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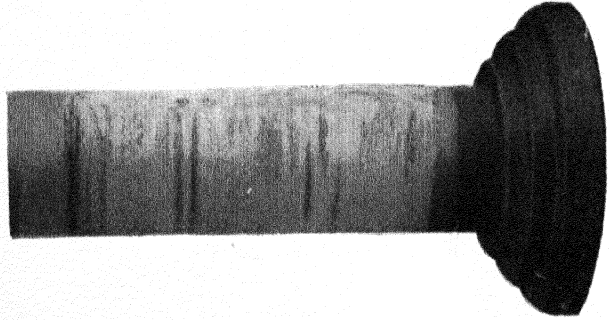
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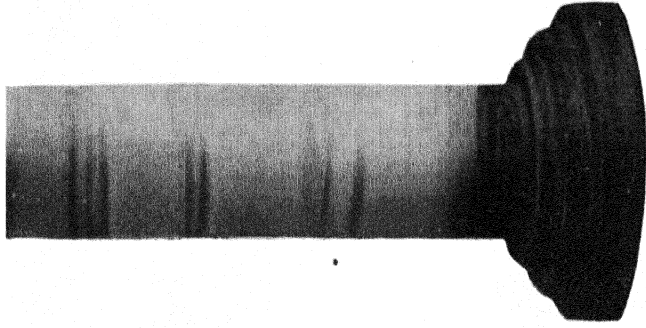
THE GATES OF LIGHT

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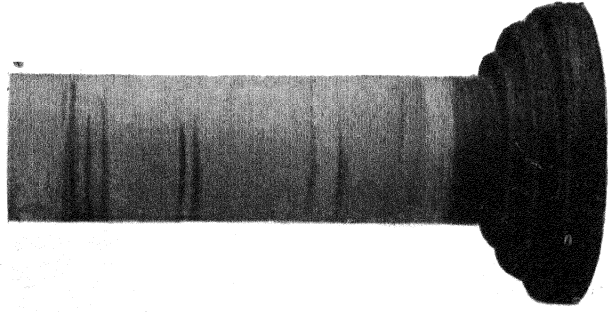
THE PAGAN TRINITY
THE NEW SCIENCE OF COLOUR
1ST EDITION



SEDATIVE BLUE



RECUPERATIVE YELLOW



STIMULANT GREEN

Irwin Colour-Filter Portables (patented). Specialised Reading Lights. •
See Chapter XXII. The filters are based on the chart in "The New Science of Colour," and presents colours combined in specific proportions, the dominant colour value classifying the filter as above.

THE GATES OF LIGHT

A RECORD OF PROGRESS IN THE
ENGINEERING OF COLOUR AND LIGHT

By

BEATRICE IRWIN, A.A., E.A.W.

RIDER & CO.

Paternoster House, Paternoster Row,
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PREFACE

THE art of illumination is a prodigy in the arena of modern life, for though it was only born some years ago, its development has been so rapid and complex that it dazzles our appreciation and leaves us struggling to synchronize some standards of knowledge and taste from its bewildering output. Colour and light are also the key-note of modern decoration, advertising, display and the theatre—all channels of communal intercourse in economics, industry and art.

It is therefore inevitable that Light should reveal its ethical and æsthetic values, adding these benefits to the utilitarian and spectacular ones already recognized.

When we become convinced of its priceless powers as a human healer and educator, we shall lay the foundations of a creative service infinite in its possibilities, and one that will merit the name of Art in the fullest sense. Few have yet fully realized what the æsthetics of colour and light can and will mean to us, but in the quest and conquest of them, there lies an untold harvest.

With humility, I offer some small gleanings

from the observation and experience gathered during a period of twelve years' practice as a colour specialist and illuminating engineer, trusting that these findings can be used and expanded in the service of the new art of illumination.

BEATRICE IRWIN.

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Part I

Exterior Illumination

The Arts of Light and Colour

CHAPTER I

THE NATURE AND BASIS OF ART

O Light, thou Sanskrit of the Sun,
Invoke our energy, and quest.
The forces of the Earth have won
Our love, our toil, our skill—but best
The eager unrest of our eye. . . .

IF we examine history we find that all art is ethically the outcome of two states of mind : man's deep certainty of his immortality, and his desire to express the same in ever new and varying forms. In proportion as his faculties unfold, he is filled with the wonder of their possibilities and with the joy of their power, which he employs successively in exercise and education. Out of exercise grows utility, out of education, art.

Involuntarily influenced by environment, and by that which satisfies the deepest needs of his being, man turns to nature as his logical guide, philosopher and friend, observing her methods, probing her depths, and rejoicing in her beauty. These operations taking place in the alembic of his mind, result in the ideas and experiments that give birth to art, which is the approximate materialization of ecstatic emotion and intensive toil. Architecture, poetry, painting, sculpture, music and the dance—

is not each one of these an outlet for man's successive preoccupations with form, sound, colour, and movement, as expressed in cosmic rhythms?

Interlacing forests, with trees whose trunks form columns to support the fluctuations of light that filter through their branches, the rhythmic music of flood and ebb tides, raptures of dawn and sunset, the delicate curves of animal and human life, murmur of winds and waters, and the interweaving of these in a never-ending pageant of subtle and soul-stirring movement—have not all these everlasting entities of Earth inspired the mysteries and the manifestations of Art? With expanding vision and consciousness, why should man not create new arts and sciences co-relative to his larger life? It is a fact, that in the past thirty years Astronomy has progressed more than in all the preceding centuries, re-modelling and extending man's conception of the Universe, and producing new and infinitely sensitive instruments for the study of light that are opening up illimitable vistas. Let us quote just one fact which illustrates the phenomenal character of this progress. "In 1844 only eighteen stars¹ of variable light were known and studied by five people. In 1928 we have catalogued 6800 of them, and 500 astronomers make 60,000 observations per year."

Within the past fifteen years the development of Light and Colour therapy, through the agency of sun-bathing and highly specialized medical lamps and filters, has become one of the foremost branches

¹ *La Grande Féerie*. Maurice Maeterlinck.

of medical research and application. It is true that Edwin Babbitt's experiments and valuable book *Principles of Light and Colour* were already published in 1844, but at that time experimentation was limited to the blue and red rays, whereas now we work with the whole visible, and portions of the invisible spectrum.

In 1879 the genius of Thomas Edison made electric illumination a universal possibility, and in so doing revolutionized many domestic as well as industrial conditions. The spectacular progress in these three fundamental fields of research, astronomy, medical science and engineering, is sufficient to indicate that one of the most absorbing preoccupations of our age is the study and utilization of Light; and therefore is it not a logical sequence that we should crave and create an art of illumination and of light, co-operative and indissoluble in aim, though different in function and expression: for by the concrete and explicit path of illumination we are proceeding to the more abstract æsthetics of Light.

Let us briefly review the present situation, and consider whether we are entitled to consider that we possess at least the rudiments of an Art of Illumination, for that, rather than the abstract Art of Light, is the subject of this volume—those more advanced possibilities demanding a separate work, for which the public is scarcely ready yet.

In spite of the mass of error and ugliness abounding in illumination, certain valiant efforts and achievements indicate that we have at least laid

some foundation-stones towards its development as an art. -

This expression has arisen not only out of the deeper issues already mentioned, but also out of a sharp reaction to inæsthetic obstacles, such as cumbrous fixtures and excessive glare—the former destructive to our sense of proportion, the latter to our eyesight. In 1921 the Vice-President of a leading New York fixture firm stated to me that there had been no appreciable progress in fixture styles for eighteen years! On another occasion, a prominent engineer candidly confessed that with the birth of electric units a big campaign had been launched in favour of excessive illumination regardless of glare and conservation of eyesight. These honest recognitions are probably typical of many others, which combined with the public's discomfort, and the radical action of progressive engineers, have been productive of the first words in an art of illumination. Let us hope that the smallness of these syllables is counterbalanced by the weight of their sincerity and their effort to respond to an urgent and growing need.

CHAPTER II

OBSTACLES AND AIDS TO PROGRESS

“ No two travellers see the sun at the same angle.”

BAHA'ULLAH. *Seven Valleys.*

THE moment is one of critical adversity because the new-born art of Illumination is battling against several domineering forces. These might be broadly classified as follows: Architectural tradition, Schools of Interior Decoration and public conservatism. These elders are not mentioned in any spirit of antagonism, but rather with a desire to clarify issues which at the moment are confused, owing to the fact that the said elders feel it not only their right, but their duty, to dictate the forms and conditions of the infant art, which hitherto has been a mere accessory to their more august operations. I voice the feeling of many comrade and creative engineers when I say that the art of illumination cannot come into robust existence until the Illuminating Specialist is recognized as an independent authority, whose scheme, though co-operative, is based upon a deeper and more detailed study of Colour and Light than architects or decorators usually have time to afford to these subjects. The public is gradually awakening to this fact, though its own limited idea

that Architecture and Decoration are fine arts, whereas illumination is a mere mechanical necessity, is largely responsible for the present situation. I have heard this difficulty discussed many times in open forum at the meetings of the Illuminating Engineering Society of America, of which I was an active member during a five years' residence in New York City. On one occasion a report was read showing that a survey of the city's leading hotels by a group of prominent engineers resulted in the statistic that public rooms were overlighted and glaring, while private rooms, such as bedrooms, offices, etc., were underlighted, both extremes causing discomfort and eye-strain. These conditions were found to be chiefly due to elaboration of fixture and unsuitable positions for the lighting outlets. Unfortunately, the majority of buildings, public and private, are in the same predicament to-day, owing to the fact that in most cases the illuminating engineer, contrary to his better judgment, is forced to submit to the requirements of the architect and fixture dealer, in whom the public has long misplaced its trust as far as any art of illumination is concerned. Architects, as a rule, do not study illumination, except from a decorative viewpoint, which often accounts for the monstrosity of central chandeliers of various "periods." Small period wall-brackets supporting pin-points of light are another favourite architectural resource, though from their very structure such brackets are incapable of generating good illumination. One well-known California architect candidly boasts

that in selecting fixtures he places ornamental effect before illumination value! The same tendencies are prevalent among interior decorators, and the fixture dealer, playing the part of an obliging automaton to these two autocrats, completes a ring through which it is very hard for the creative engineer to crash his way to the attention of the indifferent public. However, in justice to the elders, it must be admitted that all are not autocratic, and that as the possibility and practice of art in illuminating engineering is only a development of the past ten or twelve years, their æsthetic guidance in such matters was hitherto necessary. But if these excellent experts in their own line would now awaken to the fact that a new art has been born which is willing to co-operate intelligently, but cannot be forced to obey unintelligently, then we should see a more uniform taste and progress in illumination, and a public more sensitive to light. Happily there are a few advanced architects, decorators and persons of taste who are willing to concede that light is an independent study and art, and that their own efforts can be best enhanced by the expert efficiency of Illuminating Engineers. To the leaven of this minority, and to the awakening of the public, the art of illumination owes the hope of its future, for where vision leads, inertia and opposition eventually follow. Having looked our three greatest difficulties in the face, let us briefly review the minor obstacles and advantages that surround the present standing of illumination. We are burdened with quantities of

ugly fixtures, also many that are beautiful in themselves, but unsuitable to the production of good lighting values.

In some instances these fixtures were originally designed to accommodate other illuminants, such as candles, oil-lamps, etc., and are now only clumsily adapted to the brilliant requirements of electricity, which for all purposes of æsthetic discussion is our modern medium of illumination.

The economic enterprise of fixture dealers, supported by the traditions of the elders; is responsible for the perpetuation of costly, elaborate and, as a rule, inefficient and inartistic lighting units;—inartistic because inappropriate to the requirements and the quality of light employed. Under the same heading must also be classed most shades, and for the same reasons. So much for our present handicaps! Our advantages lie in several directions. The use of electricity as an illuminant that has called into existence a graduated and highly specialized service, is doubtless one of the initial impulses of the art. Added to this, the growing requirements of modern life in cities, the demands of advertising and display, the immense increase of Cinema Theatres, and the development of public interest in health as well as beauty, these are all powerful aids to the creative engineer. Last, and most important, we have the recognition of colour as an essential note and a health factor in our surroundings.

To the use of colour in Illumination, both for medical and artistic purposes, the new-born art

owes its most powerful impulse, its most satisfying results, and its most progressive hopes !

The Colour Symposium held in the Engineers Building in New York City, October 1917, gave an official recognition to these facts, and did much to stimulate the efforts of the pioneers who took part in those proceedings. My own small contribution to the march of progress, Colour Filter Illumination (patented), made its *début* on this occasion, in the excellent company of other inventions whose endeavour was also to obtain a more independent basis, and higher standards for the art of Illumination. Many names crowd upon one's memory, but in view of their extensive work it is scarcely invidious to mention the best productions of Louis Tiffany and Macbeth Evans Co. of New York who have done so much to further the use of coloured glass in illumination. Lalique of Paris has made a definite contribution to a new delicacy of design in fixtures, though I cannot find myself in sympathy with his recent exclusive use of silver and crystal, as the combination of the qualities of brilliance afforded by these substances, vies with light, instead of framing and supporting it, which is the main purpose of the art of fixture.

At the Exposition des Arts Décoratifs in Paris (1923), and in this year's International Exposition at Barcelona, evidences of the new art of Illumination were abundant and encouraging, so we may add Expositions to our list of co-operative advantages.

The characteristics of the new art so far, are

simplicity of form, brilliance of colour, diffusion and graduations of light, and increase of portable units. These, then, are our first stepping-stones away from massive chandeliers, the monotony of white light, glare and overhead fixtures of a purely utilitarian character. At least we have made a start. We have forded the shallows of tradition ; its deeps still face us !

CHAPTER III

PSYCHOLOGIC BASIS OF ART. FUNDAMENTALS OF ILLUMINATION

O Light, thou fountain in our veins
Leaping and leading—who knows whence?
We laugh and weep, darkness and dream we know
We cannot choose, we must aye march and grow.

ALL art is the ultimate expression of some deep impulse that belongs not only to the individual, but to the century that gives it birth. Primarily, we have noted that art is the outcome of our preoccupation with, and our response to Nature in any one of her manifold expressions, which, first we observe and admire, then interrogate and utilize, and finally evolve and improve upon. This final phase of activity may be called art. It is not improbable that the golden serenity of their land may have inspired the Egyptians with the love of spiritual truth, which became the dominating ideal of that great civilization, and resulted, not only in the motto of the Pharaohs ("Seek the light"), but in its realization through the building of Temples whose majesty was worthy of their quest, and whose columns were inspired by the suggestion of Egypt's abundant lotus blossoms.

The passion for human beauty and physical

culture which absorbed the Greeks, bequeathed to us the purest statuary, and the greatest art of sculpture that the world has ever known. These are but two striking examples of the fact that any dominating ideal will eventually express itself in lasting works of art. And of our day, can it not be said that speed is the dominating ideal, and that this ideal has expressed itself in two ways : physically, through the mechanical marvels by means of which we have interrogated and utilized light and electricity ; metaphysically, by our profound and fruitful research into the domain of these forces, more especially that of Light, whose challenge of speed is at the rate of 186,324 miles per second, and whose operations cover the field of so many dimensions ? In spite of all our probing, our astronomical and chemical instruments and discoveries, the terms, Electricity, Gravitation, Colour and Light, are mere symbols for a series of expanding manifestations, whose ultimate causes remain unknown, but whose effects create dynamic changes perceptible to our inner senses as well as to our outer eyes. This reflection is important in relation to an art of illumination, for all art possesses this dual angle of operation. We have gone far in our manipulation of light, rapidly employing and discarding various mediums, since the days when fire and light were worshipped as earthly representatives of divine solar radiance. Mineral, animal and vegetable oils, in combination with wicks, candles and rush-lights ; gas, and finally electricity, have successively been pressed

into the service of our research, and now we have reached a point at which we are ready to explore the human and psychologic values of light !

Out of these various mediums and experiments our new art of illumination has been born, owing its life to the preceding travail of many factors. Already an operative basis has been laid for Light-therapy, or the constructive and destructive values of light, visible and invisible, upon the human organism. In fact, this may justly be considered the most advanced and progressive branch of medical science, and it has called forth new knowledge and mechanical development, bringing specialized lamps and delicate machinery into existence to complete its service. It is not foreign to our subject to mention these facts, because they are forerunners of our art, and the contribution of their discoveries should be embodied in it.

Every art has its basic principle, in architecture, proportion ; in music, harmony ; in dancing, rhythm. All, in truth, only different aspects of the law of balance whose various methods of expression render these arts dynamically operative. For, without balance, we may have buildings, but not architecture ; without harmony, sound, but not music ; without rhythm, movement, but not the dance, and without radiance, light, but not illumination ; for radiance is the result of proportion, harmony and rhythm in light, and it is the key-note of our new art. The word radiance implies the moderated manifestation of an inexhaustible source of supply. It suggests a satisfying

and balanced expression of light, and an even distribution of its values, regulated by expert knowledge and definite laws. The radiance of the Sun itself is no less subject to these definitions than any other radiance !

And now let us briefly review our resources and achievements, and see to what extent our art of illumination is based upon the operations of light as we enjoy it in nature. Broadly speaking, four principles regulate the beauty, health and efficiency of natural illumination, viz. diffusion, fluctuation, concentration and filtration. All these principles underlie, and are creative of radiance, which is the synthetic and subtle essence of illumination, as rhythm is of the dance ! In terms, both of nature and engineering, radiance is produced chiefly by diffusion, which means that comfortable distribution of light which renders it possible for us to see equally well at any given point within the given area to which our light source is adapted. An old Persian proverb says, "The sun shines on good and evil alike," and it is this very impartiality, and even spreading of radiance, that constitutes the first essential in an art of illumination.

In the grand symphony of the year, nature orchestrates light in endless subtle fluctuations. We have day and night and the passing of the seasons. This principle of fluctuation produces also the beauty of shadow, and maintains the healthy sensibility of our response to light. It is therefore a most important physiologic factor both in nature and in the art of illumination. In

engineering, "fluctuation" is caused by changes of "intensity," whose values we regulate crudely (in comparison to nature) by changes of power in our light source, increase of electric current, higher-powered lamps, reflectors and dimming devices, according to our needs. Concentration and filtration specialize the quality of light and shadow by means of definite instruments: in nature, by means of varying pressures of light in days, nights and seasons, also through the interferences of moisture, vegetation, rocks and buildings. These interferences either increase or lessen the intensity of light.

In Engineering, we arrive at similar results through varying intensities produced by means of reflectors, shades, glass globes of scientific structure, and filters of various colours, which specialize light to the highest degree by adapting it in tone and as well as intensity to its surroundings. We may say, therefore, that diffusion and fluctuation are the physiologic and mechanical, and concentration and filtration the æsthetic and psychologic essentials of the art of illumination. The regrettable fact remains however, that we are not so adroit as nature in the use and disposition of methods and instruments, because we often place reflectors, shades and filters at angles, and in surroundings where they produce effects that are both destructive and inartistic, ruthlessly violating the principle of radiance, and producing its opposing elements which are glare and gloom! These errors it is the effort of engineering to correct

and eliminate, replacing them by a scientific proportioning of light, which results in the health, efficiency and beauty that characterize light in nature, and constitute the foundation of a true art of illumination.

CHAPTER IV

MODERN PROGRESS

CITY PLANNING. ADVERTISING AND DISPLAY

“ O sun-girt children stand secure
Amid these ecstasies of light.”

· BEATRICE IRWIN. *The New Science of Colour.*

THE spectacular developments in modern astronomy, the building of ever larger telescopes, the rapid growth of aviation and the increasing energy of man's demands, physical and metaphysical, naturally reflect themselves in his surroundings. Since we are storming the citadels of new suns and worlds, and merging our life with the depth and brilliance of space, it is only natural that we crave more colour, light and air in our buildings, and that our cities are becoming as well lit by night as by day. For though street illumination remains æsthetically a challenging problem, still exterior illumination, in some respects, is artistically in advance, on account of its standardized methods which are principally operated through flood and flash or search lights.

