The Art of Illumination

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Electric lighting with special empahasis on Desk Lighting

A thesis submitted to the faculty of History of Art and Design, and Complementary studies in candidacy for B.Sc Degree.

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INTRODUCTION

Artificial lighting, though one of the most fundamental needs of modern man is too often taken for granted. Few pause to think that without it, man's economic and social activities after dusk would be severely curtailed. The industrial working day would be ever so short. Even with modern advancement in automobile engine performance, and the speeds attainable in the average family car, we tend to forget how fundamental a role, the lights of that car actually play.

Housings for lighting fixtures, over the years, has formed a common base to which designers of different disiplines would apply their skills and make their contribution.

The rapid development of electric lighting technology at the beginning of the century, evoked a degree of excitement among designers (and also among the public at large) thus resulting in a wave of new designs for lighting housings. Unfortunately, after 1930, this momentum was not maintained. To date, little change has come about in lighting housing design since 1930 except for a brief period in the early "60's" following the introduction of plastic moulding techniques.

This thesis traces the evolution of electric lighting and reports on the plethora of designs for desk lighting housing which accompanied and followed the rapid growth period of lighting technology.

Chapter I provides a definition of light, discusses its relationship with the human eye and presents a brief overview of the direction and development of lighting technology. Chaper 2 traces, in detal, th development of lighting technology from the "birth" of the Arc-light in 1845, to the production of the Incadescent Filament lamp in the late 1860's (made possible by the introduction of the mercury vacuum pump) and up to the beginning of the twentieth century by which time the light bulb had practically reached its present-day form. Chapter 3 discusses modern advances in lighting technology, the contribution of the modern day lighting designer, and current lighting practice, ie. lighting distribution and lighting levels. Chapers 4 and 5 compare and contrast desk lamp designs and designers of two distinct periods in the decorative arts - the Art Nouveau era at the turn of the century and the Art Deco era around 1925. World War I constituted the dividing line between both of these movements. Finally, Chapter 6 examines the Bauhaus School of Design in Germany, its strengths and its struggle to design desk lighting suitable for "the production line".

CHAPTER I

LIGHT

Light, a basic aspect of the human environment cannot be defined in terms of anything simpler or more directly appreciated by the senses than itself. Light, we regard as being responsible for the sensation of sight. It has a speed that is high but yet not infinitely high. Physicists are familiar with two methods of propagation from one place to another, (1) particles and as (2) waves, and for a long time they have been in search of a definition for light in terms of either particles or waves".

In the early 19th Century a wave description was favoured, though it was difficult to understand what kind of wave could possibly be propagated across the near-vacuum of space at extremely high speeds. In the latter half of the 19th Century a British Psychiatrist, James Clerk Maxwell, showed that certain electromagnetic effects could be propogated through a vacuum with a speed equal to the speed of light. Thus, in the second half of the 19th Century, light was described as electromagnetic waves.

The quantum theory of light, which in its primitive form asserted that, at least in regard to its emission and absorption by matter, light behaves like particles rather than waves. The results of certain important experiments on the spreading of light into shadows and other experiments (on the interaction of beams of light) that supported the wave theory found no place in a particle theory. For a time it was believed that light could not be adequately described by anagoly with either waves or particles - that it could be defined only by a description of its properties.

Two properties of light we regard, as more basic and fundamental than any others. The first of these is that light is a form of energy, passing through empty space at high speed (in contrast, many forms of energy, such as the chemical energy stored in coal or oil, can be transferred from one place to another only by transporting the matter in which the energy is stored). This unique property of light is, thus, that energy in the form of light is always moving. (When light energy ceases to move, because it has been absorbed by matter, it is no longer light).

The second fundamental property is that a beam of light can convey information from one place to another. This information concerns both the source of the light and also any objects that have partly absorbed or reflected or refracted the light before it reaches the observer. More information reaches the human brain through the eyes than through any other sense organ. Even so, the visual system extracts only a minute fraction of the information that is imprinted on the light that enters the eye. Optical instruments are capable of extracting much more information from the visual scene: spectroscopic instruments, for example, reveal far more about a source of light than the eye can discover by noting its colour, and telescopes and microscopes extract scientific information from the environment. Modern optical insturments produce so much information that automatic methods of recording and analysing are needed to enable the brain to comprehend it.

