th>
<th>Position of the Person Interviewed</th>
<th>Effects on Quantity of Production</th>
<th>Effects on Quality of Product</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Increased</td>
<td>Decreased</td>
</tr>
<tr>
<td>1</td>
<td>Secretary and Treasurer</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Production Engineer</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Plant Superintendent</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Art Director</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Secretary and Manager</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Plant Superintendent</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Plant Engineer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Plant Foreman</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Assistant Plant Superintendent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Field Manager</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Purchasing Agent</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

*Source: Interviews with an executive of seventeen separate industrial firms within the Dallas-Fort Worth area.*

*Several responses under this column are explainable by the fact that an accurate record was not kept for comparison; other responses were from new plants.*
<table>
<thead>
<tr>
<th>Company</th>
<th>Position of the Person Interviewed</th>
<th>Effects on Quantity of Production</th>
<th>Effects on Quality of Product</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Increased</td>
<td>Decreased</td>
</tr>
<tr>
<td>12</td>
<td>Safety Engineer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Plant Foreman</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Plant Foreman</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Plant Superintendent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Plant Superintendent</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Plant Superintendent</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>...</strong></td>
<td><strong>11</strong></td>
<td><strong>0</strong></td>
</tr>
</tbody>
</table>

companies participating in a color conditioning program. The company and the position of the person interviewed are included. A choice of the following answers was given for effects on quantity of production: increased; decreased; uncertain; and no change. The following choice of answers was given for effects on quality of product: improved; impaired; uncertain; and no change.
The Effects of Color on the Quantity of Production and Quality of the Product

Position of the person interviewed.—An analysis of Table 3 shows that various types of industrial plant executives were interviewed. Among these were five plant superintendents, one assistant plant superintendent, one secretary and treasurer, one production engineer, one art director, one secretary and manager, one plant engineer, three plant foremen, one field manager, one purchasing agent, and one safety engineer.

Quantity of production.—Eleven of the companies report an increase in the quantity of production. Through conversation with the various executives, it was found that the causes for this increase were as follows: reduced eyestrain; increased pride of the employee with respect to their machines; decreased fatigue; and improved attitude of the employee toward his work.

No percentages were used in determining the effects of color on the product since the executives interviewed were of the opinion that color is such an intangible factor it is rather difficult to measure its influences. However, they agreed that where working conditions were improved by better color programs there was a definite increase in production.

Three of the seventeen companies under consideration showed no change in the quantity of production as a result of color conditioning. Company Four was in the process of
applying a color program. The color conditioning had been applied to only a few machines. In Establishment Nine the color program had been used only to mark traffic lanes and fire equipment. The plans of this organization were to apply the program more fully at a later date. Plant Fifteen is applying the program at the present time, but it has not been in operation long enough to report any change in the quantity of production.

Three of the seventeen industrial concerns visited indicated they were uncertain about the effect that color had on the quantity of production. In Plant Seven the building and machinery were painted before production was begun. In this particular plant all machines were painted green with the safety color code being applied to hazardous parts. An oven for baking the paint on the products of the plant is used, and this oven is painted an aluminum color because it is necessary to have a heat resistant paint there. The executive consulted in Plant Eight was of the opinion that there had not been a noticeable change in the quantity of production. Since a definite record had not been kept, it would be difficult to measure the quantity of production. Organization Twelve has used the same color program since being established, and, therefore, a report of the effects of color on quantity of production could not be measured.
Quality of product.—As revealed in Table 3, eight of the executives reported an improvement in the quality of the product. They gave the following reasons for the improvements: less fatigue; better efficiency in work; reduced eyestrain; better color scheme on machines; improved mental attitude; neater appearance of machinery; better light reflectance from use of proper colors; reduction of glare; and tendency to give employee an impetus to do better work. None of the executives reported an impaired effect on the quality of the product.

Four of the industrial officials reported no change in the quality of the product. The executive of one of the establishments indicated that under their system it had been to the employees' interest to do their best work at all times. Their production was rather seasonable, and, therefore, the production line was not rushed. In Company Two it was believed that color had little effect on the quality of the product. Organizations Four, Nine, and Fifteen had applied the color only to a limited extent. Their plans were to apply it more extensively in the future.