This elimination in method gives strength and style to exterior illumination, and confuses public taste less than the number of competitive methods available in interior lighting. Here the modern

demand for variety runs to extremes and produces freakish effects, both in form and colour, which corrupt taste and delay the growth of artistic expression. Three powerful activities are largely responsible for development in illumination, and productive of an incessant experimentation that is yielding increasing results both in beauty and efficiency. I refer to window-display, electrical advertising posters and, above all, Expositions. About the last, we shall speak at length in a later chapter, but meanwhile, just a few observations on display and advertising, which, especially in America, are playing an important part in public life, and employing colour and light to achieve unexpected effects.

The study, taste and money lavished on window-display in the States is responsible to a great extent for the high standards in dress and living. These displays educate the mass in ideals of economy, as well as luxury, and provide visual demonstrations of many important inventions, calling them to the attention of the public with ingenuity and care. On the other hand, it is true that these same educators have been, and are, guilty of many errors in illumination, but gradually the Parthenon of Progress casts out its stopgaps, replacing them by polished stones. It has been my good fortune to address many groups of display managers throughout the States and in England, chiefly on the correct uses of Colour in Illumination, and I was always careful to emphasize the fact that a great educational responsibility and opportunity

for æsthetic illumination lies in this 'commercial outlet.

To achieve better results, there should be a more individual recognition of the illuminating expert by the heads of many establishments, who at present relegate absolute authority to decorators who have insufficient knowledge of the laws or requirements of light.

In this way, financial loss and public censure are often needlessly incurred. To avoid such a situation, every big store and advertising agency should have its æsthetic illuminating and colour expert as well as its decorator, and electrical engineer, whose training only provides the mechanics and not the æsthetics of light.

The foregoing remarks apply equally to Advertising, Signs, Posters, etc., which, though less advanced than display in their development, yet offer such a wide field for the progress of art in illumination, and for the stimulation of its appreciation in our large cities, where the masses pass a great portion of their lives in streets, trollies, electric tubes and cinemas. Advertising activity, though lusty, is sorely in need of a more skilled knowledge of colour, as well as illumination, and it requires a more rigorous censorship than the cinemas, if ugliness, which is a form of immorality, is to be suppressed !

City planners or officials should awaken to this fact, and assume the just dictatorship of visual morality, by zoning advertising areas, and submitting their proposed offerings to the criticism of competent judges ! Landscape architecture is a

recognized art in our public parks. Why should we not have landscape advertising in our streets, and thus put an end to the disorderly array of ugly statements that too often confuse and offend our eyes. If the arts of colour and illumination are to have appropriate support from these communal channels of activity, and to receive from them the full benefit of their co-operation, various details of production call for discipline and revision.

CHAPTER V

STYLE AND STRUCTURE IN ILLUMINATION

Music has three basic modes—major, minor and chromatic ; light in nature has also three basic modes—diffused, concentrated and filtered.

THE structures of art have a mysterious challenge for the present, and a definite message for the future. They evolve largely in conformity with the substances they employ, and with the reactionary trends of their day, expressing a response to the needs of the many, which are always answered by the voice of the few ! These answers formulate themselves in a series of new rhythms, which constitute what we call a “ school,” “ style ” or “ period ” in art. In painting we have “ schools ” which develop from the original departures of great masters ; in architecture we have “ styles ” which are the legacy of civilizations, the Greek, the Gothic, etc., and in furniture and decoration we have “ periods ” which have a much shallower significance, and which only mirror the fashions and vanities of the hour ! Unfortunately, decorative art has become slavishly subject to the influence of “ periods,” and having till recently dictated the structures of illumination, it has imprisoned the struggling art in antiquated forms

adapted to discarded illuminants, but ill-suited to the delicate brilliance of electricity.

Heavy masses of wrought iron, polished metals and glittering chandeliers of crystal which came into existence with gas, oil-lamps and candle-light (supplementing their inefficiency with ornamental effects), though they may be beautiful in themselves, are not suited to frame electricity whose intensities approach those of sunlight, and therefore demand in fixtures the simplicity and softness without the weight of shadow. Natural or stained woods, and unpolished metals, also unglazed potteries, form the ideal substances for framing electric light, rather than the cumbrous, over-elaborated "period" fixtures, from whose suffocating mass modern illumination is slowly but valiantly emerging!

Æsthetics demand that fixture be appropriately subservient to light, though in most commercial and "period" fixtures the reverse is the case.

The austere simplicity of the first portable units of Colour Filter Illumination shown at the Annual Congress of the Illuminating Engineering Society of America in New York, was a definite protest against this æsthetic outrage, and though a battle waged for two years against the classic column that Filter Illumination introduced into lighting, it has gradually gained ground in public and engineering favour, and is now a current form in modern installations.

At Buffalo, in the National Congress of American Fixture Dealers (1921), an Educational Exhibit of Filter Illumination in portable and overhead models



Photo by

Claude Harris, Regent St., London, W.

BEATRICE IRWIN, A.A., M.I.E.S., E.A.W., IN MOORISH LECTURE COSTUME,
HOLDING "NUBIS" BEDSIDE READING PORTABLE

was supplemented by an address, in which a strong plea was made for the simplification of fixture design. The true function of fixture is to frame and uplift, rather than to obscure and dominate light by metal, wood or glass, whose costly elaboration and pretentious appeal too often deprives us of the subtler beauties and values of illumination.

Fortunately for the struggling art of illumination and its hardy pioneers, the modern art movement in decoration and furniture came almost simultaneously into prominence. Its simple lines and vivid colours are a healthy reaction against the ornamental affectation of "period" styles, and the gloom of "antiques." The forms and rhythms of modern art reflect the candour and directness of our present outlook, which contains a note of aspiration that demands an elegant simplicity in our surroundings. In the field of decorative art, France and Germany have led the way, though America and England are now nimbly gaining ground in the race. The big French decorators, Dominique, Fabre, Charavet and others, with whom it was my pleasure and privilege to co-operate during the period of my Filter Illumination Exhibits in Paris (1922-1923), were quick to grasp the possibilities of æsthetic illumination, and the idea of a new simplicity in fixture combined with better and specialized values in light.

They began to realize that only scientifically built units could create the expert lighting schemes which could co-operate efficiently with the high

standard of their own efforts. There is a host of imitative decorators and engineers who swell the stream of progress and who are responsible for its flotsam and jetsam in the shape of freakish exaggerations, both in decoration and illumination, but these are only the somersaults of exuberant clowns, who are probably tumbling on to grace and self-possession !

When the important reactions in human uplift (physiologic and psychologic) that the excellence of æsthetic illumination ensures are better understood and valued, lighting schemes will be able to claim their merited position as essential factors in public welfare. Let us speed this coveted day by a sympathetic and broader co-operation between architects, decorators, illuminating engineers and the public. We stand at a crisis where such an expansion of action and understanding is imperative to progress. Let us awaken to the full creative power of colour and light in our surroundings. Let us demand finer methods of illumination and be prepared to pay for them. Then, swiftly the waiting supplies of health and beauty will be forthcoming.

CHAPTER VI

HISTORY OF ILLUMINATION

VALUE OF SHADOW

“The general trend of chemical evolution in the universe as a whole appears to be from complex to simple, radiation being regarded as the simplest entity of all.”

J. H. JEANS. *Eos*.

AS this chapter is specially addressed to all workers in the field of illumination, it may be acceptable to briefly consider the history of light and illuminants. Broadly speaking, illumination suggests two thoughts to our mind—light and shadow—to which all artist engineers should add the words : health and progress.

Radiant light is the source of growth and well-being in all kingdoms—vegetable, animal and human, and man remains at heart a sun-worshipper, though he may not confess his creed in such picturesque ceremonies as his primitive ancestors. The mineral kingdom with which we, as a race, have become more or less destructively involved (*New Science of Colour*, Ch. II) was regarded by the ancients as a demoniac perversion of the Divine principle, and susceptible of purification only through fire and light. The camp-fire is about the earliest record of social illumination. Warrior and huntsman laid down their arms before its communal

glow which gave birth to the idea of the sacredness of the hearth as a place of peace and hospitality.

Concurrent with this secular aspect, we have the mystical, for the earliest recorded lamps are those used in temples and found in tombs, showing man's inclination to honour light and to recognize its celestial influence. From sacred lamps and tripods in temples is derived the use of candles in our churches to-day, and an interesting record states that on one Christmas Eve the Emperor Constantine illumined the entire city of Constantinople with candles.

In Egypt and other Oriental countries, stone jars of vegetable and animal oils were used in combination with wicks. In the fourth and fifth centuries, A.D., the illumination of churches was almost universal. From the primitive oil and wick lamps fashioned in stone, clay and later in brass and bronze, there was an advance to the rush-lights, or reeds dipped in oil, which were much used by the Romans. The candle was the next improvement, though there is a record of candles being used by the Phœnicians in the fourth century. The manufacture of wax candles was bitterly opposed by the guilds who made the rush-lights, and the makers of wax candles in their turn opposed the tallow candle, yet each step in progress marked the public desire for better illumination.

Not until petroleum was discovered in large quantities in America in the nineteenth century, was the oil lamp really perfected, though towards the end of the eighteenth century Argand had

invented the circular wick and glass chimney. About this time, gas also came into use, and in 1786 systematic street-lighting had been adopted in Vienna, Manchester, Philadelphia and Madrid. The first electric arc is said to have been devised by Thomas Wright of London in 1845. Its real adoption, however, did not take place till the Paris Exposition in 1881, though in the theatre, electric light was used much earlier—Meyerbeer's Opera *The Prophet* being thus illumined in 1846. It is interesting to note in these connections how the Church, Expositions and the Theatre have always been the prime supporters of progress in illumination.

The incandescent or glow lamp was introduced by Swan in England, and in America by Thomas Edison, who, however, in view of his wonderful inventions and unceasing enterprise is justly called the Father of Electricity and the Great Electric Wizard of our age. Indeed to Edison, modern electrical science, as well as illumination, owes a debt that it can only hope to repay by unceasing progress and further developments in this arena of vast possibilities.

Such in briefest outline is the history of illuminants and illumination. It is interesting to note statistics show that evolution in lighting always runs parallel with periods of general progress in civilization. Unfortunately it has not run far enough, since we are obliged to confess that the standard of illumination is still beneath that of architecture, decoration or sanitation. The mechanical efforts of illuminating engineering have

performed a great and necessary, but far from complete work in our utilization of artificial light, for there has been, and is, a tendency to develop quantity at the expense of quality, with a resultant lack of discrimination in lighting schemes. In short, there has been a commercial, rather than a scientific and artistic engineering of light, and a vast development of mechanical devices, rather than of æsthetic principles, which facts must be squarely faced and resolutely overcome by the engineers of the new art.

It is in a spirit of constructive criticism that these remarks are made, and with an earnest desire to see illumination contributing more fully to public beauty and human welfare. In an earlier chapter we have discussed the basic requirements of a lighting art, so we need only add that when the principles of diffusion, fluctuation, concentration and filtration have been studied in nature as well as in the laboratory, our next step is to maintain a satisfying, and what may justly be called an architectural, balance between Light and Shadow. This balance should create its own independent beauty, besides serving to enhance the lines of the rooms or buildings in which it is employed.

In order to achieve this architectural illumination, we have to study shadow as well as light, and to classify the various means and substances by which it can be expressed or even suggested.

In this connection, as in so many others, an æsthetic and scientific knowledge of colour plays a paramount part.

Nothing is more æsthetically boring and commonplace than a living-room continuously lighted with one quality of illumination, and even in public reception-rooms or art galleries this error should be avoided. Shadow in itself might be broadly classified as negative and positive ; the former when resulting from the angle of distribution created by our lighting units, the latter when imposed on our vision by colour and mass of fixture in relation to light, or by decorative effects in hangings, textile, etc. The artist engineer should always demand the details of the decorative scheme before planning his own, so that he can contribute to the production of a radiant and luminous whole, rather than be an aggressive interloper who drops in like an afterthought when all else is said.

At this point I can hear the advocates of the "period" fixture exclaiming : " But this is just where we fit in ! " Perhaps ? And that depends upon whether your fixture can fill the requirements of efficiency and health that the new art of illumination demands. Alas, the majority of period fixtures, from the very nature of their structure, are incapable of providing good illumination, productive of the quality of radiance, and consequently of eye comfort and æsthetic charm. This subtle charm, which in nature and art we call " atmosphere," is even more dependent on shadow than on light, therefore artist engineers must give shadow more thought and study than hitherto. The grains of different woods and marbles, and the values of certain colours, such as

deep green, purple, deep blue, lavender, etc., either opaque or translucent, all constitute shadow elements of creative power, just to cite a few examples from a rich store that the student can soon find out for himself.

It is also important to decide whether our shadows are to have weight* or softness, mass or depth, or sometimes alternating in both, if the lighting scheme covers a large area and demands a corresponding variety of effect. I spent two happy years in the study of shadow alone, yet feel that I know very little, for the vibrations of light, and the infinite gradations of matter in nature, have daily lessons for the observant eye, and make any reservoir of knowledge a relative affair! The best method therefore, is to make one's own inroads upon this vast treasury of information. As we shall deal with specialized health illumination in a later chapter, it is sufficient to remark here that the new art of illumination should make the care of eyesight and the relaxation of nervous tension essential features of its service. The scientific use of diffusion, fluctuation and filtration, combined with correct colour values in balanced schemes of light and shadow, will ensure physical welfare and stimulate æsthetic response in even the most unobservant. This increased appreciation in the individual will mean an increased demand for æsthetic illumination, and shortly our new art will attain its destined stature, and good lighting schemes will be the rule rather than the exception!

CHAPTER VII

DIFFERENT METHODS IN ILLUMINATION PSYCHOLOGIC FACTORS. COLOUR—VARIETY—FASHION DIFFERENT TYPES OF ILLUMINATION

“Colour is the warm heart of Nature without which her forms would lack their most illuminating appeal.”

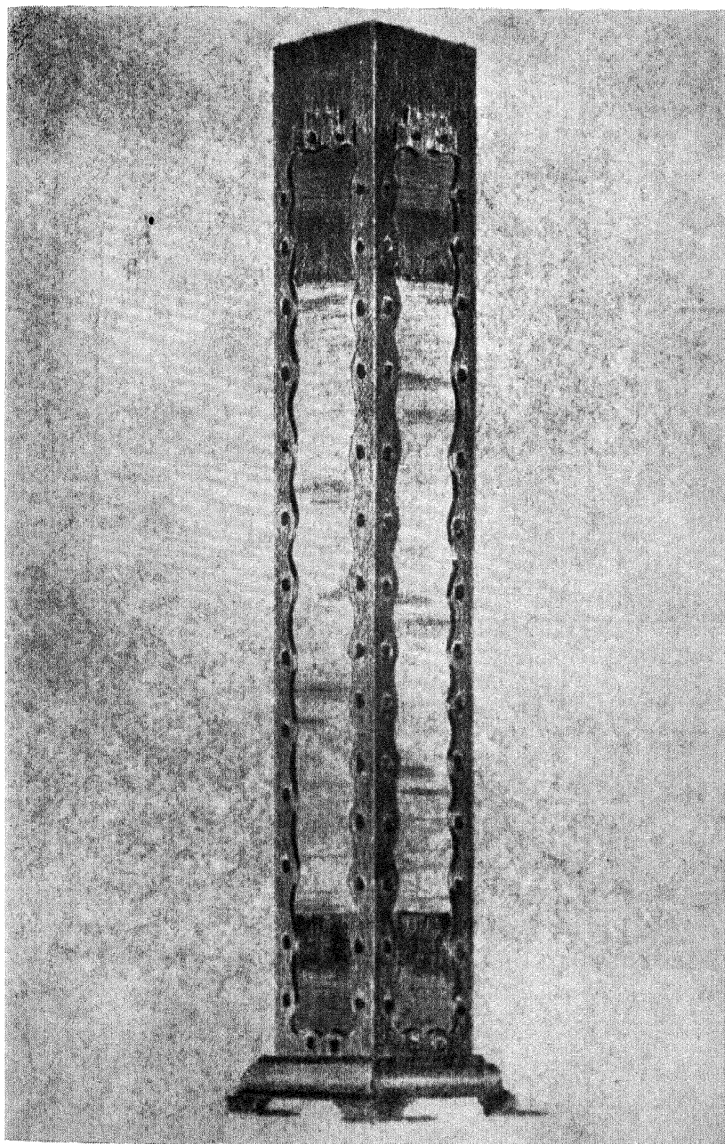
BEATRICE IRWIN. *New Science of Colour.*

ALL arts are but portals into new chambers of the soul, and if, as modern science postulates, our intellect is emerging from its infancy into adolescence, and we are beginning to discard the purely objective method of understanding and are trying to think more in abstract terms of causes and forces rather than in the concrete limitations of objects and effects, then our creation of an art of illumination may reasonably be attributed to an interest in the vibratory, and comparatively unexplored values of light, rather than merely to an infantile pleasure in the obvious charms of light, shadow and colour. Mechanical lighting devices can meet these requirements as readily as a technically trained painter can copy the works of a great master, and yet fail to convey those subtler messages of art which stir hidden depths within us and satisfy our psychic needs. These needs are changing in our consciousness, and if some of the

old forms of art are failing in their former appeal, it is probably because our conceptions of art and life have expanded to more abstract ideals than the old expressions embody.

New forms of art are reflecting this expansion in various ways. The essence of art remains unchanged throughout the ages ; an elixir distilled by the soul in its quest of the infinite ; a dewdrop hung between time and eternity, reflecting them both in iridescent symbols whose values we feel better than we can express. Based on mathematical principles of proportion and balance, art, from these, creates forms that produce reactions that are of that indefinable quality that we call psychic and spiritual. In nature, light is only an accepted necessity, and yet the beauties of dawn and dusk, and the grand pageant of the seasons, reveal an art unending in resource and revelation ! And light in our buildings can and will follow this master-pattern, and conduce more greatly than we can possibly estimate at present to physical well-being and to the unfoldment of our finer perceptions. Indeed, had we not need of this expansion, the existence of an art of illumination would be an impossibility.

From the technical basis of our subject, already discussed, let us advance to some findings on those psychologic factors which constitute the second phase of our study. Colour, with all its outer charms, inner possibilities and mysterious powers, is the myriad-edged tool with which we must learn to work profoundly and skilfully, even as nature



THE "PYLON" (14" x 14" x 8')
Colour-Filter Stand or Fixture, designed by Beatrice Irwin for
The Pythian Castle, Masonic Lodge, Santa Barbara, California.

does, if we desire to make light a creative inspiration in our surroundings. We shall have to study colour as physicists and metaphysicists, as artists, as decorators, as physicians and psychologists, if we are to acquire the knowledge and appreciation of all its operations, which are so essential to our graduation as artist engineers ! Ours is a comprehensive work, availing itself of so much that has preceded it, and necessarily obliged to co-operate sympathetically, yet independently, with so many diverse issues. In the Appendix we mention just a few of the many helpful books on colour that are available ; for without a serious study of this subject one cannot begin to understand the psychological values and structure of illumination.

Through the skilled use of colour we obtain, as in nature, our second essential, namely, variety, both of hue and intensity. I do not mean the unfortunate jazz of dancing patches, nor the roar of solid masses of colour that often masquerade in illumination under the name of " art," but rather those scientifically proportioned chords of colour, harmonized to assist each other's action and designed to produce definite qualities of illumination in given areas. Such graduated masses of colour, light and shade should be free of irritating patterns, and presented in fixtures whose forms co-relate with the amount and quality of the colours employed. Good judgment in such details as these must be the result of study and taste, rather than of commercial caprice, and then we shall produce lighting systems creative of repose

rather than fatigue. The best test of a permissible variety is its ability to increase our attention without reducing our energy.

Fashion, and different methods of illumination, are minor, yet not insignificant issues in the new art. Fashion is a gay coquette, flashing her mirror of fleeting fancies to dazzle us! Eternally youthful, yet speedily spoilt to death by her devotees, she has a compelling though snobbish charm that makes itself felt in all mundane matters, and even intrudes a fleeting shadow into the stable realm of art. Fashion in illumination may be humoured, like a wayward child, but never allowed to dictate anything but its own graceful caprices, which we can avail ourselves of with discretion, and only if they chance to contribute to the purpose of our general scheme.