LIGHT AND THE EYE

While even the Eskimo and the Patagonian use artificial light and all civilized peoples count it a necessity, it is seldom used skilfully and with proper knowledge of the principles that should govern its employment. Since the introduction of electric lights, that very facility of application which gives them unique value has encouraged more zeal than discretion in their use.

To begin with there are two general purposes which characterise two quiet distinct branches of the art of illumination. First comes the broad question of supplying artificial light for carrying on such activities or amusements as are extended, into the hours of darkness. Quite apart from this is the case of scenic illumination directed at specific objects and designed to produce particular effects or illusions. Lighting a shop or a house typifies the one, lighting a picture gallery or the stage of a theatre the other. Each has a distinct purpose, and requires special means for its successful accomplishment. Sometimes, both scenic and general illumination have to be used coincidently but the distinction between them should be fully realised even when it cannot fully be preserved. General illumination, whether intended to serve the ends of work or recreation, must fulfill the following conditions: it must be amply adequate in amount, suitable in kind, and must be so applied as not to react injuriously upon the eye.

It must be remembered that the human eye is not merely an indifferent optical instrument, but a physical organ which has, through the ages acquired the characters wrought upon it by evolution, until it bears the impress and incurs the limitations of its environment. It works best over a rather limited retinal area and through a range in intensity of light which although great, is yet immensely smaller than the range available to nocturnaL creatures (eg. the owl). The eye has become accustomed to, and adapted to, light coming obliquely from above and resents strong illumination, whether natural or artificial, from any other direction. It appears to be well established for example, that the distress caused by the reflected glare from sand or water, or snow, and the grave results which follow prolonged exposure to it, are due not so much to the intensity of the light as to the fact that it is directed upwards into the eye and is quite insufficiently stopped by the rather transparent lower eyelid. Ordinary dark glasses are small protection in this case but if the lower part is thoroughly guarded, no difficulty is found. The Alaskin Indians evolved a very effective protection against snow blindness in the form of leather goggles with the eye arranged as shown in Fig 1. below.

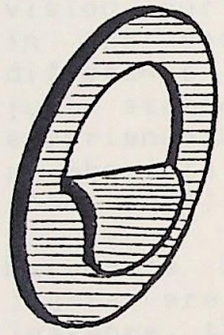


Fig.1 - Leather goggle used by Alaskin Indians to proyect their eyes against the light rays reflected off the snow.

The eyepiece is merely a round piece of dark leather with a semi- circular cut made for to permit vision, the resulting flap being turned outwards and downwards, so that the eye is fully guarded from brilliant upward beams. Blackening the whole lower eyelid with burnt cork is believed to have the same effect i.e., it makes the lower eyelid less transparent thus restricting upward beams of light. Experiments carried out in the past have proven that many of the bad effects ascribed to the habit of reading while lying down are due largely to the unwanted direction of the illumination, as well as to the unusual direction of the eyes axis.

All these matters are of fundamental importance in planning any illumination to facilitate hard visual work. Their significance is that we are not at liberty to depart widely from the distribution and character of natural daylight illumination. One realises that the eye is neither fitted nor habituated to working to advantage in anything like the full strength of sunlight, but its colour, downward oblique direction, wide and strong diffusion freedom from dark and black shadows - these must be followed rather closely in ordinary artificial illumination, or the eye, that has been taking form through a million years of sunlight and skylight, will resent the change. It is true that the eye is automatically adjustable for wonderfully diverse conditions, but persistent and grave changes in environment are more than it can bear.

From a practical point of view the key to artificial illumination is found in the contemplation of what is known as Fechner's Law, relating to the sensativeness of the eye to visual impressions. It is stated as follows: "within the limits of brightness, differences in the strength of light are equally distinct or appear equal in sensation, if they form an equal fraction of the total quantity of light compared". That is, provided the parts of the visual picture remain of the same relative brightness, the distinctness of detail does not vary materially with great changes in absolute brightness. Since, with the exception of binocular vision, our whole perception of visible things depends, in the absence of strong colour contrasts, upon difference of illumination, the importance of the law just stated needs little comment. It implies what experience has proven, that within a rather wide range of absolute brightness of illumination, our vision is about equally effective for all ordinary purposes.