Five of the company executives were uncertain as to whether the color program had affected the quality of the product in the individual plant where they were employed. The manager of Plant Five reported no noticeable change in the quality of the product. The officials of Factories Seven
and Twelve indicated the same color program had been used since production began; therefore, if a change had occurred in the quality of the product it could not be definitely accredited to color. Plant Fourteen made oil field equipment. The production line was not always rushed so that the workers usually had plenty of time to see that their product was of the best quality. In Plant Seventeen, a change from one type of product to another had been made. Hence, the effect of color on the quality of the product of this specific organization could not be determined. Through conversations with the various plant officials, the impression was obtained that it was difficult to measure the effect of color on the quality of the product.

Table 4 contains data on various effects of color on the employees of seventeen company executives interviewed by the investigator. The positions of the persons interviewed are the same as in Table 3. The effects considered in Table 4 are accidents, absences, attitude of the employee toward management, and employee turnover.

Effects of Color on the Employee

**Accidents**—An analysis of data in Table 4 shows that none of the organizations reported an increase in the number of accidents. Six of the executives were of the opinion that accidents had decreased although none of them had kept an accurate record. The various reasons for accident reduction
### TABLE 4

**EFFECTS OF COLOR ON THE EMPLOYEE**

<table>
<thead>
<tr>
<th>Company</th>
<th>Position of Person Interviewed</th>
<th>Accidents</th>
<th>Absences</th>
<th>Attitude toward Management</th>
<th>Employee Turnover</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Increased</td>
<td>Decreased</td>
<td>Uncertain</td>
<td>No Change</td>
</tr>
<tr>
<td>1</td>
<td>Secretary and Treasurer</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>2</td>
<td>Production Engineer</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>3</td>
<td>Plant Superintendent</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>4</td>
<td>Art Director</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>5</td>
<td>Secretary and Manager</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>6</td>
<td>Plant Superintendent</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

---

*a* Source: Interviews with an executive of seventeen separate industrial firms within the Dallas-Fort Worth area.

*b* Several responses under this column are explainable by the fact that an accurate record was not kept for comparison; other responses were from new plants.
<table>
<thead>
<tr>
<th>Employee Turnover</th>
<th>Attitude toward Management</th>
<th>Absences</th>
<th>widen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uncertain</td>
<td>X</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>No Change</td>
<td>X</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Decreased</td>
<td>X</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Increased</td>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>Improved</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Company</th>
<th>Position of Person Interviewed</th>
<th>7 Plant Engineer</th>
<th>8 Plant Foreman</th>
<th>9 Assistant Plant Superintendent</th>
<th>10 Field Manager</th>
<th>11 Purchasing Agent</th>
<th>12 Safety Engineer</th>
<th>13 Plant Foreman</th>
<th>14 Plant Superintendent</th>
<th>15 Plant Superintendent</th>
<th>16 Plant Superintendent</th>
<th>17 Plant Superintendent</th>
<th>Total</th>
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</thead>
<tbody>
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<td></td>
</tr>
</tbody>
</table>
were: attention-getting power of orange on emergency locations; better housekeeping; relief of eyestrain; contrasting colors applied to parts considered most dangerous; painting of electrical switches; use of safety color code in the plant; and reduction of fatigue.

The officials of four manufacturing establishments under consideration expressed their belief that the number of accidents had made no change. Various causes were given by them. Company Two has received several national awards for safety in the plant. Factories Four, Nine, and Fifteen were applying the color program or are planning to apply it.

Seven of the executives were uncertain about the effect that color may have on the number of accidents in the plant where they are employed. The plant engineer for Company Seven reported that the employees had worked two and one-half years without a loss of time because of accidents. The plant machinery and the factory itself were painted before production began. In Factories Eleven, Thirteen, Fourteen, Sixteen, and Seventeen the officials indicated that their particular companies had maintained a low accident rate at all times. The safety engineer for Plant Twelve reported that the same colors had been used since establishing the organization, and, therefore, no definite changes could be attributed to the effects of the colors used. In this case there was no opportunity for a comparison to be made.
Absences.—Further analysis of data in Table 1 shows that the number of absences had not increased in any of the plants which were visited. However, four of the officials interviewed thought that absences had decreased. They gave the following reasons for this decrease: fewer complaints of headaches; less eyestrain; happier attitude of the employee at his work; more pleasant working conditions; and less fatigue. The data also indicate that four of the executives interviewed were of the opinion that color had made no change in the number of absences. In one of these plants the number of absences had been very low all of the time. In the other three plants the color program was being applied so that there was no basis for a comparison to be made. Nine of the plant officials were uncertain about the effects of color on the absences in their plants. Some of these plants had installed air-conditioning at the time the color program was applied, and the officials of these plants believed that this equipment had more to do with absences than the color. Some of the plants had used the same colors since being established so that they could not make a comparison.