At the moment, broadly speaking, engineering science has developed eight methods of illumination for interior and exterior service, namely direct, indirect, semi-direct, colour-filter, flash, spot, cove and flood-lighting. As the detail of these methods can be found in technical books, we will not include its discussion here save from an artistic angle, as a powerful mechanical aid in our achievement of æsthetic and psychologic effects. Direct light is so seldom desirable, or even permissible, that we will dismiss it forthwith. Indirect lighting, combined with good diffusion, though costly in its operation, produces cool, lofty effects. Semi-direct, or translucent illumination, gives a warmer and more intimate atmosphere.

Colour Filter Illumination provides specialized health-lighting, reading lights and medical illumination, also variety of æsthetic moods, one might almost say temperatures, and a scientific specialization for the lighting of all art objects and craft works, such as picture galleries, wood-carving, architectural drawing, etc. Its services in theatrical presentation are infinite and suggestive, and it excels in flexibility and healing values. Flash-light is self-labelled, and, like its cousin, spot-light, has important dramatic qualities and advertising values. Cove-lighting produces illumination with elimination of fixtures, and it is the ideally impersonal method of illumination, best suited to public buildings, such as banks, lecture-halls, etc. Like indirect lighting, it produces a cool, lofty but rather monotonous effect.

Flood-lighting, in which colour now plays so large a part, might be called the lighting impresario of our modern city life, since it brings the most important buildings into dramatic prominence, teaches us the relation of colour to different stones and building materials, accentuates the value of shadow, and gives an æsthetic attraction to crowded and even sordid thoroughfares.

Flood-light and Filter-light have yet great futures ahead of them, for they are among the newly born, and they speak the inner language of the new art, the magic language of colour, which is the Sanskrit of the Sun itself, a cypher luminous with many messages !

CHAPTER VIII

SPECIALIZATION IN COLOURED LIGHT

“ In circles endless Colour springs
And faints in tidal waves on space :
Earth with her canticles of joy,
Heaven hung on rainbow nebulae
And man encircled by his dream.”

BEATRICE IRWIN. *The New Science of Colour.*

SINCE the growing demand for Colour in our surroundings has probably been one of the chief causes of the art of illumination, we shall not digress unduly if we dedicate a chapter to its discussion.

The magic and mystery of light lie in colour, which is a wand that opens up endless vistas of exploration ! These, however, are not so easy of access as at first sight they seem, for knowledge is not our only weapon in this field, discretion in use being the chief secret of the creative capacity of colour in illumination. A brief quotation may serve to explain and elaborate this statement : “ The New Science of Colour will enable us to evolve lighting systems that will be more healthful and decorative in character, and more co-operative with our surroundings, freeing them largely from their present monotony. It is unnatural that man, whose organism is such a flexible electric battery,

should dwell in any fixity of forms and colours. For most of us, the constant cost of re-decoration is prohibitive, but through a study of colour-science and the application of its principles to illumination, we shall obviate much of the drabness whose low vibration causes depression." ("The New Science of Colour." See also Appendix.)

One of the most important aspects of Colour in Illumination is that it teaches us so much about light, both in its vibratory aspect and in its relation to health and human uplift, entirely changing our limited appreciation of Colour as a decorative factor, into a dynamic consciousness of its vibratory element and creative value in our midst, enabling us to recognize in it a force that we must handle as carefully as fire. Hitherto we have classified Colour vaguely in terms borrowed from music or our emotions, speaking of it as bright, dark, tender, loud, soft, etc., but the psycho-physiologic chart contained in "*The New Science of Colour*" and quoted with reprint of my lectures at Illuminating Congresses in New York and Washington *Transactions of the Illuminating Engineering Society*, Vol. XIII, No. 1, affords a vibratory classification based on laboratory tests made in relation to the effect of colour on the human organism.

In this classification we find Colour divided into three systems—*Physical*, *Mental* and *Nervous*—and in each of the systems exist subdivisions of Colour, termed *Sedative*, *Recuperative* and *Stimulant*. These terms refer to the vibratory value of the colour, and also to its effect on us, and constitute a definite

verbal recognition of the dynamic powers of colour and light.

By this method we begin to think of colours as vast and graduated reservoirs of vibratory force, and from such thinking grows a more intelligent and responsible use of the medium in illumination, and in many other channels. In fact, our engineering practice affords a wide and fertile field for testing the validity of this, or any other colour theory, and applying the principles to the hygienic and æsthetic growth of the new art.

As a general guidance for the layman and engineer, one may say that “*sedative*” colours are deep and dull in quality, “*recuperatives*” are deep and brilliant, “*stimulants*” clear and pale. But please remember that this is a liberal generalization, and merely offered as a guide to those who have not time to study the question as it deserves. In every case the colour which predominates and determines the quality of our illumination, should be blended and proportioned with two or more other colours in order to temper or mellow our light, and to avoid the eyestrain and nervous tensions which often result from monotone masses of colour.

CHAPTER IX

SPECIALIZED COLOUR COMBINATIONS

“Colour cures are especially adapted to nervous and blood troubles because through respiration colour acts directly upon the blood, and therefore indirectly upon the nervous system.”

BEATRICE IRWIN. *The New Science of Colour*,

WHEN one has experimented over a number of years in the psycho-physiologic fields of light, the above statement ceases to be incredible, for granted the fact that colour has a definite action on our respiration, which is now one of the recognized bases of colour-therapy, we have a logical reason for our depression, repose or elation, in different colour surroundings, and we begin to realize that the distribution of this element in our homes is worth our personal supervision and consideration—unless we are able to place the matter in the hands of a genuine and *recognized* expert.

In view of the growing demand for colour in many channels besides that of illumination, it is to be hoped that our colleges and engineering societies will create examinations and degrees in this subject, in order that the public may be protected against the pretensions and ignorant operations which at present are constantly imposed on it, creating

destructive colour combinations which demoralize taste and greatly retard the progress of æsthetics in the art of illumination.

If our artist engineers held diplomas for colour specialization, better standards and more satisfaction would be obtained. I should regret to state how many ridiculous impositions of 'so-called colour specialists and engineers I have been called in to correct as best I could, without rebuilding the entire lighting or decorative schemes in question !

Just to quote two examples : one was a children's Experimental School in New York, where the ceilings were sapphire-blue, the walls canary-yellow, the result being that the children became quite unmanageable and incapable of any kind of concentration. The weight overhead combined with the surrounding stimulation worked havoc with their tender sensibilities.

Another instance occurred in a famous restaurant of San Francisco where thousands had been spent on the decorative scheme, but the illuminating engineer had installed a series of red and orange lights which killed all the delicate blues and greens of the wall frescoes ! Yet in both these cases the so-called experts had been sent out by responsible business firms, themselves ignorant of the necessary qualifications of a colour specialist.

The whole question is one of such far-reaching importance to public welfare that it demands attention and adjustment. Even from a ten years' experience as Colour Specialist and Illuminating

Engineer, I hesitate to offer any but the broadest generalizations in colour combinations, for there are always details which influence the correct use of colour in a lighting scheme, and of which the operating engineer must be the most discriminating judge.

The following suggestions therefore must be accepted with the necessary reservations. One may quote a lighting or colour combination as—"suitable" for a bedroom, lounge, etc., but the size of the room, exposure, or relation to the scheme of the whole house, may alter the case and render it unsuitable. I believe the most important point is to plan one's scheme as a co-related whole, one room affording relief and reaction to another, instead of each room expressing itself so independently that a general unity is sacrificed and nervous fatigue often ensues!

If we are developing dramatic effects and rich recuperative colour values in our living-rooms, our other rooms—bed, bath, dens, etc.—should work out in sedative and stimulant colours according to architectural limitations, and the individual needs of the occupants. If decoration is to be co-operative with illumination, we will preferably have walls and ceiling of light-tinted, monotone hue, free of designs and capable of affording good reflecting and diffusing surfaces for light. The co-efficients of reflection for white light are herewith annexed, and can be used approximately with coloured illumination. Personally, I prefer to prescribe ceilings of the same hue, only several tones lighter

in tint than walls, as this gives continuity in our illumination and an airy atmosphere to our room.

Under general conditions, recuperative tones of rose, orange, yellow and violet, combined with small proportions of balancing colours, of other hues, are most suitable for reception-rooms, halls, auditoriums, banquet halls, etc., and greens, blues, violet, rose and yellow in sedative and stimulant values for bedrooms, bath, study and library.

SUMNER'S CHART OF REFLECTIVE VALUES

Cream paper . . .	56 per cent
Light orange . . .	50 " "
Yellow . . .	40 " "
Light pink . . .	36 " "
„ emerald-green . . .	18 " "
Dark brown . . .	13 " "
Vermilion . . .	12 " "
Dark green . . .	5 " "
Maroon . . .	5 " "
Deep blue . . .	3 5/10

Mono-tinted light produces a flat and fatiguing illumination, and is irritant to the eyesight and productive of nervous tension. Our ears have already been educated to a point where they resent any monotony of tone, but our still illiterate eyes suffer dumbly! In the hands of the artist engineer and colour specialist lies the higher education of this most delicate, complex and long-suffering organ of our body!

Let us beware of colour monotony in our lighting schemes, also of exaggerated variety, and let us

follow the endless and profound suggestions of nature, where light, shadow and colour radiate, merge and mingle with powerful and rhythmic appeal, producing moods of infinite renewal and charm.

CHAPTER X

CREATIVE AND PROTECTIVE COLOUR VALUES

Into the tingling ether—into the stainless blue
One with the forces of light air
Life is larger and purer there. . . .

WHEN we become fully fledged as a flying race, probably our old Earth home will approximate in brilliance to our aerial life, for as we come to live more fully and constantly in the pure element of Air, we shall become aware of its inner as well as its outer blessings, to which the Science of Aviation is but the portal! We shall then consider Colour and Light as human builders and educators, and shall not use them haphazard as we do now. When we have acquired this new consciousness, we shall use Colour like a treasure rather than a toy in our surroundings, realizing—as the sage Aristotle said—that “Colours may mutually relate like musical concords for their pleasantest arrangements, like those concords mutually proportionate.” And in that last word lies the master-key to the new uses of Colour and Light, for it is in the scientific proportioning of qualities and quantities that the secret of operative results lies. These remarks apply to the use of

colour and light in Architecture, Decoration, Landscaping, Display-advertising and Illumination.

But since our immediate interest lies in illumination, let us say that this should always be both protective and creative, ensuring the elements of repose, change and stimulation in equal measure in our surroundings.

Practical experience has led to the conclusion that the most powerful yet flexible decorative effects are produced by colour in illumination, for by means of coloured light scientifically used we can approximate our surroundings to nature's mobile colour range, and free ourselves from the unnatural condition of living in monotonous vibrations. One of the secrets of our well-being in nature is the fact that we are surrounded by constantly changing rates of vibration. The present tendency in illuminating engineering is towards an excessive brilliance and exaggerated variety in colour expression, which though arresting is finally irritant and destructive of pleasure and sensibility. This condition is more noticeable in public and exterior than in interior illumination. The selection and study of backgrounds, though of prime importance, is too superficially understood, and therefore backgrounds often create a jarring and obstructive note. In relation to light, they represent area, quality, and even shadow value. That is to say, they create impressions of space, density and depth, and in selecting them we have to make choice of our determining factor.

In short, the new art of illumination develops protective and creative values, through—

- (a) A scientific proportioning of colour.
- (b) Graduated intensities of light.
- (c) Discriminating variety of colour and fixture.
- (d) Studied values of background.

These broad principles underlie all æsthetic illumination. We will supplement the colour suggestions of the preceding chapter by a few more definite findings. In living and public rooms, lighting tints of yellow, orange, rose, green and occasionally blue, violet and indigo, serve best for purposes of relaxation or stimulation—in combination with backgrounds which produce whichever one of these results one is working for. In bedrooms, studies, libraries, offices, etc., tints of green, blue, violet, rose and yellow are most helpful. Of course, there are always special cases which may demand unusual colour combinations which it is the expert's privilege to prescribe. Backgrounds have to be considered in relation to so many issues; area, material (whether paint, paper, textile or woods); the pictures, decorations, lettering, etc., to which they are tributary; that it is almost impossible to specialize, yet bearing these modifying conditions in mind, one may mention cream, pale yellows, blues and greens as creative of area, or the feeling of loftiness and space.

Recuperative and sedative (i.e. full) values of the same colours, and also of rose, orange and violet, give quality and feelings of repose, depth, vitality.

Sedative values of all these colours, plus indigo, produce density, and feelings of repose, weight, concentration and shadow. The questions of display and advertising open up a field of discussion wide enough for a separate volume. In passing, one can only offer a few proven points and principles.

Such a great power for the progress of illumination, and for the education of the public, lies in the hands of the owners of big stores and the creators of poster and display, that they, above all people, should encourage æsthetic illumination, and place their products unreservedly in the hands of the artist engineers and colour specialists, who will contribute the final illuminating touch that will harmonize the whole, providing high lights and shadows where they are necessary to complete the purpose of the scheme and show the exhibits to the best advantage! In display and advertising, the first consideration naturally lies in the colour values to be illumined, and experimental service alone can furnish the engineer with adequate knowledge on this subject, so that he does not project red light on to blue or green surfaces, rendering them black, or commit similar elementary errors, which unfortunately are still too common.

However, this question disposed of, one may state that tints of orange, yellow, green, blue and pale violet create the highest luminosity, or are most suitable for long-range illumination. Red and deep blue for short-range service, giving depth, dramatic value and richness. Magenta, purple, citron-yellow and a few other unusual tints should

only be used in small quantities for purposes of spot-light effect, sharp contrast and advertising accentuation. Large areas of such stimulant tones prove irritant and dazzling. These suggestions hold good for lettering also. In backgrounds, never contrast pale and stimulant tones with dark goods, but rather use sedative and recuperative creams, greens and blues. With light-coloured goods, costumes, millinery, etc., use sedative blues, mauves and stimulant yellow. For books and jewellery, yellow, orange, Nile-green, turquoise-blue and cream are all available.

If you wish to expand the area of your background, use light stimulant colours. If you wish to contract it, use sedative shades. If you need depth, use recuperatives, and preferably orange, old gold, orchid- or emerald-green. In relation to display and advertising, illumination has four distinct services to perform :

- (1) To produce better visibility by quality rather than quantity of light.
- (2) To co-ordinate and harmonize rather than to detach objects.
- (3) To provide variety of effect by means of light coloured without destroying the colour values displayed.
- (4) To create restful areas of shadow which add dramatic value to the ensemble.

CHAPTER XI

PRESENT CONDITIONS

So swift Light moves, we cannot see,
But like the seeds we stir and wake.

THE march of progress, both in astronomy and illuminating engineering, is so rapid that we are being carried along at a rate which makes it difficult to see clearly what we are discarding and absorbing in the way of knowledge. That eminent scientist, Professor Jeans, in his recent work, *Eos*, says: "We begin to realize that our terrestrial physics and chemistry are only the outermost fringes of far-reaching sciences. . . . The new world in which astronomy moves to-day is all a discovery of the present century. The conversion of matter into radiation, which appears to be the primary physical process of the universe, did not come within our purview at all till 1904." These and many similar thoughts reveal our increasing pre-occupation with light, both of the heavens and the earth. How significant it is also, that *The New York Herald* and *The Times* in their Sunday issues, which are great popular educators, find it not only possible, but profitable, to publish long illustrated articles on astronomy full of technical statistics.

In relation to the angle of light under discussion,

i.e. the art of illumination, it may be helpful at this point to pause and consider just where we stand. Here, again, intense activity renders discrimination difficult, but our course appears to be approaching mid-stream, namely, the most difficult situation in which to maintain a direct onward line. We are still badly hampered by obstructive cargo, in the shape of outworn traditions, domineering commercial standards, public indifference and bad taste, and a general divorce from nature. These conditions constitute the chief bars to æsthetic progress in illumination.

The destructive traditions of illumination, as we have seen, are various. Among them the idea of quantity instead of quality in light, and the general impression of the public that brilliant light means good illumination! The tendency to employ ornamental fixtures which embody the maximum of metal with the minimum of light! The point of view that illumination is only a technical necessity in buildings rather than an æsthetic and hygienic essential of increasing importance. In justice to commercial standards be it said, that these are broadening and elevating themselves to meet the growing needs, which, however, they still restrict by the domineering fashion of "period" fixtures, which owing to their mechanical limitations are seldom capable of producing good illumination.

If the public will increase its demand for modern methods and æsthetic engineering, the commercial standards will respond accordingly. The indiffer-

ence of the public itself is one of the most serious bars to progress, and my experience is supported by the discontent of many prominent engineers who complain that the meagre financial appropriation often allowed for the illumination of buildings renders it impossible to achieve the best results. In short, in most cases illumination is only accorded the crumbs that remain after every other condition of the building has been lavishly considered. I have found the same difficult situation in private practice where women would spend regardlessly on ornamental cushions, furniture, etc., and yet would grudge even a modest outlay on portable units that meant the preservation of eyesight as well as the harmonized charm of their entire apartment. This lack of knowledge and taste, especially in cities, is probably due to artificial environment and the constant divorce from nature. Living continually in cinemas, theatres and public buildings that are usually overlighted, and in homes that are underlighted, the eye either becomes overstimulated or inert, and loses its normal sensibility to light, not only accepting, but through habit, even demanding conditions that are injurious.

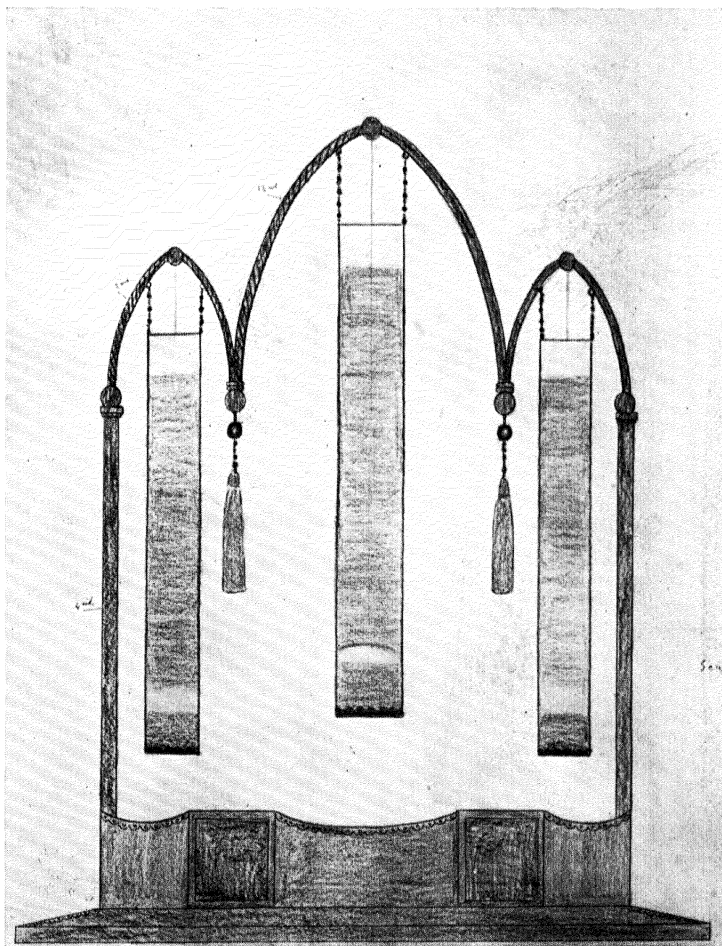
I have often had to treat cases of eye-strain by Filter Light, that were the result of constant overstimulation and at first the sufferer would assure me that he could not possibly see with less light ! As the ciliary muscles relaxed to normal tension under correct illumination, this resistance was replaced by astonishment, at the discovery that more work could be effected with less effort, and

that it is quality, not quantity, that means comfort in illumination. If this knowledge were more prevalent we should not have such an alarming increase in the use of glasses. Among primitive people, like the American Indians, or even mountain peasantry, whose eyes are nurtured by nature's subtle graduation of light and shade, eye troubles and glasses are almost unknown.

If such is the retrospect from our mid-stream situation, let us see what lies around and ahead in the way of aids to progress.