Fechner's Law fails perhaps, when extremely brilliant lights are concerned. Few people realise, for instance, that the sun is twice as bright at noon as it is when still 10 to 15 degrees above the horizon, still less that its brilliancy is reduced more than a hundred fold as its lower limb touches the horizon. Yet while the eye does not detect very small changes or properly evaluate large ones in a body so bright as the sun the mere fact that one can see to work or read about equally well from sunrise to sunset is most convincing as to the general truth of the law. Full sunlight at noon is generally overbright for the eye, if it falls directly upon the work, but with half of it one can get along very comfortably.

All this is most important from the standpoint of artificial illumination, since it means that within rather wide limits of intensity, artificial lighting remains about equally effective for most practical purposes.

LIGHTING AND LIGHTING DEVICES

Lighting in modern times derives almost entirely from electric light sources. Lamps with a wire filament in an evacuated glass bulb or long fluorescent tube. A building is lit throughout to levels comparable to daylight, and selectively placed light is focussed on work of special difficulty. Lighting devices of many kinds have been used through the long ages since man learned to control fire. Evidence of torches has been found at archaelogical sites: the cave painting at Altamire in Spain and the Dordogne in France are perhaps the oldest.

From its beginnings, artificial light had had two distinct purposes:- to permit visibility in natural darkness and to create visual effects. The development of lighting technology has been characterised by invention of light sources with greater output and efficiency. With the introduction of each light source, technology for its control has advanced. The candle produced the candelabra that enhances light with prismatic glass adornment. The oil lamp brought in its train the development of various reflectors to concentrate the light. The gas mantle gave rise to the first efforts at precise optical control with prisms and reflectors, the principles of which were later applied to the electronic light bulb, which in turn, because of its safety and cleanliness, permitted the first designs of decorative and architectural lighting fittings and lampshades. The last major advance in light sources, the fluorescent tube, gave rise to the luminous ceiling, which is a characteristic feature of modern buildings.

Two important aspects of the development of lighting technology in recent years can be identified. First, lighting technologists and specialists in human vision have colaborated, and a science of lighting and seeing has grown up, based on the idea that artificial lighting must not only be decorative but efficient and comfortable in terms of human sight, as well. Second, the lighting technologist has learned from the architect, who has always concerned himself with natural lighting in buildings but rarely with the artificial counterpart. The lighting engineer has learned about the flow of light, modelling of people and objects, and the active creation of beauty by the interplay of light, form and colour. Perhaps to these could be added a third development the recognition by building designers and engineers that large amounts of artificial light give off heat, which if ignored can cause discomfort but if controlled can be used to heat a building. Understanding of the relationship between light and heat has given rise to the concept of total environmental design.

CHAPTER 2

DEVELOPMENT OF LIGHTING TECHNOLOGY

(i) The Arc Light:-

After much experiment with frictional electricity, involving spark discharges and the fusion of wires etc, the first useful potentialities of the electric current were disclosed by the invention of the voltaic cell. As soon as large batteries were assembled it was probable that arc-ing would be noticed, and as early as 1802 carbon electrodes were deliberately substituted for metal ones in order to improve the arc. From this the science of electrical illumination arose.

The brilliant light from the arc was immediately impressive, but early experiments towards its practical use for illumination failed because it was near impossible to obtain a steady light. It proved difficult to procure carbon from the electrodes in a satisfactory state of purity and hardness, and to regulate the arc automatically. After twelve years of experiment W.E. Staite was able, from 1846 onwards, to give reasonable satisfactory public demonstrations of electric arc-lighting. Patents for carbon purification processs were granted to Jabez Church in 1845 and to W. Greener and Staite in 1846.

Many experiments with incodescent metallic filaments showed that their life in air must be brief, as a result of oxidation. Such men as Warren de la Rue and Sir William Grove realised that the success of the filament lamp was immediately linked with the problem of operating the filament in an oxygen-free atmosphere. In the experiments of de las Rue and of Grove, directed towards the use of filaments of platinum wire enclosed in glass bulbs as highly towards evacuated as possible as shown in Fig 2. The lamps were found to possess only a short life, mainly owing to the imperfection of the vacuum but partly to he narrow margin between the temperature at which a platinum wire begins to glow and its melting point.