Attitude toward management.—Other data in Table 1 refer to the attitude of the employee toward management because of the influence of proper color in the plant. Ten of the executives were of the opinion that there had been an improvement in the employees' attitude. Various reasons were given for this improvement. These are listed as follows: men were
impressed by management's interest in their surroundings; reduction in the number of grievances was noticed; compliments about the new color program were made by the employees; comments about reduced eyestrain were made; employees' interest in neatness of machines increased; and employees were more cheerful and more jovial.

None of the officials reported an impaired attitude toward management. No change in the attitude of the employees toward management was reported by three of the seventeen executives. These three executives were beginning the color program in their plants. Four officials remarked that they were uncertain about the change in attitude of the employees toward management. In three of these plants the attitude of the employees toward management had been excellent at all times. One factory had used the same color program from the time of its establishment, and, therefore, the engineer could not report a change that may have been attributed to color.

**Turnover.** Of the seventeen company executives listed in Table 4, none reported an increase in employee turnover. The field manager of Company Ten and the purchasing agent of Company Eleven reported a decrease in turnover. Their reasons for this decrease were that the employees are better satisfied and are more appreciative of their employment. Five of the plants showed no change in employment turnover. The secretary and treasurer of Plant One stated that in this plant the prospective employee must be recommended by one of
the present employees. For this reason the employee turn-
over has been exceptionally low at all times. In Company
Eight the percentage of turnover has been very low all of
the time. In the last three years only one employee has left
the firm. Establishments Four, Nine, and Fifteen are apply-
ing color conditioning to their plants.

Ten of the industrial executives were uncertain about
the effect of color on the number of employee turnover. An
accurate record had not been maintained so that it was diffi-
cult to make a comparison. The plant superintendent of
Company Six stated that among the old employees the unde-
sirable ones had been weeded out and there was no noticeable
change among the others. Through an expansion program of
this company as well as in Company Sixteen, new employees
had been added. The other plants were uncertain because of
the following reasons: the same colors had been used all of
the time; the number of employee turnover had been low at all
times; and skilled employees were used in some instances and
they usually remained on the same job.

Summary

Twenty-five companies within a radius of fifty miles of
Denton, Texas, were visited. Only seventeen of this number
had initiated a color program. A personal interview was held
with some official who was acquainted with the results of the
program in each of these seventeen companies. The following findings were obtained: (1) eight of the twenty-five companies visited had not initiated a color program; (2) gray is the predominant color which formerly was used in a majority of the plants, whereas green is the outstanding color used presently; (3) eleven of the seventeen companies using color conditioning had applied it to the entire plant, whereas six applied it to departments only; (4) all or some of the safety colors were used by each of the seventeen companies; (5) eleven of the seventeen companies reported an increase in the quantity of production, none reported a decrease, three indicated that there was no change, and three were uncertain; (6) eight of the seventeen companies showed an improvement on the quality of the product, none indicated an impairment, four reported no change, and five were uncertain; (7) none of the companies showed an increase in accidents, absences or employee turnover; (8) six companies reported a decrease in accidents, four indicated no change, and seven were uncertain; (9) four organizations indicated a decrease in absences, four reported no change, and nine remarked that they were uncertain; (10) ten companies reported an improved attitude toward management, three reported no change, and four seemed uncertain; and (11) two establishments showed a decrease in employment turnover, five indicated no change, and ten were uncertain.
CHAPTER IV

SUMMARY AND CONCLUSIONS

Summary

The preceding study has considered some of the effects of color on the individual, with special emphasis placed upon the effects which color produces relative to personnel in industry. Books, periodicals, and pamphlets have been written in great abundance concerning the various aspects of color. Numerous scientific research tests and experiments have been made in order to determine the definite effects that can be brought about through the scientific use of color.

Color has a universal appeal. It is everywhere. Man lives in constant contact with it each day. Colors, like individuals, have unique personalities. It can be truthfully stated that the characteristics of color are many. Among these, the following may be included: hue, value, intensity, feeling of warmth and coolness, quality of advancing and receding, and the feeling of much or little space.