First, and most important, we find the co-operative current of the "Modern Movement," which is actually a growing state of mind, reflecting itself in our surroundings—a consciousness that is demanding essential rather than artificial values; directness of statement, comfort in operation, restful simplicities of line, and slender space-saving proportions! Many will assert that economic pressure is responsible for these facts, and, to a certain limited extent, this is perhaps true; though I believe that aviation, and the whole quickening of our mental outlook has created the psychology of which the "Modern Movement" in furniture, decoration and illumination is but the logical outcome.

The development of mechanical excellence and invention is another powerful factor in progress, and offers a field of infinite resource and experimental invitation to both æsthetic engineer and public. If our needs are changing, undoubtedly our taste must follow suit, and the laborious products



THE "GATE" (7' x 3' 6")

Portable Standard in Irwin Colour-Filter, designed by Beatrice Irwin for
the Bahai Shrines, Haifa, Palestine.

which formerly satisfied æsthetic sensibility are being replaced by those of more subtle appeal, though possibly not less laborious manufacture.

Among these new beauties of environment, light must surely rank first, as it naturally does, with persons who become educated in this most human, yet most abstract, form of art.

The "Modern Movement" in the theatre, the increasing occurrence of International Expositions, and ever-expanding possibilities in the fields of display and advertising, are all co-operative aids to progress in the art of illumination. On the whole, therefore, in spite of useless cargo, which we shall soon throw overboard, our course seems rapidly advancing to a bright haven where well-merited repose awaits our skilful steering, and fresh inspiration will doubtless open up new ventures. The present may be confusing in its complexity, but it is certainly precious with hope, and powerful in promise.

CHAPTER XII

THE NEW ART OF ILLUMINATION IN MANY LANDS

“The loam of every land runs in our veins.
Our æoned ashes are the universe.”

BEATRICE IRWIN. *Pagan Trinity.*

MODERN scientific methods have taught us quickly to resent any lack of ventilation and sanitation in our surroundings, or any monstrosity of form in architecture. How many of us are there that can with equal promptitude detect the unhealthy conditions of faulty illumination that insidiously cause eye-strain, nervous tension and general discomfort ?

Definite standards of diffusion, fluctuation, concentration and filtration are obtainable upon a mathematical basis, yet more than this is needed for the achievement of æsthetic illumination, namely the discriminating adjustment of these factors to each other, and to given areas and surfaces. It is the harmonizing of the technical elements in illumination that for the æsthetic engineer makes every scheme both a standardized and an individual problem.

The immense uplift in health and mentality resulting from scientific illumination, is already a

proven fact in private homes, so why should we not extend these benefits to communal welfare, especially in an age when the majority pass much of their time in locomotion and in public buildings?

At the moment, though exterior is on the whole more efficient than interior illumination, it is lacking in æsthetic appeal, and disfigures rather than beautifies our streets, buildings and parks. An interesting endeavour is afoot in California, and in America generally, for progress in this direction, through the ornamental flood-lighting of buildings, but though this points the way, it leaves us far to go. The problem is a severe one, because it involves so many economic considerations, space, safety, traffic laws, conflicting store and advertising lighting, cost and resistance to weather being some of the knots that have to be untied in relation to exterior lighting. In public parks the situation is equally crude in expression, yet here the practical difficulties are fewer and the æsthetic possibilities much greater. In our subsequent chapter on gardens and fountains we shall expand this discussion. Interior illumination, as we have seen, is in a state of progressive and healthy chaos, struggling for its independence and æsthetics, and passing successively through the hands of architect, decorator and engineer. When the demands of a more educated public reverses this order of succession, the art of illumination will make rapid advances, and in reality much time and trouble will be avoided for all concerned.

The initial recognition of independence is the

important point, and it is but logical that the illuminating engineer should understand light and its possibilities better than those who are obliged to give their time to other studies and requirements—technical and æsthetic.

In flood, display, and theatrical illumination, we find actually the most advanced and artistic expressions of our day. This is probably largely due to the fact that in these connections the engineer is left to his own resources, and is unhampered by the prejudices and restrictions that he encounters in buildings. In every branch of modern illumination we find that colour plays an increasing part, and though its spectacular values are often exploited at the expense of efficiency and good taste, there is a sincere response to the educational campaign of pioneers in this line, and a desire to use colour with knowledge and purpose. Unfortunately, colour produces such immediate results with so little effort, that the public and many engineers still naïvely imagine that it is sufficient to use it in quantity to achieve their effects! Alas, these effects often prove disastrous to the interests of the public, as in the case of the San Francisco restaurant already mentioned, where crimson and amber lighting cancelled all the values of the painted frescoes!

Having had the advantage of practising in various countries, America east and west, England, Germany, France and Spain, over a period of eleven years, the remarks in this chapter are based upon a cosmopolitan experience, embracing

different racial and climatic conditions, which produce their reflexes in illumination as in everything else ; but everywhere I found the new art recognized as an existent, though not always a robust, entity ! In the hands of the public and the artist engineers lies the health of the future !

CHAPTER XIII

ÆSTHETICS OF COLOUR AND LIGHT IN CITY PLANNING

“ It is from dearth that we discover and create new laws.”
BEATRICE IRWIN. *New Science of Colour.*

CONTACTING new avenues of thought is very similar to the refreshing experience of a country walk in a new land, where all is unexplored and a source of stimulation to one's mental as well as one's physical eye !

New objects create new rhythms in one's brain-cells, and the result is a healthy sense of mental expansion and psychic activity. One absorbs the impact of the fresh appeal, and then one begins to compare and harmonize it with existing experience. The process of lecturing before different groups of minds bears a close analogy to these remarks, and one of my happiest contacts was made in connection with the City Planners of California, in Los Angeles, where I was invited to speak on Colour in City Planning. This occasion opened up a new area of thought and information, which it was most agreeable to pursue through periodicals and exchange of ideas with various city planners. Among these, as among engineers, is found a small progressive group who are ardently

striving to combine the æsthetic with the utilitarian demands of the stern problem of city planning. The word "stern" is used advisedly, for if the æsthetic engineer has restrictions, the city planner has traditions to cope with which are doubled in complexity and weight, owing to the variety of issues and the economic discipline which underlie successful operation in this connection. City planners are the architects of nations and historians of the future, and therefore it is with respect and humility that my hopes and ideas for the development of exterior illumination are addressed to their consideration, as well as to that of the engineers and the public.

To those who travel, and in our "diamond age" travel is considered almost an essential of life and education, the cities of the world are like great personalities, and by their atmosphere and outline, impress themselves upon our consciousness as much as human entities!

I wonder if all city planners realize the extent of their immense responsibility to the future, and the extreme importance of their choice of co-operative experts? Cordova, in Spain, was the first European city to have street lighting, a fact doubtless due to the scientific and refining influence of the Moorish occupation, and recently the International Exposition at Barcelona has offered suggestions on progress in this respect that are a real inspiration. In this connection it is also interesting to note that at Meknes, in Morocco, a small "city of a thousand minarets," I met the most artistic and efficient type

of street lamp I have ever seen, a creation of metallic and electric art that was a combination of modern science and Aladdin's lamp !

In the States, especially in the west, there is a decided effort to introduce an æsthetic element into public illumination, but the results so far seem rather laboured, too obvious in intention, and too alien to their surroundings—the creation of mechanical rather than of artist engineers !

In such parts of Europe as I know, namely the leading cities of England, France, Spain, Germany and Italy, we have hardly begun to emerge from commercial and utilitarian expression in street fixtures. Surely we might start some improvements in our main boulevards, by means of which we should greatly enhance the charm of our cities, call the attention of the public to the value of æsthetic illumination, and give the traveller a more memorable impression of our buildings and our culture ! Such an endeavour would naturally call for the specifications of artist engineers and colour experts, and, as we have already noted, the terms should be synonymous.

A committee could select the areas and buildings most suited to such operations, and consider them as essential to the illustration of the city's life, as good illustrations are to the leading chapters of a valuable book ! I believe that various advantages would also accrue from a strict regulation of colour expression in such chosen areas, so that instead of the crazy patchwork of colour that at present disfigures the main thoroughfares of big cities, we

should find certain streets restricted to the use of certain colours and definite combinations, the proportions of such combinations supplying the variety necessary to meet the needs of area and operation.

Such restrictions would yield particularly valuable results in advertising districts, though if these could be more definitely zoned, their appeal might be more powerful, and their interference with civic dignity less pronounced ! Streets dedicated entirely to advertising would prove a novelty in city planning, and might call forth new ideas in architecture and illumination ? They certainly would meet with a warm response from both merchants and public, and would provide a harmless diversion for the traveller within the gates, especially if they included restaurants and bars !

As a colour specialist, it is my belief that the minimum amount of red, blue and violet, the moderate use of orange and indigo, and the maximum of green and yellow and white, should be employed in city illumination, these selections being based on architectural and psychologic requirements, and subject to slight variations to suit climatic conditions.

For instance, in northern towns one might use orange and green ; in villages, red and violet. It is hard to see yet how we can do away completely with the street lamp, but the increased service of flood lighting wherever possible would add charm to the landscape, and permit of a broader operation of restful colour values. There seems to be no valid economic reason for the exclusion of wood

and cements from the structure of street lighting, and as they are mediums whose qualities harmonize more naturally and æsthetically with light, than metal, we might give our wood carvers an outlet in this direction. Weathered woods, lacquered, unpolished or polished, and cements in dark tones, would add a new and distinctive touch to fixture, provided their natural limitations measure up to the exacting requirements of city planning and boards of municipal control? Already certain cities in America are distinguished for their fine street lighting, and if this example could be more actively emulated, city planners would materially serve the public welfare.

CHAPTER XIV

ILLUMINATION OF PARKS, GARDENS, FOUNTAINS

In all fountains colour is kindled, crowned,
In all fountains, fire and water merge—
In all fountains light is the soul of sound.
In all fountains, sight seeketh the sun's urge.

SINCE the days of Eden gardens have been dedicated to refreshment of soul, and have been symbolic of joy through growth and beauty, as expressed in radiance, colour and perfume. In parks and gardens, among the green mysteries of nature, Hope slips her hand softly into ours, the conscious immortality of youth returns! and we can exclaim with the great Italian lyrist, Carducci :

“ Life bringeth forth in everlasting spring
Upon the eternal stem, flowers ever new ! ”

In our modern Renaissance the young art of illumination is one of these new blossoms, and nowhere can it expect to shine more sympathetically than in co-operation with Nature's ecstasy of undulating shadows! Shadows opaque and translucent, velvety, liquid, polished, fathomless, flickering, dancing and dreaming—all ever responsive to the caress of light! Fountains, cascades and lakes, at present either ignored or disfigured by illumination, invoke the most dramatic developments.

Public parks, like street lighting, have scarcely entered the field of æsthetic endeavour, save through tiresome spotty effects of multi-coloured bulbs, which are used to outline arbours and pergolas, or are hung in lines of swaying specks around and above otherwise restful areas of water into which they project their speckled insistence ! In private gardens, illumination is scarce, and is considered either an intrusion or a luxury. Nature lovers often feel that artificial light is too garish, and under the prevalent methods of expression their objections are valid, yet will shortly be overcome by those engineers who have studied light in nature, and who will consequently be able to attune the new art to her subtle rhythms.

While visible and decorative lighting apparatus is to a certain extent unavoidable in public parks, its use is an obvious anomaly and vulgarity in private gardens, where emulating the magic of the glow-worm, fire-fly and moonbeam, light should merely ripple, pulse or gleam among the shadows, and never be too explicit ! Specialization and skill in the handling of colour is also a prime factor in this field, for when night merges all those chalices of flame, which we call flowers, into the depths of her dream, the illumined garden should only evoke the memory of their brilliance, by sudden radiance or dim diffusions of colour which emanate rather than project from the enfolding shadows.

Statuary, benches, rockeries, pergolas, urns, fountains, lakes and cascades, can all be built to

secrete the sources of luminance that guide us to chosen spots.

In this manner the density of shadows etherealized by light, becomes akin to the translucence of night and serves to accentuate the dramatic majesty of still waters or dark wind-swept trees !

The art of landscape gardening will be greatly enhanced, and more appreciated, when the sister art of illumination develops poetic specializations of light, which will harmonize with the mystery of growing things dimly seen under starlit skies ! The fountain can, and will, be one of the most important mediums for garden illumination, and even where this is not possible, bird-baths or other small ornamental areas of water can be used co-operatively with light. Gardens and parks reveal man's appreciation of the infinite, as expressed in the joy and peace of Earth. Time enriches the beauty of their growth, embroiders trees and stones with lichen and moss, while Light, like a high priest, chants to the swinging censers of flowers and seasons. In these Temples of Nature, the æsthetic engineer can give fuller rein to his imagination and create luminances full of invocation and dream !

CHAPTER XV

FOUNTAINS, CASCADES AND LAKES

The sands, the sea, are lost to sight,
But by reflection of a star
I know where the deep waters are !

THE fountain is a subject which deserves a volume to itself, and one that I hope to write at a later date. Meanwhile, let us consider it along with other fluid sources in relation to the art of illumination.

Water of any kind both intensifies and contrasts light, and is therefore a valuable asset in æsthetic engineering. Light gains in brilliance by combination with water, and at the same time the stimulating element in light is softened by the translucent element of water, the psychologic reaction to their combination being that of repose or refreshment according to the nature of the water and colours of light employed. New techniques are evolving in fountain structure by means of which water is taking on different rhythms, but the usual interpretations of the word fountain means an upward leaping mass of water, this joyous movement and music constituting its basic appeal. The fountain reveals its message in three words—beauty, renewal and rejoicing ! The music of fountains frees the

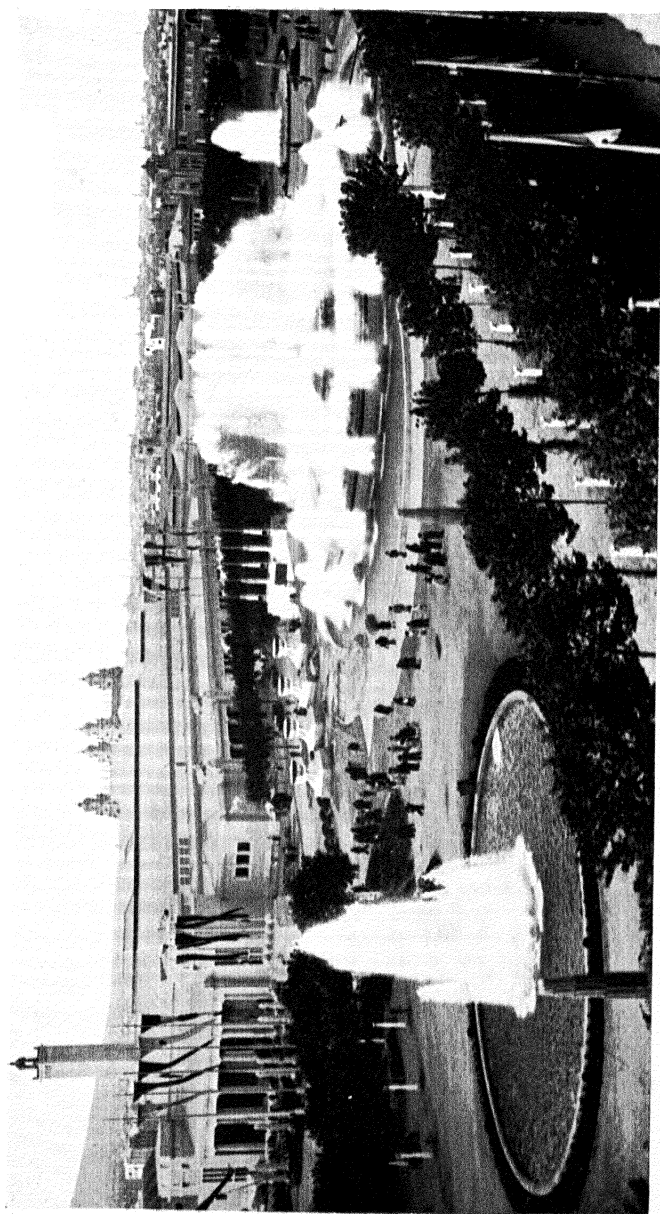
heart, invokes ease and mirth ; it contains the melody and spontaneity of youth and the magic of earth's immortality ! It bids hidden springs leap in us, and reminds us that life without leisure and laughter is an outrage against nature !

In spite of our critical materialism, the spirit of the fountain does obtain in modern life and its ardent enquiry into the finer forces of nature as contained in the element of air. Heat, light, electricity, wireless and aviation, with their capacities to expand and intensify consciousness, are they not all fountains of force and renewal ? Glowing tiles, marbles and concretes can all be brought to the co-operative aid of illumination in the building of fountains.

Let us have more fountains in our homes, gardens, schools, libraries, hospitals, ball-rooms and theatres, as well as in our parks and gardens, for wherever people congregate to rest and exchange thought, the music and brilliance of illumined fountains increases the joy of intercourse ! High-leaping fountains accentuate the stimulating values of light, and are suitably placed on hill-tops, in public squares, and among tall trees and high buildings. Wide-spraying fountains intensify the radiation of light, and are better placed among low-growing shrubs or large areas of flower-beds, also in hotel lounges and ball-rooms surrounded by ferns, palms, etc.

Flowing fountains increase the depth and penetration of light, and are suitable in hospital wards, living-rooms, libraries, halls, theatres, rockeries,

ferneries, and among broad-leaved tropical plants. In every case the mere movement and music of the fountain augments the dynamic values of light, and affords infinite possibilities for the skilful use of colour. Lakes, bird-baths or any surfaces of still water emphasize the concentration of light and its depth. Light either reflected in or diffused through such mediums gains in vibratory value and produces reactions of repose. In cascades we find the principle of fluctuation and the quality of coolness accented, especially if the water in the cascades is artificially "pulverized." The intermittent rhythms in such masses of water give glint and gleam to illumination, and cascades possibly have more spectacular value than either fountain or lake. However, we have only begun to explore the enchantments and utilities which the art of illumination can evolve through these factors, which will give fresh inspiration to the allied fields of architecture, sculpture, mechanics and engineering.



THE GRAND FOUNTAIN, DESIGNED BY CARLOS BUIGAS SANS
(COLOURED ILLUMINATION)

Barcelona International Exposition, Spain (1929-30).

CHAPTER XVI

THE HYGIENE AND ÆSTHETICS OF LIGHT

“ Beauty has its roots in the lives of those who express it.”

NANCY FULWOOD. *Song of Sano Tarot.*

WE have endeavoured in the preceding chapters to show how the whole field of exterior illumination is operating at the moment, and giving promise for further development in the architectural, decorative and dramatic values of light and colour ; and how a scientific fusion and understanding of these two elements, studied separately and co-operatively, can contribute to the growth of the new art, and to a more definite recognition of its importance by the general public.

In the domain of Interior Illumination, while not neglecting the values already discussed, it is essential to place the hygiene of light before any other consideration, to study this more in detail, and to plan lighting schemes that will contribute to eye-comfort and nervous relaxation. We live in an age of high and complex pressures that make unusual demands upon our mental and nervous resources, and for this reason we are becoming more careful and specialized in the adjustment of our surroundings. Light-therapy is now recognized and practised as one of the foremost and most

progressive branches of medical science, and in this connection the following paragraphs from "*The New Science of Colour*" are worth quoting because they have fulfilled their prophecy in so short a time :

" Colour cures are especially adapted to nervous and blood troubles because through the breath system colour acts directly upon the blood system and therefore indirectly upon the nervous system, though a few nervous centres are directly responsive to colour. Colour-healing cannot be called anything but empirical until it is based upon a mass of statistics collected from scientific observation condensed into scientific formulæ, but I believe that the chromatophilist, or certificated colour doctor, is by no means so remote a possibility."

Æsthetics and Scientific Illumination provide for the education as well as for the care of the eyes, which, like any other organ of the body, undergo development and physiologic changes. Excessive, insufficient, or ill-chosen colour illumination, produces tension and fatigue of the ciliary muscles which support the eye, and therefore they rob, for their work, nervous energy, which should be flowing comfortably along the great optic nerve, and swiftly conveying knowledge to our brain, of which the eye is in reality only a muscular outpost. It is evident therefore that all working conditions are rendered doubly hard by faulty illumination, and if the eye were not such a long-suffering organ we should be forcibly obliged to recognize this fact sooner than we usually do,

The specialized reading and working units of Colour Filter Illumination have carried on a strenuous and successful campaign in this connection, thanks to the demand of the public and the endorsement of progressive physicians and oculists whose co-operation is gratefully acknowledged !