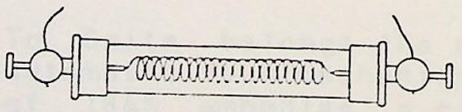


Fig.2 - De la Rue platinum filament incadescent lamp -1820.

Staite in the mid 1840's made similar experiments with a platino iridium alloy, but was unable to prevent the filament from disintegrating. Sir Joseph Swan, a

chemist, gives us a description of the state of lighting in the early nineteenth century, which today is somewhat difficult to appreciate.

"The days of my youth extended backwards to the dark ages, for I was born when the rushlight, the tallow dip or solitary blaze of the hearth were the common means of indoor lighting. In the chambers of the great, the wax candle, or exceptionally a multiplicity of them, relieved the gloom on state occasions - but as a rule, the common people, wanted the inducement of indoor brightness such as we enjoy, went to bed soon after sunset".

This was untrue of large cities, where lighting by coal-gas was introduced form about 1812, but it must be remembered that before the invention of the Welsbach incadescent mantle in 1886 gas-lighting depended upon the fish-tail and similar burners.

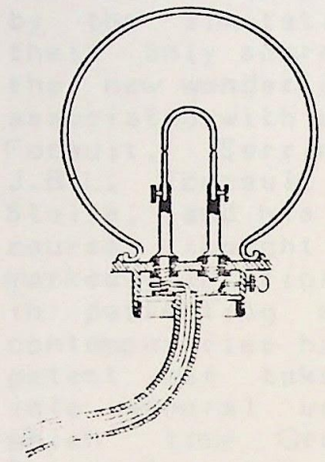


Fig.3 - Staite's metal filament lamp -1847.

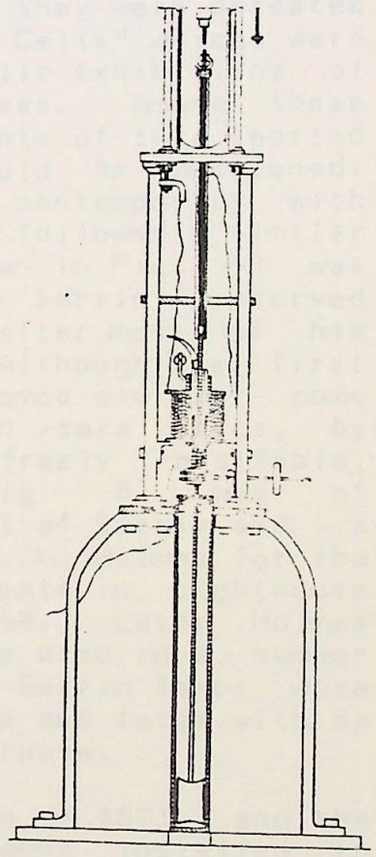


Fig.4 - Staite's early carbon arc-lamp -1853

To Saite belongs the credit for the first practical automatic-feed mechanism for the carbon arc. His lamp of 1846 embodies a clockwork mechanism whereby the carbons were advanced at a fixed rate. This had obvious disadvantages and in 1847 Staite introduced his pyrometric principle employing the fact the heat radiated by the arc increases with its length as the carbons are consumed. In Staite's device, the hat thus

allowing a weight loaded gear train engaging with vack work to raise the lower carbon. Arc-lamps operating on this principle were made again by both Siemens and Edison some thirty years later, W. Petrie, an Engineer considerably improved the mechanism of the lamp, and participated with Staite in many public demonstrations and lectures on electric lighting in different parts of U.S.A. The improved lamp was exhibited in London for the first time in 1848, arousing must interest - though perhaps not enthuasisasm - among "artists, scientist, engineers, gas directors, properietors of patent lights of every kind, and a multitude of intelligent and respectable persons". Fig. 4 shows an 1853 example of the lamp.