The ways in which colors are used together in good or bad combinations is of extreme importance because of the effect that may be created in the individual. The successful
use of color is a very complex matter. Hence, the various studies and surveys which have been made should be ranked as immense contributions to humanity as a whole.

Color preference is significant since everyone has particular colors which appeal to him more than others. These preferences are evidenced by the choice of colors the individual makes when he buys clothing, food, furniture, automobiles, and other types of merchandise. Color preferences are also indicated by the colors used on the interiors of the homes.

The use of proper color conditioning in non-industrial institutions such as the home, hospitals, and schools is important because in these places people live and work. If the worker has a pleasing home environment it will have a better effect upon him at work. In the hospitals, color can be used to give the building a pleasant atmosphere which will improve the attitude of the patients, employees, and visitors. If the schools have pleasing colors, the students and teachers will enjoy their work more. Eyestrain should be eliminated as much as possible in the school rooms. It is especially useful for safety in the manual training department. Here a large number of the students obtain their training before entering into shops of various industries where they work.

The interior of the home should have a carefully selected color scheme. Correctly chosen colors will create a pleasant, cheerful place in which to live. Colors can be stimulating
or soothing; therefore, it is necessary to give some consideration to the purpose for which the room should be used. A happy home environment will produce a satisfactory effect upon the emotions of the individual. Colors can be contributing factors in the achievement of this goal. The employee in industry will, in all probability, do better work if he is surrounded during his leisure hours by a pleasing home atmosphere.

The functional and scientific use of color supposedly had its origin in the hospital. It was found that colors could produce desirable effects on the patients as well as the members of the hospital staff and visitors. Correct color conditioning in the hospital can be an aid to convalescence. It can also have a calming effect on nervous or anxious visitors. The traditional white is not used so much today as a predominant color.

Colors in the school should be of prime importance in the education of the world's children today. As in the home and the hospital, colors will produce certain effects in the school with respect to students and teachers alike. The aspect of illumination in the school should be thought of as the use of correct color for proper reflection and correct lighting since these two factors work hand in hand. Eye-strain and eye fatigue should be eliminated as much as possible.
Hotels, apartments, and restaurants may be classified as types of industries since they employ a number of workers and a large sum of capital. The hotel and apartment should have a pleasing atmosphere so as to obtain new customers and keep them. The industrial worker may make one of these places his home. The restaurant, whether public or in an industrial plant, should have a clean and neat appearance.

Restaurants also have color problems to consider. The color said to have the most "appetite appeal" is peach. Colors should be avoided which might tend to draw attention from the food.

Color in industry carries much significance. In retail stores, color plays a role with respect to profit of the business and the amount of merchandise sold. The retail store should be color conditioned so that it will compliment the merchandise to be sold. It also should create a welcome atmosphere for the customer and a pleasant, comfortable environment for the employees. Satisfied and comfortable employees will give better service, and thus more merchandise will be sold.

Correct color conditioning should be employed in the office so that the executives and employees in the personnel department will have a cooperative attitude toward each other. Good illumination also is essential in the offices of industry for the elimination of eyestrain and eye fatigue.
The offices of industrial organizations should have a good appearance in order that the best impression will be made on visitors. Properly applied colors can raise the prestige of the firm.

The use of functional color in industry avoids the theory of color in the purely decorative sense. It is used today functionally and scientifically for the benefit of the worker and management. Through the correct use of color, certain desirable psychological effects can be brought about in the employee. His mental attitude can be improved by correct color conditioning, or it can be impaired by the incorrect use of color.

Results from personal interviews as indicated in Table 4 show that ten of the seventeen organizations participating in the present survey report an improvement in the attitude of the employee toward management. The executives interviewed largely attributed this improvement to the color conditioning program. Four of the seventeen company executives were uncertain as to the effect of color on the employees' attitude toward management, and three indicated no change. Table 4 also shows no increase in absences of employees and no increase in employee turnover.

In industrial painting, the type of industry and the kind of workers employed have something to do with the color choices for the interiors. Color schemes should never be
decided upon as a matter of personal taste. The purpose of
the interior should have first consideration.