Those physicians with whom I have been privileged to work in consultation, and whose references are contained in the Appendix, have fully proved the effects of coloured light on respiration, and on the equalization and stimulation of nervous energy, which facts have a definite bearing on general, as well as on medical illumination. It is therefore important for the æsthetic engineer to acquire fundamentals at least in light-therapy, if he is to operate creatively in interior illumination ; for an art that does not create well-being on all planes, is too superficial to meet the universal needs that illumination has to satisfy. The communal and educational trend of our day inclines us to spend much of our time in theatres, auditoriums, hotels, clubs, offices and shops ; so let us first consider this group of buildings.

The colour theatres to which so many pages of *The New Science of Colour* were dedicated, still retain their perspective on the horizon, but though distant, their possibility becomes daily more definite.

This fact is due to the efforts of many pioneers in the Colour Movement, and that means writers, painters, decorators, costumiers, theatrical managers, scene-painters, physicians, psychologists and illuminating engineers. We are a group that have

worked collectively in aim, though individually in method, toward the building of a new æsthetic outlook that is meeting the evolutionary need of our day. The co-operative spirit which is the essence of our age reflects itself in the increasing number of theatres, hotels, baths, clubs and libraries, which in our cities constitute the partial homes of masses of the population. It would be surprising to many if a census were taken of the people who spend hours daily in cinemas, clubs and the reading-rooms of public libraries, to say nothing of those who make their homes in hotels, so we may consider these buildings as communal homesteads, adding to our list stores and offices, in which another large section of the public passes the better portion of its life.

Let us briefly review the present standing of illumination in such conditions, for by so doing we shall glimpse the areas of corrective service that have to be covered. Auditoriums, theatres, hotels and clubs have been, and unfortunately are, more productive of abuses in illumination than any other buildings, and the example is all the worse because it affects the public at large and is destructive to health and good taste. Just to mention a few of the most obvious errors, we find a decided tendency towards glare, created by over-illumination and incorrect uses of colour, an excessive amount of red, yellow and orange being employed, and in some theatres an irritant, ever-changing spectrum of colour is operated throughout auditorium and proscenium. This competitive lighting between

different sections of the building, combined with a total disregard of shadow values, results in visual and nervous fatigue for the audience.

A complementary lighting service between proscenium and auditorium would be more desirable, so that in the *entr'actes* the audience might be refreshed rather than over-stimulated by light. Our optical attack, and appreciation of colour and light, become blunted and exhausted by monotony and excess, in the same way that our ear rejects a monotony or intensity of sound.

The "period" fixture is another source of faulty lighting, supplying in most cases ornamental metal effects rather than good illumination. Unfortunately the owners of theatres, auditoriums and hotels still labour innocently under the impression that appropriate decorative effects are only obtainable by such means, or by equally undesirable shades, befringed and bespattered with fatiguing designs that obscure and distort light. It is needless to add that all shades do not come under this category. The general indication for progress however, is that scientific lighting fixtures (along the lines discussed in a previous chapter) should replace "period" styles; that glare should be avoided by the balancing of shadow with light, and that colour should be used in moderation and with expert knowledge rather than with ignorant excess or purely decorative appeal. Another important angle of evolution lies in a more integral co-operation of light with structure, and this is where architect and engineer can, and should, confer

more intelligently than hitherto. In the blue-print stage of buildings, the planning of pillars, panels, niches, ceilings and fountains could all be made mechanically more co-operative with light.

How often one finds it impossible to carry out beautiful and desirable schemes, owing to the obstructive limitations of architecture, wiring and substances like cement, etc., which have all been given their due, before illumination and the lighting engineer have even come under consideration. Incidentally, an increased use of illumined fountains would be a great asset in theatres, auditoriums and clubs, on account of the decorative lighting values which they can accent so happily !

The Modern Movement in theatrical art inspired by the original vision of Gordon Craig, has advanced logically from his pure conceptions of form to an accompanying preoccupation with the subtleties of colour and light, so that some of the best modern productions have much to teach us, and their illumination is usually far in advance of the lighting of their auditoriums. If the architecture of theatres had advanced as rapidly as scenic art, its illumination would be a simpler and more grateful task. The few progressed buildings already available can be used to frame the new art of illumination until we arrive at those colour theatres of the future, in which we shall find "pale marbles relieved with onyx, ebony and granite, devoid of gilding or ornament, save that afforded by luminous fretworks of bronze, aluminium and alabaster, and an æsthetic disposition of coloured lights, whose



DR. W. A. MARTISUS, D.O., READING BY "TOWER" FILTER LIGHT IN HIS CLINIC OFFICE,
PARK LANE, LONDON, W.

reflections will play on cornices that are too hard or shadows that are too heavy." (*The New Science of Colour*, Ch. XII.)

Fortunately, light mono-tinted walls are growingly used in public rooms and buildings where their value is great in producing an impression of space, and affording reflective surfaces which co-operate economically and æsthetically with illumination. Dark reds, greens, browns or blues should always be avoided in the mural treatment of public gathering-places of large dimensions. In libraries and clubs a great deal more attention is needed in providing specialized portable lights for reading service, and a far more discriminating use of shadow and mural effect is also desirable. In one of the reading-rooms of a California library, a lighting scheme is effected by means of fixtures similar to street lamps, resulting in such an irritant brilliance that concentration is difficult, and 80 per cent of the readers sit shading their eyes with their hands, or constantly looking up and down from their books. Such a condition could be remedied by a scientific use of the spectrum in small filter fixtures, that would provide a maximum diffusion on reading areas with a minimum diffusion of light in the body of the room, thus rendering it shadowy and conducive to study and repose.

In the Filter Service of Illumination I have found that specialized blues, greens and yellows, scientifically proportioned with other colours, produce a comprehensive lighting service which meets the requirements of various eyes.

In offices and shops visual and economic needs claim our first attention, and decorative effect should be our last, though not our least, consideration.

Here again, clear pale-tinted walls are profitable and protective, and co-operative with illumination. In America, public baths have become such a factor for health and recreation that they must also be included in our discussion of communal buildings. Swimming, thermal and Turkish baths are all more or less crudely and uncomfortably illumined, and call loudly for a corrective campaign.

Cove-lighting, combined with blue, green or violet colour values, is most appropriate for swimming-pools. In thermal and Turkish baths, soft yellow or green illumination of low intensity can be generally recommended. Reading is best discouraged under these conditions, as it interferes with the physical activities of the bath ; therefore dim light is appropriate. Illumined fountains could also be introduced, combining a drinking and lighting service, and they would form a novel decorative feature in such establishments.

In stores, offices and factories we meet situations which may demand general or specialized efficiency in illumination according to the work in progress.

By specialized efficiency, I mean coloured illumination, scientifically adjusted to the needs of the workers, as, for instance, in glass or metal foundries, or in drafting-rooms, etc. In the former case, the eyes being subjected to the heat and glare of fire and molten material, should be eased by the use

of coloured glasses and by blue or green Filter Light.

In architectural or clerical work, blue or yellow filter illumination is best. In both cases, the filter cuts off a certain amount of heat, as well as the glare of direct light. The use of shades and reflectors only intensifies light on the working surface, and eventually proves a fatigue factor, as it is the quality rather than the quantity of light absorbed by the eye that aids endurance. Though the lighting of factories has not come within the technical field of my practice, visits of inspection and observation to weaving, dyeing, lamp, glass, metal and fixture factories, etc., has convinced me that a wide field for humanitarian progress lies in this direction, and that better efforts of colour expert and engineer are awaited by those masses of humanity whose eyes are overtaxed in public service. In alleviating the conditions of monotonous strain which such occupations entail, the scientific and psychologic application of colour to light and to wall surfaces is of essential importance, and should be placed in the hands of really skilled advisers.

CHAPTER XVII

MUSEUMS, ART GALLERIES, ARCHÆOLOGICAL RUINS, ETC.

“ Let the specimen suffice to those who have ears, for it is not required to unfold the mystery, but only to indicate what is sufficient.”

SAINT CLEMENT OF ALEXANDRIA.

THE great bequests of Science and Art that are housed in our museums and galleries, preserve for us the marvels of nature and the culture of the ages, and are the means of recreation and education to masses who have neither the time nor the means to study and travel. Visits to such buildings prove that they are frequented mostly by tourists and working people. Owing to their size and the complex purpose and number of their exhibits, museums and galleries are exacting and fatiguing in their physical and æsthetic demands, and the welfare of the public could be increased by the use of more specialized lighting systems than are at present prevalent in such institutions. Such installations need not be more costly, but more skilled in their method and disposition. It is true that the majority visit museums and galleries during the day; still, it is becoming more customary to keep the doors open on certain evenings, as it has been found that this proves very attractive

to the professional and working classes. In America, short free musical programmes are added to these evening sessions, and after enjoying the harmonizing influence of the music, the public is better fitted to appreciate all that the gallery has to offer of wonder and beauty. In the illumination of galleries and museums, the main problem is the æsthetic lighting of such diverse exhibits as painting, sculpture, stuffed animals and marbles or cements, jewellery, manuscripts, tapestries, etc., and to bring out the characteristic values in each of these by correct illumination is no small achievement. It is equally important that the general illumination be flattering to the materials of the building, as well as to its contents, and therefore the artist engineer considers first the colours and qualities of his areas, whether they be developed in pale cements, dark marble columns, draped or stained walls, etc. Secondly, he must meet the specialized requirements of the exhibits.

An extensive study of sculpture, and many intimate conversations with the late Auguste Rodin and other noted sculptors, has inclined me to the belief that the movement rather than the outline of sculpture should be revealed and accented by illumination, for this is the rhythm and soul of the work.

In plotting light schemes for paintings and tapestries, their dominant colour values should determine the quality of our service. If these are in sedative or recuperative values of reds, oranges, yellows or greens, either indirect white light or

specialized yellow or green semi-direct filter light can be employed with success ; but if blues, pale greens, violets and greys predominate, indirect blue daylight or semi-direct blue-green or violet filter light produce the best results. In lighting both public and private collections, it is advisable, as far as possible, to group the objects in certain ranges of colour value. In art galleries and expositions this becomes an interesting problem for colour expert and engineer, as it offers an opportunity for harmonizing the new art of illumination with all the other arts expressed. I have found the solving of such problems among the most difficult yet stimulating experiences of my practice. Many new angles of operation and mechanical invention await development in this connection.

Unfortunately tradition is very rigid in this field, and rears its obstacles against us in the shape of direct white light intensified by reflectors set in horizontal lines, which is the accepted and prevalent method of lighting pictures.

A careful study of the results thus produced convinces me that we can graduate from white light and the horizontal line with advantage ; using them, not exclusively, but as occasion demands, and expanding our expression in the direction of scientifically filtered colour illumination, diffused rather than concentrated in quality, for concentration usually produces hard high lights in backgrounds, and leaves the delicate and more important colour values of the foreground in a comparatively dull obscurity. Reflectors generate

an intensity of light, flat in character, and destructive of that subtle element of "atmosphere," which is as much the soul of art, as perfume is of the flower !

We have also to learn the economic and æsthetic possibilities of the perpendicular line in the mechanics of art illumination. Experience has proved to me that in lighting single masterpieces, or even cases of arts and crafts, or natural history, that perpendicular portable units have much to teach us, both as regards economy of current and quality in service.

The satisfaction given by experiments with perpendicular portables justifies further exploration. Under no conditions should we have uniform lighting in galleries and museums, because it cannot possibly meet the varied æsthetic requirements of the exhibits ; also it proves a visual fatigue factor.

Variation of intensity and colour in illumination are valuable restoratives to the eye and the mind, as they "accommodate" themselves with rapid flexibility to diverse observations. For purposes of relaxation, illumined fountains could be included with great advantage in museums and galleries. They might be situated in central positions, wherever space was most conveniently available, and around them benches could be placed, and the weary sight-seers could seek their comfort as an oasis of repose from which he would proceed refreshed upon his pilgrimage !

I believe such fountains would add materially to the attendance in public galleries, and I hope that

this suggestion will receive the executive attention of architects and engineers.

Another interesting, and as far as I know, untouched field for the artist engineer, lies in the sympathetic illumination of archæological ruins ! How many bitter complaints on this score have been heard from travellers in Egypt and other countries ; and I shall never forget how my first visit to the Colosseum in Rome was spoiled by the crude and inefficient illumination which projected itself with discordant intensity against the dim splendour of moonlit skies, and the crumbling shadows of the ancient stones ! Surely State appropriations might be made for a more dignified illumination of the great historic shrines of the world ? No true traveller or lover of art would object to paying his share of the taxation necessary to meet this situation, and to enable him to better enjoy those mysteries of the past that constitute the charm and meaning of travel ! Many interesting ruins owing to their structure require illumination even by day, as, for instance, that remarkable catacomb in Algiers, "Le Tombeau de la Chretienne," whose origin remains a challenge, and whose underground cloisters, with their finely tessellated arches, compare favourably with the best efforts in modern architecture and engineering. In the winding passages there are small niches, rhythmically spaced, which could be utilized to produce a much more beautiful and efficient illumination than is now in operation. I quote this mystery temple of the past out of many

examples, as it is probably one of the most perfect and baffling records that Time has left us, though it is unknown to the average tourist. The main points to consider in archæological illumination are the diffusion of light from appropriate angles ; preservation of the dramatic value of shadows, not letting their depth obscure architectural beauties.

Another important item is the creation of qualities and concentrations of light that would accent the colour value of stone and marbles, and the significance of frescoes, inscriptions and carvings. What an enchanting field of mutual education lies ahead for those engineers and archæologists who will co-operate in the achievement of this interesting service, which will contribute so much to public taste and to progress in the æsthetics of illumination. Officially, the temples of Greece and Egypt and the palaces of India and Persia may be national property, but æsthetically and spiritually their sympathetic illumination is a matter of international importance and universal responsibility.

CHAPTER XVIII

CHURCHES, CHAPELS AND MASONIC TEMPLES

“ Your daily life is your Temple,
When you enter it, take with you your all.”

KAHLIL GIBRAN. *The Prophet.*

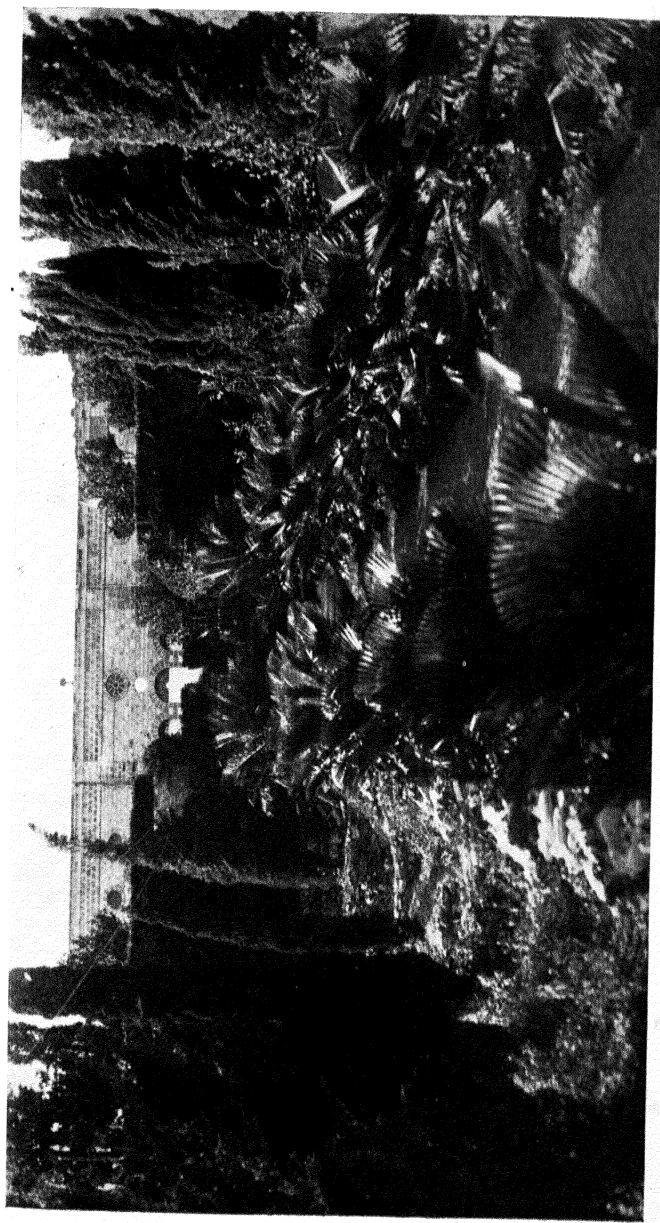
IN spite of its highly specialized activities, modern life is struggling back to the synthetic consciousness of the Ancients who, by living closer to nature, realized that Religion, Science and Art are only human modes of expressing cosmic consciousness. Therefore, in the great civilizations of Egypt, Greece, India and Rome, these expressions permeated rather than adorned life, a fact which is corroborated by the sculpture paintings and literature of those epochs.

We find the representations of the Gods and temple ceremonies sculptured in fountains, in agoras, and in coliseums, and in many a ruin there are graven records of harvest festivals, victorious battles and triumphal dances ! In those days man's kinship with the finer forces of nature rendered his conception of life more cosmic and unified, though less complex and outwardly varied. The astonishing progress and discoveries of modern astronomy, and the developments in aviation referred to in previous chapters, are

leading us up to a cosmic consciousness of perhaps even greater depth than the Ancients knew. In this march we are hampered somewhat by the industrialism of great cities and mechanical science and manufacture, which all induce competitive and intellectual, rather than co-operative and æsthetic perception. As a result of this condition, Occidental civilization has become more or less of a calculating machine, regardless of the great reservoirs of Nature, whose forces in reality dominate action and evolution. We are inclined to work, play, swear or pray, intensively, and in watertight compartments, detaching our activities and forgetting that life connects all invisibly, even as the thread that runs through a necklace. In the West, we do not consider religion as an integral part of life, probably because our scientific education makes it impossible for us to accept reasonably the dogmatic theories or orthodoxies which narrow men's thirst for the infinite down to their own particular measurements. The message of the Bahai Revelation which came through the Persian prophet Baha'ullah (1866) is most in keeping with our modern outlook, since its fundamentals enjoin the union of Religion with science, universal religious tolerance, international parliaments and the absolute equality of men and women.

The general transformation which religious outlook is undergoing is reflected even in the equipment of churches and shrines, whose illumination and fixtures are often too secular in character to be even dignified. Ornamental chandeliers, though

constantly used, are obviously out of place, and whenever possible cove or niche lighting should be used in preference to fixtures, unless these are specially and symbolically designed, and most carefully and sparingly used. Colour in such illumination should also have symbolic as well as scientific value. In Masonic Temples, or Lodge Rooms, where illumination plays an even more ceremonial part than in churches, the quality and graduation of light is very important, and the supporting fixtures should follow the lines of masonic symbolism rather than of decorative effect. In such buildings I have employed Pylon and columnar units of Filter light varying from 3 to 9 and 11 feet, finding that the maximum area of diffused light combined with the minimum number of outlets always produces the most restful atmosphere, and a spacious effect which is akin to the starry vault of "That Temple not made by human hands," under whose dome we can all draw nearer to Truth, freed from ceremonial, save the beating of our own hearts, as they respond to those wondrous tides of light that we call night and day, spring, summer, autumn and winter !



BAHAI SHRINES AND GARDENS, HAIFA, PALESTINE (MOUNT CARMEL)
THE "BAB" (1850) AND ABDUL-BAHA (1921)
Flood and Filter lighted by Beatrice Irwin, April 1930.

CHAPTER XIX

HOSPITALS, ASYLUMS, PRISONS, REFORMATORIES, ETC.

“Disasters of all kinds, sickness, offence, poverty, prove benefactors ! Our strength grows out of our weakness.”

EMERSON.