Even though there was much interest in the invention, Staite and Petrie faild to gain financial backing and to convince industrialists and others of its merits. The inventors were forced to realise that although they had solved the problems of the lamp, they were defeated by the limitations of the "Daniell Cells" which were their only source of current. Public exhibitions of the new wonder continued nevertheless. Among those associated with arc-lihting experiments of this period Focault, Serrin and Doboscq should be mentioned. J.B.L. Foucault was approximately contemporary with Staite, and his activities in Paris followed a similar course, thought his apparatus (shown in Fig. 5) was markedly inferior to Staite's model. Serrin, preserved in perfecting arc lamps (Fig. 7) after most of his contemporaries had lost interest. Although his first patent was taken out in 1857 his lamps did not come into general use until some fifteen years later, by which time Grame dynamos were freely available. Duboscq's lamp (as shown in Fig. 8) was of approximately the same period as that of Serrin and is of interest in that it was used by F. H. Holmes for the Blackwal of South Foreland experiments in lighthouse illumination which started in 1858. Later Holmes designed his own arc lamps which were used in a number of English Lighthouses. In France Serrin lamps were used extensively, first with alliance and later with de Meriten's generators for a single purpose.

The advent of the Gramme ring dynamo in 1871, and the successful operation of the arc-lamps installed in Grammmes Paris factory in 1873 reawakened public interest in arc-lighting, and from 1875 onwards many municipal and private installations were completed. It was impossible to operate more than one arc-lamp form one dynamo, which resulted in the instalation becoming very expensive.

In 1876 it was announced that in France the Nord Railway Company had adapted arc-lighting for platforms

at its La Chapelle Station, the lamps being supplied by Grame dynamos driven by compressed air engines. Simultaneously it was announced that the Paris-Lyon-Marseille Company was adopting it also, and a further advance was made in 1877 when the completion of a 12 lamp instalation at Lyons Railway Station, supplied from one generator took place.

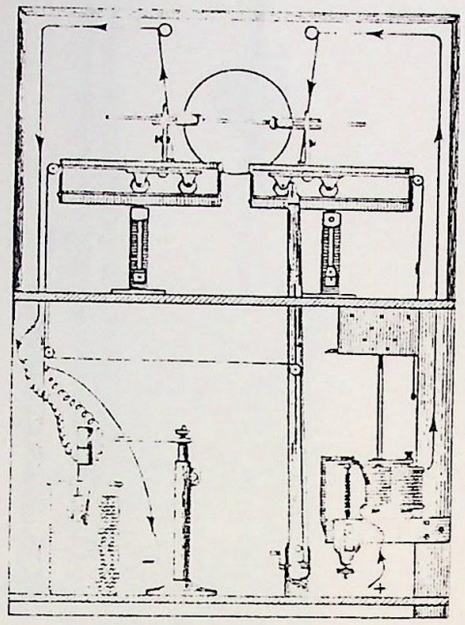


Fig.5 - Regulator for Foucault's early arc-lamp.

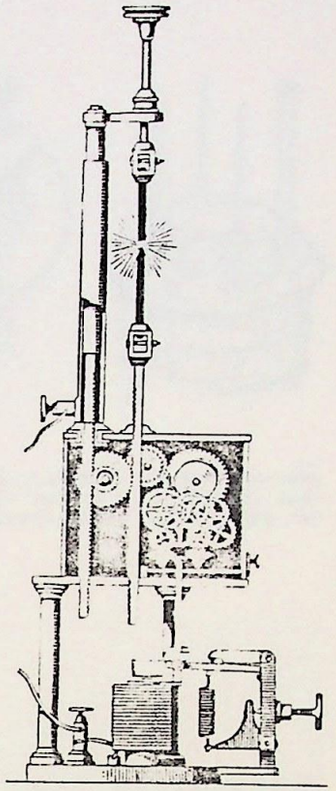


Fig.6 - Duboscq's arc lamp -1858.

In Britain the adoption of arc-lighting logged behind for two reasons. The most likely explanation for the delay was the necessity to import both machines and arc-lamps from the continent, but there must also have been many who could recall the unsuccessful experiments of an earlier generation and the financial losses sustained by several companies formed to sponsor arc-lighting from electrical batteries. In 1878 the first English installation was carried out in the Gaeity Theatre, London, where an installation consisting of six "Lotin Lamps" to illuminate the facade of the building was completed. About the same time R.E.B. Crompton instaled two Gramme alternators and imported arc-lamps at the Stanton Ironworks near Derby.