Nervousness, monotony, fatigue, and eyestrain can be
reduced with correct color tuning in the plant. These
factors may have an influence on the morale of the worker.
Many of the executives interviewed were of the opinion that
color conditioning programs in the plant encouraged the
employees to take a greater amount of pride in their work
and to take better care of their tools and materials. Good
housekeeping and safety are closely related in some ways,
for if tools are kept in their proper places and if refuse
is cleared from the aisles and traffic lanes, there will be
less danger of tripping or falling. Results in Table 4 show
that none of the seventeen company executives reported an
increase in accidents, whereas six reported a decrease after
the safety color code had been applied. Seven of the execu-
tives were uncertain and four seemed to think there had been
no change in the number of accidents.

Table 3 shows that eleven out of seventeen firm execu-
tives reported an increase in the quantity of production,
three were uncertain, and three reported no change. None of
the persons interviewed reported a decrease in the quantity
of production. With respect to the quality of the product,
Table 3 indicates an improvement in eight of the firms, no
impairment, four reporting no change, and five showing
uncertainty.
An analysis of the tables in the preceding chapter, together with a review of conversations with company executives concerning the use of color in the industrial organization, is indicative of the fact that it seems rather difficult, in some instances, to evaluate accurately the effects of color conditioning in the plant. In a number of cases, color programs are too new for complete analysis. Some plants are in the process of putting a color program into effect, but it will take a certain amount of time before the influences on the worker can be determined. Many new factories begin with a functional color program, and, therefore, the effects may not be easily measured since there is no comparison to be made.

Conclusions

An analysis of the findings related to the present problem resulted in the following conclusions:

1. The functional use of color has been and is being applied to hospitals, schools, homes, and many other industrial and non-industrial places.

2. The use of color conditioning in industry is somewhat new in this section of the United States.

3. In companies where the color program had been carried further, the executives were convinced that color has the following effects upon the employee:
(a) The quantity of production output had been increased by applying the proper colors in their plants.

(b) The quality of the product is affected favorably.

(c) Accidents have been reduced as a result of safety color codes being applied.

(d) Employees' attitude toward management has improved because of better working conditions, which resulted from color conditioning the plant.

(e) Reduced eyestrain, fatigue, nervous tension, and grievances are the physical and mental factors which color has helped in these industries.

(f) Proper color conditioning has improved housekeeping; raised morale; increased pride in the appearance of machines; increased the number of complimentary remarks from employees about the improvement in seeing conditions; and caused the employees to be more jovial.

4. Color has little effect on absences and turnover in most of the plants visited.

5. It is difficult to measure the exact effect that color has on employees.

6. The color conditioning of a hospital, school, home, industry, or any other place is a problem to be studied and worked out by an authority on colors and not by an ordinary painter.
7. Additional tests and experiments probably will tend to clarify the effects of color in the field of personnel.
APPENDIX

Questionnaire

Date _______________________

Person interviewed ______________ Title ______________

Company ______________________ Address ______________

Please check only one answer where a choice is given.

1. Have you taken specific action as to the effects of color on personnel? Yes ____ No ____

2. What colors were formerly used? ______________________

3. What are the new colors used? ______________________

4. Did you apply the color program only to given departments ____, or to the entire plant ____? If given departments only, please list them. ______________________

5. What were the effects of color on the quantity of production? Increased ____; Decreased ____; No Change ____; Uncertain ____. Please list some of the factors contributing to these effects. ______________________

6. How did the change in color seem to affect the quality of the product?

Improved ____; Impaired ____; No Change ____; Uncertain ____. Please list the factors which contributed to this effect. ______________________
7. What were the effects of color on the number of accidents?
   Increased __; Decreased __; No Change __; Uncertain __.
   Please list the causes. ________________________________

8. What were the effects of color on the number of absences?
   Increased __; Decreased __; No Change __; Uncertain __.
   Please give the causes. ________________________________

9. How did the use of color seem to affect the attitude of the employees toward management?
   Improved __; Impaired __; No Change __; Uncertain __.
   What indications, such as grievances, etc. were present?
   ____________________________________________________________________________________

10. What were the effects of color on the employment turnover?
    Increased __; Decreased __; No Change __; Uncertain __.
    What factors seemed to contribute to these effects?
    ____________________________________________________________________________________

11. In what other ways (if any) did the use of color seem to affect the attitude of the employees?
    ____________________________________________________________________________________

12. Have you observed any other effects of color on personnel not previously asked for?
    ____________________________________________________________________________________
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