IT is rather a sad comment on civilization, especially on city life, that such masses of humanity inhabit hospitals, asylums, prisons and reformatories ! One can't help wondering sometimes if it is owing to the limitations of science and education, or to their maladministration, or to the growing pressure of life that the cause of all this weight and suffering is due ? Even though the fine equipment and increasingly humanitarian conduct of such buildings leaves less and less to be desired, still they cast their solid shadows in our midst, invoking every effort to the alleviation of their gloom. Here is a field in which an artist engineer can give the hygiene and psychology of light pre-eminence, bringing all his knowledge of light and colour-therapy to bear constructively on human ills. Medical science has proved that the human organism is as sensitive to light as the animal and vegetable kingdoms, and modern therapy is

placing coloured-light treatment very high in its research and application.

The disastrous dregs of the world war, as embodied in shell-shock, insomnia and other nervous troubles, has revealed the fact that light of various colours readjusted these nervous disorders where all else failed, and this not only by means of definite treatment through specialized ultra-violet, arc or infra-red units, but also through a continuous environment of scientifically balanced colour illumination. In this connection the Colour Filter service has been widely tested (*vide* Appendix) and found definitely corrective in cases of shell-shock, eye-strain, insomnia, irritability, loss of memory, arthritis and high and low blood pressure. Bedside reading units of Filter light have proved friends to many despondent cases. These facts are merely recorded to stress the practical importance of a scientific use of colour in illumination, and the need for all artist engineers to include a course of light and colour-therapy in their education.

There is no place where people complain more of irritant and faulty illumination than in hospitals or where individuals are more grateful for the constructive and healing offices of light. Blue or green or yellow light, not mono-tinted, but combined with appropriate proportions of other colours, is generally most suitable in hospital wards and for bedside reading units; while orange, violet or delicate rose is more desirable in convalescent and depressed conditions.

Broadly speaking, these suggestions would also

hold good for asylums, reformatories and prisons, though in the last named green light should predominate. In such institutes the colour scheme of walls and illumination should be planned simultaneously and co-operatively. A more scientific and abundant use of colour should be actively developed in mural treatments, for since the war, in many hospitals and in the best clinics, the psycho-physiologic benefits resulting from correct colour environments have been proved of vital importance. In asylums and prisons, where the obscure diseases of mind and soul which are the mainspring of lunacy and crime remain for the most part in undisturbed stagnation, a great campaign awaits philanthropic engineers and colour specialists ; for here, like silent handmaidens, Light and Colour can minister slowly but surely, as they do in nature, without words or condemnation, working miracles of cleansing and readjustment in body, mind and soul.

CHAPTER XX

SCHOOLS AND COLLEGES. EYE-CULTURE

“ Go, speed the stars of Thought
On to their destined goal. . . .”

EMERSON.

IF we pause to think of it, how many kinds of light there are—celestial, terrestrial, animal, vegetable, mineral and human, for the light of the mind is the most subtle, steadfast and magical light available in our midst; capable of every rhythm, expansion, contraction, diffusion, concentration, reflection; iridescent in its possibilities, profound in its penetration and susceptible of development and control—such is the Aladdin’s lamp or portable unit that each one of us owns!

This priceless possession, however, has its exactions, among the foremost of these being the care and training of the eye, which, as we know, is but the muscular outpost of the brain. An interesting proof of this is furnished by Dr. Bates of New York, who tells us in one of his books that many of his tests have shown that when people lie, definite changes of accommodation occur in the eye. My own experience has proved that the eye in healthy persons is quickly responsive to protective and corrective illumination, and that specialized colour

values aid endurance and efficiency. Statistics show that there is an alarming increase in the use of glasses among students and professors, and this is not to be wondered at considering the casual attention given to the lighting installation in most schools and colleges. Here, as in many other buildings, inadequate appropriation for illumination is often the cause of the trouble. In view of the human toll exacted, drastic changes should be forthcoming. The principal errors in the lighting of educational buildings are the unsuitable position of outlets, with a resulting lack of diffusion of light, over-illumination of class-rooms and lecture-halls, lack of specialized light in preparation rooms, faulty choice of colours in ceilings and walls, combined with disregard of æsthetic effect and shadow values. When the health claims of the eye are better understood, these errors will be righted ; and the initial cost of an illuminating expert's advisory scheme will be considered essential.

In large class-rooms and lecture-halls the relief of shadow can be supplied by dark fixtures, or even mural panels, and in smaller rooms by gradations of intensity in the lighting scheme. In lecture-halls, the minimum number of overhead units providing a maximum of diffusion, results in a cool, restful atmosphere. If colour is employed, it must be scientifically adjusted to the area, walls and ceiling.

On general principles, and given backgrounds of a light tint which afford high coefficients of

reflection, blue, green or yellow light are most suitable in educational buildings. The same may be said of studies where desk lights are needed, but whenever possible such units should be equipped with dimming devices, so that the student can regulate the intensity to suit his needs and the nature of his work.

In recreation or reception rooms recuperative rose or orange light affords the necessary physiologic reactions. The comfort and increased efficiency of teachers and students have been proved under such conditions.

If carefully schemed installations in schools and colleges were the rule rather than the exception, the public would begin to recognize the importance of illumination as an imperative aid to health. Again, one must express a hope in the interests of general welfare, that definite standards and diplomas might be demanded of artist engineers and colour experts, so that with more skilled hands they would uplift the torch of progress in the halls of learning, where it should logically receive its quickest and fullest recognition.

CHAPTER XXI

HOMES

HOW TO PLAN A COLOUR SCHEME

“ Your house is your larger body.”

KHALIL GIBRAN. *The Prophet.*

IF only homes could be like nests, sequestered, yet free of access to cosmic communication, sheltered from the winds of the world, yet ventilated by their invigorating strength, and ever embowered in a verdure of thought, then homes would recreate life in the likeness of nature, and expand our hearts to lyric gladness.

The discussion of home lighting has purposely been reserved as the final problem of the artist engineer, for here he must bring his psycho-physiologic observation to bear upon his technical skill and æsthetic preferences ! He cannot, as in public buildings, plan his scheme upon general principles of hygiene and beauty, but giving these due consideration, he has also to ascertain the individual needs and tastes of his clients, and to compromise these with the requirements of his art.

Home lighting is one of the most difficult and important tests in an engineering career, for unless

the true standards of health and beauty are maintained, even if necessary at a cost of argument and financial loss, the art of illumination cannot progress. Every installation built to humour the ignorance of the public, and in contradiction of an engineer's best judgment, is in reality a betrayal of communal welfare and delays the development of the new art.

I have lighted many homes in different lands, and the encounter with national as well as individual prejudices has been arduous but educational. There is nothing that people know less about, technically and creatively, than Colour and Light, yet there are no subjects on which they are more sentimental and didactic. As a last resource I have sometimes allowed argumentative clients to educate themselves by following out their own ideas, and had them later return and request me to correct them according to the colour and lighting schemes originally proposed! These, providing better results, the doubters were finally convinced that there is a definite science in handling colour, and a subtle art involved in illumination. Fortunately a growing movement is afoot for the development of beauty in our surroundings, and the actual economic values of beauty as a stimulating human factor are becoming universally recognized. Annual "Own your Home" and "Model Electric Home" Expositions have advanced the cause of Colour and Light considerably, and are creating a more co-operative understanding between architects, builders, decorators, illuminating engineers

and all the other craftsmen concerned in residence construction. The word "home" includes many types of building; mansions, houses, apartments, studies and even single rooms, but in essence all these are united by the common denomination of a dwelling that is supposedly dedicated to private relationships, and to rest and joy.

These at least are the ideal elements of a home, which, like all other structures, has its physiology and its psychology, capable of speech alike, in a single room or a mansion, for the home is the centre of self-expression; an organic creation, or, if not organic, then it is only a building, but not a "home"! Therefore, while maintaining the integrity of his art, the engineer has also to satisfy the individual needs of the home-builder.

Shortly after the publication of *The New Science of Colour*, one of New York's most distinguished decorators said to me: "This book solves a problem that has long puzzled me, namely that some of my favourite colour combinations became highly irritant to clients after a few months' use, whereas if I had known more about the psycho-physiologic values of colour this difficulty might have been avoided."

Once convinced of the fact that Colour and Light yield us definite reactions, physical, mental and spiritual, we become aware that we are sensitive receivers, and we begin to engineer these powerful factors with a careful and constructive skill in our surroundings, endeavouring to make our personal taste coincide with the advice of

scientific experts, whose knowledge can expand our vision and create new pleasures and perceptions for us.

There are many channels through which large homes can express colour scientifically, but even one room may do so through the universal and essential medium of light, whose silent enchantments are sometimes even more appreciable in a simple and austere setting !

In every home, no matter how small, it is important to provide variety in colour and light by means of at least one overhead and one portable unit, which give scope for alternating intensities and colour schemes. In larger houses, colour and light should be plotted as a co-operative whole, so that the rooms have a definite colour ratio and correspondence with each other, thus providing the healthy changes of co-related vibrations and reflexes that we find in nature, where, under normal conditions, we are daily led through a subtle progression of light and colour values that escape the notice of the unobservant, save through the general sense of refreshment that they induce.

A monotony of colour values either in mural or lighting effects is destructive in many ways, and therefore to be avoided, and the mixing of different qualities of light in a room is also a strain on the eyes, and an error in taste. In home lighting, our first decision should be the method which we consider best adapted to our different areas. To these we can give the suggestion of expansion, contraction or depth, according to our choice of

colour values and mechanical operation. As it is so seldom desirable, we shall exclude direct light from this discussion, and that leaves us with indirect, semi-direct, reflected, shaded, spot and Filter light to choose from. It is advisable (personal and technical limitations permitting) to adopt a uniform style of illumination throughout a building, e.g. either indirect, filter, or whatever is most universally suitable, though this need not prevent the occasional use of a semi-direct or reflector unit, to meet some special need which they alone can fill. The variety afforded by different colour values in overhead and portable units is sufficient without adding diversities of *method* which are like two people speaking different languages at once, giving confused results in illumination destructive of taste and a sensitive response to light.

Speaking broadly and from the angle of atmosphere, indirect light creates an impression of loftiness in a room, semi-direct of width, reflector and shade give dramatic variety, and filter light embodies all these values, adding to them a decided increase of depth. By utilizing any one of these methods we can expand, contract or deepen the values of our areas. Our second step is the choice of fixture. This should be selected in reference to our lighting methods, proportion of rooms and mural colour values, and never, as is often the case, merely on account of its individual decorative appeal and without reference to lighting efficiency or the complementary demands of our room. Only when such installations are in operation does their

incongruity dawn on us with an appalling insistence, and then it is probably too costly to make the needed change. Let the artist engineer therefore beware of recommending any scheme until he is furnished with all the details that his work will have to illumine, viz. besides the architectural areas, he should be advised of the colour values in walls, woodwork and textiles, and also have a general idea of the nature of plants or works of art that are liable to be included in each room.

Cut crystal or steel, or any highly polished metals, create a competitive brilliance with light, and large chandeliers of such a nature which are rapidly going out of style should never be used in square or low-ceilinged rooms.

Heavily wrought antique lanterns, which people often acquire in their travels and then want to use in the home, may be beautiful in themselves and suitable to the light for which they were originally created, but they are only grotesque and inefficient combined with electric light and modern furniture. I have often been asked to adapt Filter light to such units and have had hard work to explain the futility of any such attempt. Another very prevalent æsthetic error is the use of a number and variety of wall brackets combined with shaded floor lamps, the result produced being a fitful diffusion whose spotty effects make a masquerade of illumination. Such methods employed in small rooms, under the mistaken impression that they will supplement otherwise meagre decorations, only accentuate the limitations that they endeavour to hide. Other

minor abuses in home illumination are the use of period fixtures in country bungalows, and the combination of shades with antique Oriental pottery, exquisite in itself, but originally designed to hold wine, oil or flowers, and therefore in its very outline unsuitable as a container or frame for light. Such combinations are æsthetically puerile, vulgar and inappropriate to the new art of illumination in which correct engineering principles and a comprehensive understanding of colour and light will always prove trustworthy guides in the creation and choice of fixtures.

If diffused white light is preferred, we shall adopt the semi-direct method, combined with ground glass bowls ; if sharp contrasts of light and shadow are desired, we shall utilize lamps and shades ; if aerial and unobtrusive effects, then indirect or cove-lighting should be our choice, but if we want illumination to be a varied intimate and specialized factor for health and beauty in our surroundings, then Colour Filter Illumination will be our choice. Illumination in the home should produce repose and joy, which results can best be secured by subordinating all ornamental values, historical, decorative and metallic, to the operative enchantment of light itself.

The development of this recreative enchantment is more urgent in the home than in any other place, so that in a sense the home is both a starting-point and a goal to the artist engineer ; a laboratory for experiment and a stadium of achievement !

When the new art of illumination gains a broader

basis and more stable public support, endless surprises and pleasures will be evolved for us. Exquisite niches, invisibly illumined, and columns and panels of delicately tinted translucence will enrich our homes, reproducing nature's fluctuating

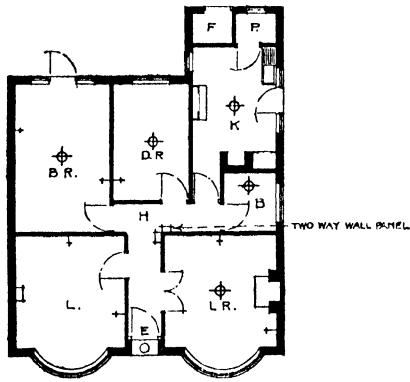
LIGHTING UNITS

- ENTRANCE LANTERN COMBINED WITH GLASS
- 2 HALL TWO-WAY WALL PANEL COMBINED WITH GLASS
- 3 LOUNGE A 'ORIENTALE' WALL BRACKET.
B 'TOWER' PORTABLE.
- 4 LIVING ROOM 'OCTAGON' OVERHEAD
'DRUM 60' PORTABLE.
- 5 BEDROOM. A 'MANDARIN' OVERHEAD
B 'TOWER' PORTABLE.
- 6 DRESSING ROOM 'PIERETTE' OVERHEAD
'NUBIS' PORTABLE.
- 7 BATHROOM. CEILING PANEL COMBINED WITH GLASS.
- 8 KITCHEN 'MANDARIN' OVERHEAD.

COLOUR COMBINATIONS FOR FILTERS,

- 1 GREEN ORANGE, AZURE.
- 2 BROWN, ROSE GOLD
- 3. A PURPLE, PEACH, NILE GREEN,
B GREEN BLUE, GOLD.
- 4 A BROWN, GREEN, GOLD.
B PURPLE, ORANGE, AZURE.
- 5 A SAPPHIRE, ROSE, AZURE.
B PURPLE NILE GREEN ROSE.
- 6 A PURPLE, GOLD, ROSE.
B GREEN, AZURE, GOLD.
- 7. PURPLE, GREEN, GOLD
- 8 BROWN, BLUE, GOLD

- E. ENTRANCE
- H HALL
- L LOUNGE,
- L.R LIVING ROOM.
- B.R BEDROOM.
- D.R DRESSING ROOM
- B BATH ROOM
- K KITCHEN
- F FUEL,
- P PANTRY.



PLAN

- ⊕ OVERHEAD LIGHTS
- PLUGS.
- ┌ WALL BRACKET

W R HINDMARSH AND CO
ARCHITECTS.
ELTHAM S.E.5.

mysteries of light. Illumined fountains, large and small, will be more used, and their sparkling radiance and delicate music will help to free us from many futile worries and self-imposed cares, making us partners in that larger life of which they are symbols.

In illustration of the suggestions contained in

this chapter, we submit a colour and lighting scheme suitable for a small home (house or apartment) furnished in modern style. It is always desirable if possible that the engineer, and not the decorator, plan the mural colour scheme, for by doing so he knows his coefficients of reflection and the quality of areas to be illumined, and can then determine better the most suitable positions for wiring and outlets. The present custom of plotting these specifications only from blue prints, and ignorant of the colour values to be used in walls, etc., is productive of much faulty wiring and poor illumination, as the coefficient of reflection in walls and ceilings play such an important part in the efficiency of lighting. The problem presented in the home under discussion is one of broad areas and windows, combined with smooth surfaces. Therefore we will plan our colour and lighting scheme to unite in harmonizing with these conditions, and the method chosen will be the Colour Filter System of Illumination.

CHAPTER XXII

FILTER ILLUMINATION

SCIENCE has proved that the human organism is as sensitive to light as either the vegetable or animal kingdom. In nature both these kingdoms derive benefit from light chiefly owing to its constant changes, its mobility; therefore plants and animals are never too long exposed to any undue intensity of vibration. Primitive man shared these benefits, enjoying all the rhythmic fluctuations of light from sunrise to moonrise, as it filtered its message through the veils of moisture that fill the atmosphere, and through the screens of verdure and many-coloured objects that adorn the earth.

Civilization has induced man to create homes and buildings into which he has introduced, by a process of selective elimination and refinement, all that is best in nature; and Light, being man's most fundamental requirement, he has adapted it, discovered and combined its properties and adjusted them to his needs. Man has advanced from the use of wood, from the camp-fire, the torch and the rush-light, to coal, gas, oil and electricity, always through these mediums, refining and intensifying light. Perhaps he has reached the limit of intensification possible or even desirable?

The multiple evolution of high-power lamps, and the various devices developed for the betterment of illumination, bring us to that dangerous point at which efficiency may exceed and lapse into exaggeration. Whether this point has or has not been passed is a matter of debate, but it is obvious that we have entered a period of specialization in light which will affect human life, education and industry more profoundly than most people could believe possible at the moment.

In the beginning of this volume we spoke of Colour as the magic wand of light, and we have endeavoured to draw the reader's attention to the fact that there are very few problems in illumination to which this wand cannot be applied with advantage. In view of this fact and conviction, it is without hesitation that the system of Colour Filter Illumination is now presented for discussion.

The writer does not consider her contribution of this invention to Illuminating Engineering in any other sense than that of an impersonal service, which was born of the necessity to make practical applications of the light and colour theories contained in *The New Science of Colour*. Findings that had served the few in new and unusual ways, cried for a wider field of activity, and owing to this fact Filter Illumination came into existence. The writer had hitherto been occupied only with experimental research and literary work ; therefore the creation of suitable models through which to express Colour and Light in equal efficiency

involved a new departure and specialized study. Materials and designs had to be selected with a view to presenting radiant Colour as a dynamic factor of Light, and with the definite purpose of proving that a scientific application of Colour to Light could produce a finer and more protective method of illumination.

About nine months were devoted to experimentation with various media—glass, silks, linens, parchment-papers, and all kinds of pigments were put to the test. Finally a hand-made parchment paper was selected because it provided the best surface on which to express an unlimited and powerful range of sedative, recuperative and stimulant colour values, and also because in operation it proved itself the best diffusing and the most durable and cleanly medium. The colours used were the result of the writer's mixture of different uncompounded ingredients, as the ready-made pigments available did not produce the vibratory colour values required. The additional working out of fixative and fireproofing processes completed the fundamentals necessary to the practical life of the Filter. Then it remained to be seen in what way the Filters could embody the three working principles of light in nature, and experimentation led to the following devices.

To develop the principle of *diffusion* combined with delicate colour values, a series of semi-direct overhead filters were constructed in the forms of octagons, hexagons and inverted cones similar in shape to a Chinaman's hat and therefore christened

“Mandarin.” At a later date “Monoplane,” a horizontal filter, and “Zephyr,” a perpendicular filter were evolved to complete the overhead series and to meet the lighting requirements of schools, hospitals, large showrooms, workrooms, homes, hotels, etc.

The principle of *Concentration* combined with powerful and specialized colour values has been achieved through columnar Filters varying from 1 to 6 or 8 feet in height, which are set in light portable stands of either lacquered or stained woods, pottery or metal.

These stands are purposely simple yet classic in line, being intended to serve rather as rhythmic bases of shadow affording a relief to the vital radiance of the Filter, than as decorative supports claiming any independent attention for themselves. In every case the size of the stand and the weight of its shadow are carefully proportioned to the amount and intensity of light and colour that it carries. Finally a dim-a-lite is attached by means of which intensity can be gradually developed from a mere gleam to an illumination adequate for the entire room. In this manner, a stand provided with two or three changes of filter represents a miniature and flexible lighting system, a person can obtain various illuminations suitable for specialized work or decorative effect, or for curative conditions in case of insomnia and other nervous troubles.