Crompton, like other British Engineers, had studies arc-lighting in Paris, and was aware that in factories which had changes from lighting by oil-lamps and gas-flares to arc lighting, complaints of eye-strain from glare were numerous. He carried out many experiments

about this time on indirect lighting by means of arc-lamps and a little later with Swan incadescent lamps. An illustration of an early Crompton lamp is shown in Fig. 11.

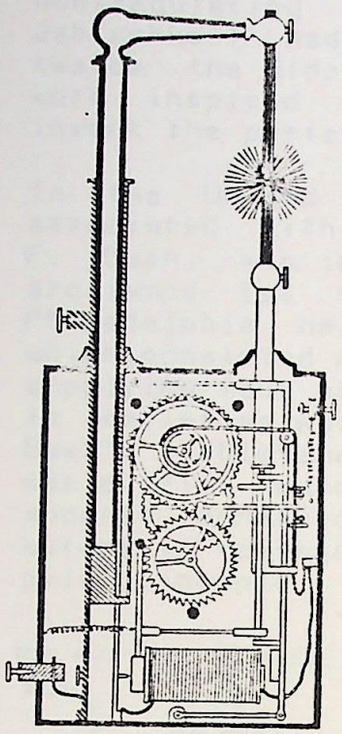


Fig.7 - Serrin arc-lamp -1857.

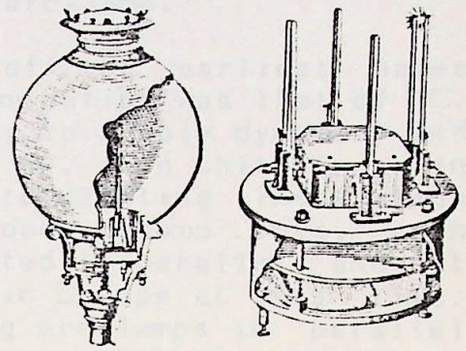


Fig.8 - Left- Jablochkoff's candle arc-lamp using two parallel carbon rods. Right- Jablochkoff's four-candle-lamp ,with globe removed.

Arc lamps in which the gap between the pair of vertical carbons in the same line was automaticaly regulated were expensive. The problem was however, rendered much easier by the invention of the "electric candle" in 1876 by Paul Jablochkoff, a telegraph engineer. Jablochkoff candles consisted of two parallel rods of carbon, usually about four millimetres in diamater, mounted vertically with a kaolin seperator between them and bridged at the apex by a strip of graphite as illustrated in Fig. 8. When the current was first switched on, the graphite strip was consumed and an arc formed between the two pencils of carbon which gradually burned down. With this device it was necessary to use alternating current, in order to prevent unequal consumption of the electrodes, such as occour in a D.C. Arc.

The Jablochkoff method was tested in England at West India docks in 1877, but the first small permanent installation cosisting of six electric candles fed from a single "Gramme machine", was completed at the Shoreditch ironworks of Wells and Co., in 1878. Jablochkoff was fortunate in that he had secured immediate and substantial financial support in Paris.

His designs were developed and the lamps marketed by the "Societe General d' Electricite", an organisation responsible for carrying out many of th early English instalations. By 1881 the number of Jablochkoff candles in service is disuse as the inhert defects of a non-regulating lamp become more aparent. Yet Jablochkoff had successfully taken the first step twards the wide diffusion of electric lighting. His work inspired numerous competitors in attempts to invent the perfect low-current arc-lamp.

In the United States, one of the earliest names associated with elctrical illumination was that of C. F. Bush, who in 1878 was ready to supply dynamos and arc-lamps (as shows in Fig. 9). In this year in Philadelphia he completed an arc-lighting instalation which consisted of five independent dynamo sets, each supplying four arc-lamps connected in parallel, and not in series as was the practice in Europe at this time. Bush's achievement in operating arc-lamps in parallel was a prime reason for the success which he enjoyed, a success enhanced by his intorduction in 1879 of an automatic voltage-regulator, which worked on the carbon pile principle - as shown in Fig. 10.