Overhead and portable Filters are designed to complement each other in a lighting scheme, the

former giving a general and the latter a specialized illumination.

The Filters are based on the chart in *The New Science of Colour*, and present *affective Colours combined in specific proportions*, the dominant colour value classifying the filter as sedative, recuperative or stimulant. The Filters are so called because they *filter light through radiant colour surfaces*, adjusting the quality of light to the need of the consumer by methods similar to those employed in nature, namely by varying the intensity of light at its source, and by interposing screens of Colour between a light source and the human eye. In order to encourage the public to a more individual consideration of light, the portable units of Colour Filter Illumination have been christened as carefully as flowers or books, and are as follows :

“Orientale,” “The Drum,” “Nubis” and “Tower.” The aims of Filter light are as follows :

1. To provide a better quality of light.
2. To rest and educate the eye.
3. Through the eye to economize and repair nervous energy by employing Colours which operate actively on the nervous system along chosen lines.
4. To emphasize the need for the beauty of semi-direct diffused light, allied to mellow shadows.
5. To afford a medium for the scientific and organized co-operation of Colour with Illumination.

6. To create Colour statements in our homes that have scientific and hygienic as well as æsthetic value.

Like silent handmaidens these structures stand ready to reveal to us all that in their limited scope they can embody of the physical, mental and metaphysical messages of Colour. They are but small syllables in a language of light whose development and full articulation lies in the heart of the public and in the hands of the artist engineers.

To these sympathetic co-operators Filter Illumination already owes a warm debt of gratitude as a reference to its record in the Appendix will show. This debt it is a pioneer's privilege to acknowledge here, with sincerity, humility, and a great hope for rapid expansion along the lines discussed in this volume.

CHAPTER XXIII

FILTER ILLUMINATION AS AN EDUCATOR

PHYSIOLOGICALLY and psychologically the eye is only an outpost or sentinel of the brain, and when we have gained a practical appreciation of this fact we shall secure the repose, recuperation and stimulation of the eye as intelligently and carefully as we now secure the enduring efficiency of other members of our body, namely by rational methods of recreation.

Probably the high competitive standards of modern life, and the complex visual impressions that any average city affords, call for increasing concentration and visual registration; and consequently the need for new methods of relaxation and eye conservation become necessary.

It is a proven fact that nothing repairs brain-fag more quickly than a change of ideas and occupation. If the strain of the day has put certain nerves at too high a tension, we can most readily and normally relax that tension by calling other nerves into action. That the physical and psychic stimulus of scientifically applied radiant Colour is one method, and a very natural one, of achieving these necessary reactions, time will reveal moer fully, and the regulation of lighting systems will

then be recognized by the public as an important branch of social service and human welfare.

In the past, architecture has had first honours in contributing to the distinction of the landscape, but when light is engineered architecturally and æsthetically in civic life, we shall enter a new era, which will give a great impetus to spiritual democracy by drawing human beings closer through communal appreciation of a new beauty.

The geniality and freedom from rowdyism of any kind, among the crowds that thronged the Panama Pacific International Exhibition at San Francisco in 1915, was a fact which attracted much comment and many people attributed this condition to the harmonizing influence of the remarkable colour schemes in decoration and illumination which were justly considered the distinguishing achievement of that unique undertaking.

Discussing Colour one day with the writer, Mr. Moore (President of the Exposition) expressed an opinion that the cities of no distant future would be as exacting in their requirements for Colour in buildings and in illumination as they are now in specification for sanitation and structure. Let us hope that his prediction may be speedily fulfilled, and that California will bring her great wealth of coloured stones and marbles, as well as her progressive initiative to bear upon the dawning of this day.

Briefly reverting to the aims of Filter Illumination, we shall see that they are all based upon the educational values of Colour as applied to different

conditions. Through the Filters, we find that Colour is an educator in Light, teaching us the constructive and destructive capacity of its various visible and invisible rays. Secondly, we prove through daily use of the Filters that Colour, scientifically proportioned, affords physical and mental culture to the eye, conserving its energy and quickening its powers of observation and perception—a process that leads to the realization that new comforts and pleasures can be ours if we make a practical application of our Colour findings to the science and art of illumination.

We are no longer condemned to a monotony of light that is aptly classified as artificial, but we can approximate interior illumination to the mobile and sensitive graduations of light which we enjoy in nature. With purpose, precision and flexibility we can build into our surroundings the sedative mystery of spring twilights, the recuperative glory of summer dawns and autumn sunsets, balancing the ardour of these vibrations with the stimulant radiance or sombre weight of winter skies.

The reader should not be misled by this poetic use of natural comparisons into a belief that this process of education in Colour and Light is a mere matter of sentimental associations, vague in operation and indefinite in results. On the contrary, as many who have tested its service can bear witness, it is a calculated method which has been evolved by earnest enquiry and continuous experiment, and its results, though varying in accordance with application and understanding, leave no doubt as

to its capacity to fill various human needs. As a race, we are functioning more actively in the nervous portion of our organism than ever before, and consequently the outer and the inner eye, and the physical and psychic bodies, are becoming aware of their kinship. The physical body is nourished chiefly by the absorption of Earth's products through the organ of the mouth. The psychic body, to which our nervous system serves but as muscle, is nourished chiefly by light and Colour transmitted through the organ of the eye.

This statement opens up a wide field for discussion and one which is not pertinent to the present volume, but it is offered for the reflection of enquirers, and also in support of the psychologic and metaphysical importance of Colour, when it is expressed with æsthetic skill and science in our surroundings.

CHAPTER XXIV

FILTER ILLUMINATION AS A RECREATION

TO those who have entered into the appeal that this volume has endeavoured to convey, an appeal for recreative illuminating engineering and for a broader co-operation to this end between expert and layman, the æsthetic and human aspects of Colour Filter Illumination will be welcome. Revolutions are effected by contraction, but evolutions by expansion, and if the understanding of Colour can extend our knowledge and use of light, why should we not engineer Colour as efficiently as we engineer the various other things that contribute to good illumination ?

The idea cherished by many, that the education of the Colour sense means a loss of its inspiration, is erroneous and illogical. Every other sense is developed by use, and disciplined by discretion, a process that results in what is called good taste, or, in other words, a knowledge of how to use the experience acquired to the best advantage.

Then why should the Colour sense work less normally than other senses, or by the hit-and-miss method that many people think is the only one admissible in this connection? If we desire to cultivate our musical taste we attend good con-

certs, or if the appreciation of form is our objective we study architecture and sculpture and introduce these things into our surroundings.

Good paintings represent Colour and form combined, but for most people the subject and technique of the painting constitute its chief interest, and as there are very few pictures whose size or theme permits of unbroken fields of Colour, the question of Colour *per se* plays a secondary part in the selection of works of art.

If, therefore, we are to develop the Colour sense, why should we not introduce Colour into our homes and buildings in such a way as to demonstrate its intrinsic vibratory values independently of other considerations? That we can best do this by combining Colour with light, of which it is an integral part, is a self-evident fact. The use of balanced colour structures in our buildings will slowly but surely educate us and obtain their merited share of recognition, gradually defining their individual importance in our surroundings.

In referring to the mental stimulus of Colour, the following extract from a medical journal may be of interest here :

“*Science Progress*” contained an interesting article on ‘Coloured Thinking’ by Professor F. D. Harris. Certain persons, he points out, always associate sounds with colour, and “there is also a small number of persons who always think in colours—that is to say, ‘they invariably associate some kind of colour with such things as the names of the days of the week, the hours of the day, the months of

the year, the vowels, the consonants, etc. A typical thinker in colours will tell you that Sunday is yellow, Wednesday brown, Friday black.' ”

The chief characteristics of such thinking are :

1. The early age at which these associations are fixed.
2. The unchangeableness of the colour thought of.
3. The extreme definiteness of the colours in the minds of the thinkers in colours.
4. The complete non-agreement between the various colours attached to the same concept in the minds of different thinkers.
5. The unaccountableness of the phenomenon.
6. The hereditary, or at least inborn, nature of the condition.

The late Mr. Galton said that the intelligence of thinkers in colours was rather above than below the average.

Exclusive of many results that have accrued from the writer's psycho-physiologic experiments, which, save for a few brief references in the Appendix, cannot be detailed here, it is a matter of record that some successful endeavours were made during the recent war along the lines of the chart in "*The New Science of Colour*," for the alleviation of shell-shock and convalescent conditions. If light and radiant Colour have been found capable of re-adjusting human balance where other means have failed, is it not reasonable to infer that they are also capable of extending human perception along finer constructive and executive lines than have



GOLD MEDAL

Awarded with Diploma of Honour to Irwin Colour-Filter Exhibit and Illumination
of the Palace of Fine Arts and Crafts.
By the Pacific South West International Exposition (1928), Long Beach, California.



BRONZE MEDAL (ORPHEUS AND THE MUSE)

Awarded to Beatrice Irwin, A.A., Author and Lecturer, by the French Commission to
the Panama Pacific International Exposition, San Francisco, California.

hitherto been operative or explored? And, if it can be demonstrated that Colour scientifically applied, can afford as much as, and possibly more recreation, physical, mental and nervous, than a good bed, or arm-chair, or radio, then why should its use not become a part of our daily life?

The liberating stimulus experienced when witnessing a fine sunset or sunrise, or spectacular effects in exhibitions or theatres, can be experienced also in a lesser degree in all buildings through the use of scientific coloured illumination.

Part III

Future Developments

CHAPTER XXV

INTERNATIONAL EXPOSITIONS (1915-1930)

“ Let air-ports welcome world citizens,
The earth is but one nest for sun-birds soaring !
Let one flag fly above these air-ports,
The blue flag of heaven ! ”

BEATRICE IRWIN. *The Wings of the World.*

IF the new Art of Illumination has sprung from the soil of the past, and is receiving growth from the breezes of the present, it is also looking to the Sun of the future to develop its maturity. Peering into that shadowy distance with a long range and inferential vision, perhaps we are justified in expecting a realization of the many possibilities that at present drift undefined in space like shining nebulae ?

The forecast and pulse of progress is largely created by new inventions, and by international expositions, where the competitive effort of different countries stimulates public taste and inspires fresh enterprise ; for these two results are the real object of expositions, and the compensation for the vast expenditure, and actual financial loss usually incurred by the nations and individuals participating in them.

To those who can afford to wait for returns, and to maintain their enterprises with a view to

future development, expositions represent a good investment, since economically and ethically they involve an outlay which expands ability and equips individuals with fresh education and ideas. International Expositions are like Communal Encyclopædias, published in the esperanto of products! They create that reciprocity of understanding that is one of the best aims of our day. As demonstrating progress in illumination we will therefore discuss some recent expositions. To catalogue the inventions, mechanical and æsthetic, that have been published during the past ten or twelve years in the field of lighting, would be a wearisome and invidious attempt, but in expositions we find a résumé and testing laboratory of collective endeavour.

Between 1915 and 1929 there has been time for progress, and good use has been made of that time, for if we compare the Panama Pacific International Exposition of San Francisco (1915) with the recent International Exhibition at Barcelona (1930), we can honestly congratulate both engineers and the public upon a marked development in skill and taste, and in appreciation of the beauty and possibilities of light as a factor of enjoyment. This appreciation has been largely due to various exhibitions and to the serious endeavours of a group of progressive engineers, who are creating an art as well as a science of illumination.

The use of colour has been the basis of this art, and was probably the cause of its inception. At least, the first serious claim for decorative illumina-

tion on a big scale was made at the Panama Pacific Exposition in San Francisco, where the coloured flood-lighting of buildings and fountains created a new era in illuminating engineering. Through these efforts various important departures and discoveries were made, among them the fact that light, instead of merely outlining buildings by the white spot-light system hitherto chiefly used, could, by means of coloured floods, give depth and added richness to architecture and create landscape vistas of unusual beauty.

It was also observed that coloured light, combined with fountains, could rival music as an item in popular entertainment.

It is true that this idea had been already exploited at Versailles and at other exhibitions, but not quite in the same way ; the former methods having been developed by projecting colours on to the surface of playing waters, the new system being the incorporation of coloured light in the body of, and in combination with, the architecture of the fountain itself, which greatly amplifies results.

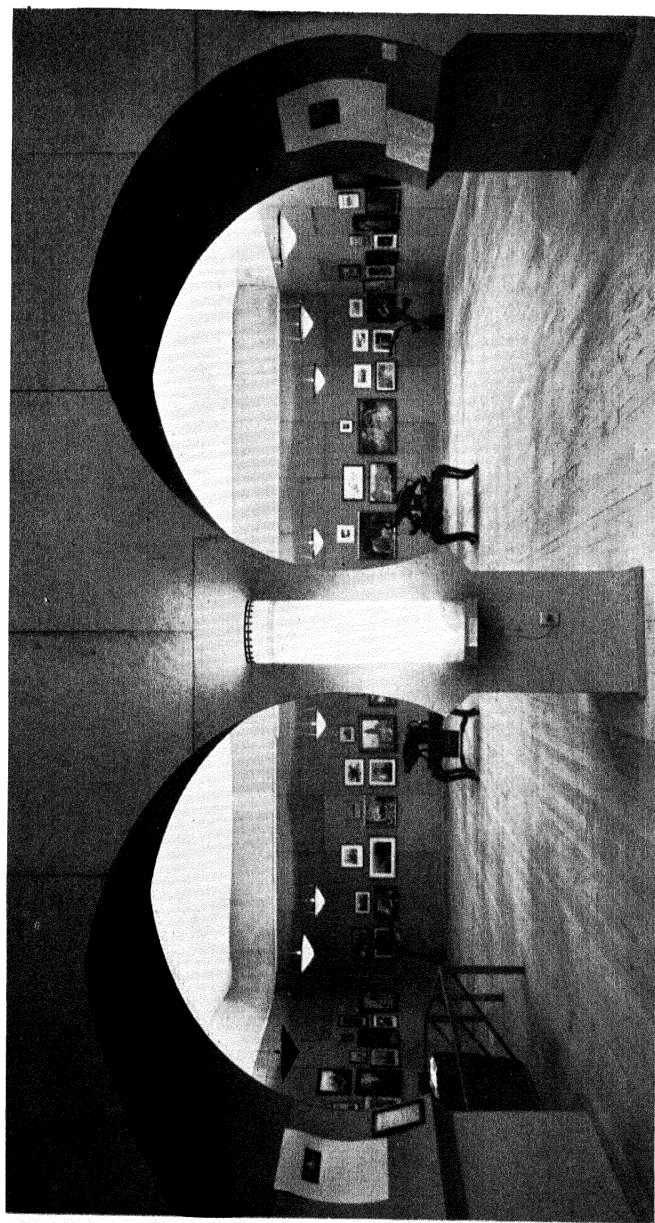
Coexistent with San Francisco there was the exposition in the sister city of San Diego, which also contributed its share to this crusade for beauty in illumination. Possibly as a result of these exhibitions, in 1919, at the Annual Congress of the Illuminating Engineering Society of America, in New York, an entire evening was devoted to a "Colour Symposium," at which the subject of colour in illumination was discussed by various experts. The papers read at this Congress, to which

it was my privilege to contribute, gave Colour its first official recognition as a scientific and artistic essential in illumination. In 1922 the Wembley Exhibition, near London, carried on the lighted torch with credit, and in 1923 the Exposition des Arts Décoratifs, in Paris, contributed some graceful novelties to illumination in the shape of floating restaurants and fountains which were anchored in the Seine. With the exception, however, of certain choice and unexpected corners of landscaping, the general illumination of this exhibition fell far below the standards of San Francisco, San Diego or Wembley.

In 1928, an international exhibition at Long Beach, California, again marked progress by the specialization of two important principles in coloured illumination, i.e. filtration and reflection. The Irwin system of colour filter illumination was used in the Palace of Fine and Applied Arts, by means of which specialized scientifically proportioned colour values were diffused over paintings, sculpture—batiks, tapestries, etc.—thereby enhancing the value of each group of works, besides providing a pleasantly varied quality of light, very restful to the eyes of the sightseer.

These colour filters consisted of hand-painted parchment devices which in themselves constituted fixtures, replacing metal and glass by delicate colour combinations allied to graceful forms.

The value of static colour, or colour in reflection, was brilliantly conceived and engineered by building the principal square of the exhibition around



WATER-COLOUR SECTION. PALACE OF FINE ARTS AND CRAFTS, PACIFIC SOUTH WEST INTERNATIONAL EXPOSITION (1928), LONG BEACH, CALIFORNIA
Showing "Mandarin" and "Drum" Irwin Colour-Filter Illumination (patented).

a lake, in the centre of which was a bandstand, and around which were grouped illumined towers and pavilions that reflected themselves into the still shadow of the water. This lake was christened the "Pool of Reflections," and, through its services, the dramatic relations of light to shadow were variously revealed and much appreciated by the public.

In this exhibition, a third departure was also made that marked progress in taste : in the lighting of the towers, more delicate colour combinations were used, Nile-green, coral-pink, orchid, moon-blue and primrose-yellow being employed instead of the customary crimsons, dark greens and blatant yellows generally considered essential to spectacular effects.

As each of these exhibitions has marked development in the art of illuminating engineering, a review of their achievements has seemed an appropriate introduction to the record of operations in Barcelona, for to the past we owe the present, and in the present we forecast the future.

Beautiful as this international exhibition was—with its Spanish, Oriental, classic and modernistic palaces scattered among the terraced groves of Montjuich Park—its outstanding attraction and achievement lay in its decorative exterior illumination and in its illumined fountains and cascades, which at night created a world of opalescent flame and musical movement. We lost ourselves gladly in these gardens of light that surpassed all limitations of the written word.

Perhaps the development of such gardens of

light may become a recognized factor in city planning, and refresh the lives of city dwellers as much as national parks have done in the past? The decorative illuminations at Barcelona at least indicated this thought as a feasible and wonderful possibility appropriate to our electric age.

There were many courts and fountains of enchantment, scattered unexpectedly throughout the exhibition grounds, many flower-like combinations of glass and light that merit description, and that insistently forced upon us the suggestion that gardens of light should provide a novel and refreshing field of development in the near future, and a new source of communal well-being appropriate to our electric age.

The table of mechanical and economic values that this exposition furnished bears witness to the skill and research, and to the co-operative resources of wealth and service that modern life is spending and expending on progress and beauty. There need be no limit to our outlook, for we are marching towards a new democracy greater than that of Greece or Rome, and the engineers of all lands are contributing their share to the building of the new day !

This democracy of service is the true basis of internationalism and peace.

Doubtless there were many other expositions during this time which it would be interesting to record, but personal participation in those mentioned made it possible to observe details at first-hand !

The glowing promise furnished by these international beacons constitutes the dawn of a new day, and gives us every reason to hope for the rapid development of the ideas that they have launched.

It is chiefly a matter of evolutionary progress, if we did not hitherto need to understand and use illumination as a great constructive and recreative factor in our surroundings, but now having awakened to its significance, can we not cease to confuse issues and delay well-being by placing the engineering of colour and light unreservedly in the hands of those whose specialized knowledge ensures its best operation? We are rapidly marking milestones in our march, but the future beckons smiling to a hill-top of extended vision !

CHAPTER XXVI

ARCHITECTURAL AND AERONAUTICAL ILLUMINATION

“Golden hawks toward the Sun we are flying !
With the birds and ethers one
We are lying in the singing breast of Space. . . .”
BEATRICE IRWIN. *The Wings of the World.*

ALREADY on the Scrip of modern life, Light has set her jewelled seals ! Seen from above and afar, our great cities glow against the night skies like caskets of gems where ruby, emerald, topaz and sapphire mingle in a flaming abundance ! Electricity and colour, combined with advertising enterprise and engineering skill, have contributed thus much, and even though distance lends enchantment to this great fanfare, we must allow that it is an aggressive and necessary herald of better things to come. With the development of aviation, we shall become accustomed to look up and down rather than up and around, as we do in earth-bound conditions, and the luminous perspective of inhabited tracts will have an increasing significance and appeal.

Possibly colour will then play an even more important rôle in illumination, certain areas being defined by prescribed hues or combinations. For

instance, business areas might be illumined in red and white, shopping districts yellow, theatres green and violet, and so on, always regulating the quality of light in relation to size and colour of buildings, and several other constructive details. Such schemes would act as indexes to a flying population, and would add dignity to our cities and eliminate the irritating medley of colours now prevailing, regardless of harmonized effects or the requirements of the buildings to be illumined.

It is hoped that this suggestion may be worth the consideration of city planners and municipal treasurers? A new era would then dawn in flood-lighting, which has such a great future in æsthetic and advertising illumination. Meanwhile the stepping-stones to these conditions might be laid through a definite campaign for architectural illumination in our boulevards and streets. By this, I mean an æsthetic development in structure, and a scientific use of Colour, which would render illumination an integral part of architectural effect rather than the glaring aggression that it often is. To achieve such results the artist engineer will have to study the architectural handling of colour and light more fundamentally, learning to proportion them almost mathematically in mass and volume if they are to produce the necessary efficiency combined with the æsthetic ratio demanded by the nature of buildings and thoroughfares.

If we can increase diffusion and flood-lighting in our exterior illumination, we shall be advancing towards an architectural understanding of light,

and though the problem is a many-sided one, whose technical difficulties it is outside the province of this volume to discuss, all inventors and artist engineers will agree that the challenge faces us, and that we must welcome it as a great adventure !

Another stimulating call comes from the growing air-ports and aerial signal towers.

These, set in fine open spaces surrounded only by hills or generously domed hangars as they usually are, also give scope for coloured illumination that acts as a beacon from afar. Air-ports and signal towers have scarcely emerged from their pioneer phase, that wonderful period of imaginative appeal during which both builders and the public co-operate in defining the requirements of a new activity.

Here, again, architectural illumination will play a great part through dramatic structures carefully proportioned in mass and volume of colour and light !

Aerial signal towers will contrast their slenderness with the weight of their glow, and they will pierce the night skies with a beauty that we shall learn to love and value as much as all the minarets and church spires of the past. Standing so close to this arena of operations, we can hardly estimate yet what vast opportunities it offers to architects, mechanical inventors, electrical and illuminating engineers and colour specialists. Is it not well worth extending our education and endeavour to answer this call of the air, and to meet its larger rhythms with an appropriate response evolving new

symbols of form, colour and light, to express our consciousness of the ethereal element !

In spite of our aërial trend, however, we must always remain citizens of earth, and even though we be crusaders in air, our anchorage will continue to be on terra firma for many years to come. This being the case, we will naturally endeavour to reproduce more of the brilliance of space in our surroundings.

CHAPTER XXVII

GARDENS OF LIGHT

. . . Breath of the Gods wafts over all
And twilight deepens the garden !
Our hearts expand, our spirits wake
And slip into the starlit lake. . . .

AMONG the gifts of the new age I believe that gardens of light and communal dromes will be most highly prized, because they will nourish and supply our æsthetic and practical needs as the gardens of earth have done in the past.

Gardens of light will co-operate with and extend the enchantment of nature, and will prove theatres of demonstration for the most advanced expressions of the art of illumination !

As we have already noted, many expositions have been leading in this direction, and Barcelona has recently emphasized the idea. Out of the scattered mass of machinery and spectacular effect already evolved in decorative exterior illumination, we should be able to formulate a few basic principles upon which to build our gardens of light which can be as large or as small as we desire !

Eleven years of research and practice in engineering and colour science may possibly justify the presentation of the following ideas, which are but

flashlights that we must hope to extend in operation. Since verdure, shadow and water form the most poetic settings for light, through gardens we shall develop some of the most inspiring effects of the new art.

The main principles upon which the æsthetic success in gardens of light would depend, are diffusion, depth, and the merging rather than contrasting of colour values, for by these methods we should follow the example of nature, who uses light as a solvent, by means of which her endless diversity is harmoniously unified.

The effective distribution and plotting of colour to area, to mass, and to the quality of surfaces and substances demands as much accuracy, yet more discretion, than the technical plotting of the light curves which result in engineering efficiency. Since the expositions of the past ten years have proved that light artistically handled can rival any form of popular appeal, why should our gardens of light not give extended scope to the results already tentatively achieved in this line. Once we have studied and grasped certain basic principles of light, it is as easy to express its æsthetics in inches as in feet or miles? As a humble contribution to these gardens of the future, I offer the following thoughts and suggestions, based on practical experience.

As light is a penetrating and enveloping force, therefore it should be engineered to demonstrate these capacities. The beauty of light is dependent on nuance, colour and shadow, therefore these

elements must be studied individually in the new art of illumination. Colour should be proportioned with a mathematical knowledge of its intrinsic vibratory values, and with a psycho-physical knowledge of human reactions to given masses of colour. The principles of repose and movement, of depth and brilliance, must be alternated and combined in order to create effects of rhythm, space and harmonized unity. Psychologic and dramatic landscape schemes, or in other words, science and spectacular effect, should go hand in hand and divide the honours. The relation of coloured light to different substances and forms demands detailed study. The poetic value of trees, statuary, benches, fountains and flowers should be co-operatively utilized, rather than accented by an excess of brilliance. Water is one of the most important factors in landscaping, because it can be used to intensify the depth, brilliance, movement and reflections of colour and light. Psychologically, its coolness invigorates and stimulates vision. Shadow accentuates and outlines light, and largely creates the architectural plan of our scheme. It is probable that in gardens and fountains, geometric symbols, such as triangles, circles, stars, etc., will combine more appropriately with the rapid vibrations of coloured light than the fitful and disturbing outlines of human and animal figures that we have been accustomed to in the past. Colour and light should always penetrate and permeate, rather than detach themselves in glaring assertions on our landscape schemes. The accompanying illustrations

may serve to amplify these thoughts and demonstrate ideas available for the gardens of light.

	PRINCIPLE.	METHOD.
(1)	Dynamic.	Colour-filtration.
(2)	Static.	Reflection and shadow.
(3)	Pulsation.	Symbolic suggestion.
(4)	Scintillation.	Spectacular statement.

(1) To demonstrate the dynamism of light through colour-filtration, let us take a large circular space in the centre of which we shall operate a fountain with three bowls, in each of which, through pulverized spray, coloured light will be filtered in three successive combinations changing every fifteen minutes :

- (1) Green—rose—gold.
- (2) Gold—green—rose.
- (3) Rose—gold—green.

This fountain could be encircled by a pergola of gold and crimson roses in various shades.

At rhythmic intervals the roof and columns of our pergola would contain filtered light in combinations of violet, green and gold. The other examples suggested could be carried out through the composition of various symbols, rhythms and colours, with co-operative settings of trees, shrubs and statuary.

CHAPTER XXVIII

COMMUNAL DROMES OF LIGHT

Dim through the flame of coming centuries
The glow of our spent orb shall circle on,
Lighting the new-born worlds that rise and fall
Upon some system vaster than our own !

THE *New Science of Colour* embodied an appeal for a Colour College and a Colour Theatre, and though neither of these institutes has materialized individually, they have both begun to do so communally, for the Modern Theatre Movement has given such prominence to scenic art, and has evolved coloured illumination as such an integral factor of its operations, that the *décor* often equals and sometimes supersedes the play in interest.

As for the Colour College, it has similarly spread its outline over the world instead of in the limited area of an institute, since the significance and inner values of colour and light, as we have seen, are being studied and understood in so many new ways, and applied to human service.

Through the agencies of coloured light-therapy, of advertising and display, architecture, decorative art, psychology and illumination, the world has opened up a Communal Colour College with various branches of research and achievement !

Thus the hopes of the pioneer period are amply and progressively, though not literally, fulfilled ! For the spirit and essence of our age is co-operation, and history has never recorded an epoch in which there was a greater alliance and interpenetration of activities, not so much for the purpose of individual enjoyment as for that of general welfare. The world spirit works at the moment synthetically, linking activities and interests in unexpected ways, showing new correspondences in understanding, and, above all things, eliminating the rigid barriers of the past, which placed Religion, Art, Science, etc., in closed compartments whose dividing lines excluded all possibility of intercourse ! The crowning glory of modern thought is its revolt against the absolute, and its scientific appreciation of the relative. Illumination, like other channels of universal service, has graduated successively through its periods of utility, physics and science, and it is now emerging into its era of art, metaphysics and philosophy, and thereby demonstrating its finer relations to life ! The international spirit of our day, by drawing together minds and hearts of such diverse outlook and culture, is materializing many good things, and one of these is the foundation of institutes dedicated to the comprehensive service of specialized activities.

Public libraries, clubs, clinics, research laboratories, stadiums, swimming-baths, etc., all are significant of the communal spirit. Rich inheritors of the Egyptian, Greek, Persian, Roman, Moorish and other civilizations, we can profit by the legacies

of their toil and skill, and add new contributions of our own to the expectant Future.

I believe that the arts of illumination and light, when fully developed, will be among the most precious bequests of our century, evolving new beauties in our surroundings and creating fresh vigour and perceptions in our activities.

The vibratory harmony of our homes will educate our eyes, and stir finer nervous centres as yet dormant in us, and we shall become ready to create and appreciate an art of light whose study and demonstrations will mean as much to us as music, concerts and paintings do at present. Already tentative efforts along this line foreshadow the splendour that lies like a radiance upon the far horizon !

And meanwhile, since we have buildings dedicated to the collective service of so many other things, why should we not add Communal Dromes of Light to the attractions of our great cities ?

In such centres every aspect of Colour and Light could be engineered and distributed with scientific and æsthetic skill, and with economic efficiency. There are endless possibilities, human and financial, in such a project, for in these dromes the various services of Light, like the rays of a star, could converge into one flaming circle of achievement. The domes and galleries of such buildings might be dedicated to astronomy, physics, æsthetics and a library ; their heart to engineering, architecture and decorative art ; their foundations to distribution and commerce, and their auditoriums to

demonstrations dealing with colour, light, illumination and the music of light, or mobile colour, which is destined to be one of the fine arts of the near future.

Whenever possible, gardens could surround such buildings, and in them illumined fountains would play a joyous part. Through such centres the human heart and mind would become more attuned to Light, and more appreciative of its many creative mysteries. It is not too optimistic to forecast such possibilities, for the glittering tide of progress is rising, rising, and sweeping away old landmarks in its onrush! In the gleaming curve of this wave, let every artist engineer gaze deep, and vision his share in the building of the present and the future.

Freed from the spells of ancient Earth
Our vision soars,—we seek the sky
Where colour in redeeming flood
Of mighty symbols gives rebirth
And Light with magic fires our blood!

APPENDIX

REFERENCE BOOKS ON COLOUR AND LIGHT.

Principles of Light and Colour. Babbitt.

New Science of Colour. Irwin.

Theory of Light. Preston.

Spectrum Analysis. Schellen.

Human Atmosphere. Dr. Kilner.

Sound and Colour. Dr. G. MacDonald.

Sensations of Tone. Helmholtz.

Colour Music. Wallace Rimington.

Also treatises by Tyndall, Locke, Nussbaum, Starr White, Mitzscherling, Hessey, Mount Bleyer, Dr. Finch Strong, and Dr. Luckeish.

SOME EXHIBITS AND CONGRESSES AT WHICH IRWIN COLOUR FILTER ILLUMINATION WAS DEMONSTRATED AND BUILDINGS ILLUMINED BY THE METHOD.

EXHIBITS AND CONGRESSES.

Colour Symposium and Annual Congress of Illuminating
Engineers of U.S.A., New York City.

Own Your Home Exposition, Grand Central Palace,
New York City.

Electrical Fixture Dealers' Congress, Buffalo, New York.

Illuminating Engineering Society of Philadelphia, Penn.

Engineering Society of Washington, D.C.

Bahai Congress, New York City.

Copley-Plaza Hotel, Boston, Mass.

The Illuminating Engineering Society of London.

The Electrical Association for Women, London, England.

Second National Silk Convention, Paterson, N.J.

Women's Medical Association, Academy of Medicine,
New York City.

BUILDINGS.

- Ritz-Carlton Hotel, Atlantic City, N.J.
 Palais de Glace, Paris.
 White Plains Theatre, New York.
 Blanchards Club, London.
 Fairmont Hotel, San Francisco, California.
 Barker Brothers' Auditorium, Los Angeles, California.
 Samarkand Hotel, Santa Barbara, California.
 Pythian Castle, Santa Barbara, California.
 Rosicrucian Centre, Los Angeles, California.
 Edgewater Beach Club Auditorium, Los Angeles, California.
 The Palace of Fine Arts, Pacific-South-west Exposition, Long Beach, California.
 Ebell Club Theatre, Long Beach, California.
 Centennial Club, Auditorium, Nashville, Tenn., U.S.A.
 Bishop's School, La Jolla, California.
 Highland Women's Club, Auditorium, Highland, California.

Beatrice Irwin, A.A., M.I.E.S., Associate in Arts, Oxford University, recent member of the Illuminating Engineering Societies of England and of America, and founder-member of the Electrical Association for Women, is an author, lecturer and illuminating engineer of international repute. A grand-daughter of the late Sir John Hall, K.C.B., she was born in the Himalaya Mountains, of British parents, and graduated from Cheltenham College.

Her *Pagan Trinity* is dedicated to the late Auguste Rodin, and *The New Science of Colour*, now in its fifth edition, contains the first psycho-physiologic colour chart published, and has been widely quoted in Engineering and Medical journals as the basis of a scientific application of colour to light. (See "Transactions" of Illuminating Engineers' Society for November, 1917, U.S.A.)

Her invention—Colour Filter Illumination—is a mathematical combination of prescribed colours designed to produce definite results.

POSTAL LIFE INSURANCE COMPANY, Health Bulletin, No. 22, New York.

“ But the craze for ornamentation in electric light fixtures and the vast amount of money spent for purely decorative purposes in the wiring of costly buildings, in total disregard of the visual requirements and limitations of those who inhabit them, are apt to be superseded ere long by the ‘ new science of Colour,’ as developed by Beatrice Irwin, the noted specialist on decoration and illumination. This scientist has evolved a theory of Colour harmonies in combination with light that is probably the most advanced step in optical science that has been taken since the invention of the Kryptok lens.”

Monthly Bulletin, American Association of Engineers, Washington, D.C.

“. . . It is desired to emphasize some of the unique discoveries from Miss Irwin’s research work and wonderful effects produced.”

PROFESSOR C. E. FERREE, Bryn Mawr College, U.S.A.

“. . . There are many things to learn in this field which you have penetrated farther than we.”

DR. MARTISUS’ CLINIC, 7 Park Lane, London, England.

“. . . I am glad to express my appreciation of your Filtered Lighting system as installed throughout my clinic. It embodies the Colour theory of your book with most practical and beneficial results to the patients.”

(Signed) A. MARTISUS.

197 GREAT PORTLAND ST.,

LONDON, W.1,

August 24, 1925.

MISS BEATRICE IRWIN,
London, England.

DEAR MISS IRWIN,

I am sorry to find that you are going back to America and therefore that our interesting experiments

must come to an end for the present. I am very glad, however, to have been able to do some work with you on such a subject—I have found that the filters you made for me act very well ; they also apparently retain their properties without fading. The blue Filter is very useful. I have never been able to find a medium which gives such a pure Colour before.

Thanking you for your kind assistance,

Believe me,

Yours very sincerely,

(Signed) DR. J. DODSON HESSEY.

HUGH DAVIES, Architect of Pacific-South-west Exposition,
Long Beach, California. 1928.

“ . . . For several evenings in the Fine Arts Gallery at the Pacific-South-west Exposition, I studied with pleasure and satisfaction the fine quality of illumination there, thanks to your Colour Filter System of lighting.”

PACIFIC-SOUTH-WEST EXPOSITION,
LONG BEACH, CALIFORNIA,
September 7, 1928.

Particularly may we comment on the Filter System of Illumination which you placed in the Art Gallery. We congratulate you on your genius in this work.

Very sincerely,

(Signed) J. D. LARSON,

General Manager.

THE PACIFIC-SOUTH-WEST EXPOSITION,
LONG BEACH, CALIFORNIA,
July 21, 1930.

When I heard your illustrated lecture at the California Art Club I realized that your invention, Filter Light, marked a definite progress in the Science and Art of Illuminating Engineering. I wish to congratulate you on the efficiency and beauty of Filter Light, and to thank you for your personal care in the completion of this work,

which will be one of the educational features of the Pacific-South-west Exposition.

Believe me, Yours truly,
 (Signed) THEODORE B. MODRA,
Art Director.

October 23, 1924.

DEAR MISS IRWIN,

Since the installation of your "Mandarin" Filter I have been entirely free from eye-strain and headaches—a fact which emphasises the importance of the service your lighting renders.

Yours faithfully,
 (Signed) W. R. HINDMARSH,
Borough Engineer and Surveyor, Woolwich.

ROSICRUCIAN FELLOWSHIP CENTER,
 LOS ANGELES, CALIFORNIA,
 February 1, 1927.

It is indeed a re-creation in lighting systems and the writer cannot say too much in praise of it. It has met with such approval in our chapel that our Executive Board instructed that the Filters be also installed in the library rooms of the Fellowship.

Yours very truly,
 (Signed) J. E. BURGE.

SALON DU GOÛT FRANÇAIS,
 PALAIS DE GLACE, PARIS.

The Filtered Light produced by these fixtures is easy on the eyes, restful by reason of its Colour value, and exquisitely artistic and decorative in effect.

A large number of nervous ailments result from eye-strain, but there cannot be any strain for the eyes and nerves where Colour Filter Illumination is used.

(Signed) LORD HEADLEY,
Former President, Civil Engineering Society, London.

RABINDRANATH TAGORE, of India.

“. . . Have already used the light and found it very restful to my eyes.”

LOS ANGELES, CALIFORNIA,

December, 1929.

In Filter Light Beatrice Irwin has created a veritable lyric of illumination as her gift of beauty to the world. Both by her exquisite instinct and exact knowledge, she has mastered all the processes of co-ordination and distribution of light, transmitted through lovely Colour schemes.

(Signed) SAROJINI NAIDU,
Former President of the Indian National Congress.

OJAI, CALIFORNIA,

1926.

Your Filter Lights have been a great help here, and everyone likes them. It was indeed a great pleasure to have met you, and I hope we shall meet again in the future.

With all best wishes,
Yours very truly,
(Signed) J. KRISHNAMURTI.

SAMARKAND HOTEL,

SANTA BARBARA, CALIFORNIA,

December, 1926.

I wish to thank you for the personal interest displayed in the designing and proper installation of the Filter Lighting fixtures for our dining-room and Marigold Terrace. You are certainly a scientist in Lighting and Colour features.

Cordially yours,
(Signed) CHARLES B. HERVEY,
Manager.

FAIRMONT HOTEL,
SAN FRANCISCO, CALIFORNIA,
December 24, 1925.

The effect is original, artistic and entirely satisfactory. Assuring you of our appreciation for the interest you have taken in perfecting the work,

Very truly yours,
(Signed) LEROY LINNARD,
Manager.

DENISHAWN HOUSE,
VAN CORTLANDT PARK,
NEW YORK CITY,
January 24, 1929.

Your ideas and inventions of Light are a real inspiration. Light has a message to deliver ; it always has had, but so few to interpret it. You are a real Light Bringer.

I wish I had time to say more, for I feel much more.
(Signed) RUTH ST. DENIS.

DEAR " B " IRWIN,

Your Colour Filter in Ruth's room fills me with envy and delight. She spoke so enthusiastically about you and your work. I hope we can have the great privilege of your genius applied to the problem of our big studio here.

Cordially,
(Signed) TED SHAWN.

LOS ANGELES, CALIFORNIA,
May 20, 1927.

DEAR MISS IRWIN,

We wish to express our satisfaction and appreciation of the results produced by the installation of your Irwin Colour Filter System of Illumination in our Auditorium.

We are very glad to hear of your further successes, and believe they are well merited.

Yours very truly,
BARKER BROS. INCORPORATED
(Signed) C. A. BARKER.

APPENDIX

PYTHIAN CASTLE,
SANTA BARBARA, CALIFORNIA,

January 12, 1928.

We wish to express ourselves as being highly satisfied with the quality of light given by this system. In the Lodge Room it is soft and restful; in the Club Room excellent for billiard and card tables. The diffusion being such that there are practically no shadows cast in any direction.

Very truly yours,

SANTA BARBARA PYTHIAN CASTLE
CORPORATION,

(Signed) DR. L. J. GOODRICH,
President.