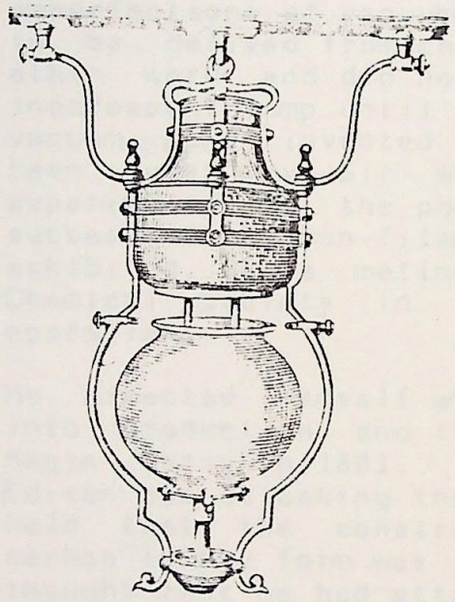


Fig.9 - Brush arc lamp -1880.

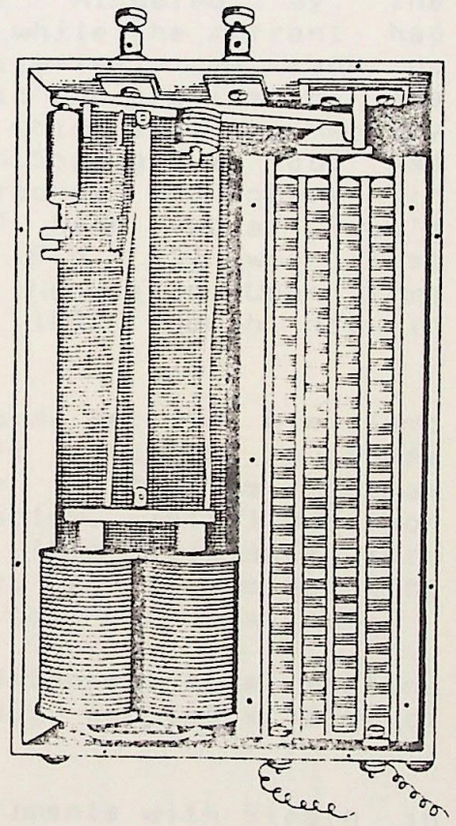


Fig.10 - Automatic regulator for Brush arc-lighting dynamos -1880.

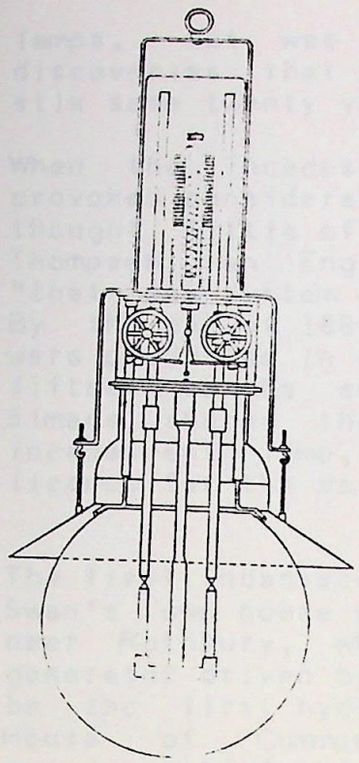
(ii) The Inadescent Filament Lamp.

Although Joseph Swan had been familiar since 1847 with both the primative filament lamp and the then more promising arc-lamp, he was convinced that the future of electrical illumination depended upon the perfection of the former. Pursuing his own investigations, he came accross a patent of 1845 taken out on behalf of J. W. Starr, who claimed "that the application of cintinuous metallic and carbon conductors, intensely heated by the passage of a current of electricity, to the purpoe of illumination". Starr used a thin sheet of platinum foil or carbon and remarked that when carbon was used, "it should be enclosed in a Torricellian vacuum". Swan was probably aware of the short life span of lamps made with platinum filaments, and the idea of using an incadescent carbon filament in a vacuum appealed to him. Soon he succeeded in making strong and flexible strips of carbonized paper, and in the following years was able to render an inadescent strip of carbon about 6.5mm thick and about 30mm long. This lamp, made in 1860, still had only a short life, but Swan had learnt that success was un-attainable so long as high exhaustion of the bulb was hindered by the imperfections of vacuum-pump and while the current had to be derived from chemical batteries. He took up other work and did not return to the problem of the incadescent lamp until 1877, by which time the mercury vacuum pump invented by Hermann Sprengel in 1865 had been used by Sir William Crookes and ohers in experiments on the phemomena of high vacua. Swan's successful carbon-filament lamp (Fig. 12) was first exhibited at a meting of the Newcastle Upon Time Chemical Society in December 1878 though not in operation.

He directed himself wholly towards getting his lamp into production and this for all practical purposes began early in 1881. Meanwhile in America, Thomas Edison was attacking the same problem. Initally Edison held that the construction of lamp filaments form carbon in any form was impossible, and at one point he thought that he had attained his goal with platinum.

However, by the end of 1879, Edison was experimenting with carbon, and later, in 1880, adopted strips of bamboo suitably carbonised.

Swan, during his initial experiments with Stearn in 1877 had discovered that his carbon filaments retained air, which was released by their first incadescence. This caused early deterioration of the filament and



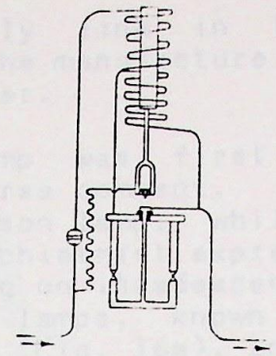


Fig.11 - Crompton's arc-lamp -1880. The regulator is seen above and feed mechanism below.

blackened the interior of the bulb. To overcome the defect Swan initiated and patented the practice of rendering the filament incadescent during exhausting before sealing the bulb.

Swan, being not entirely satisfied with his mercerised cotton thread filaments, felt that it should be possible to design a more uniform filament from a non-fibrous material. Further research led him to adapt a plastic substance, such as nitrocellulose dissolved in atetic acid, and to extrude it as fine threads through metal dies, under pressure. This process not only revolutionised the manufacture of carbon-filament

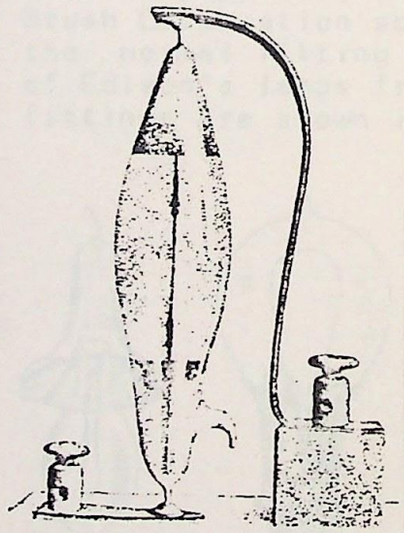


Fig.12 - Swan's experimental carbon-filament glow-lamp, publickly exhibited in 1878.

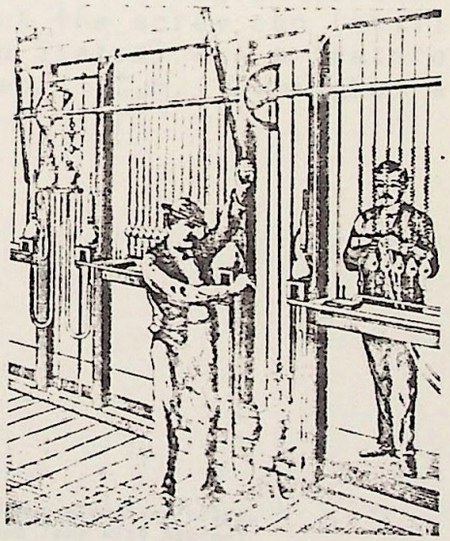


Fig.13 - A mercury air pump used in a lamp factory -1883.

lamps, but was an early link in the chain of discoveries that led to the manufacture of artificial silk some twenty years later.

When the incadescent lamp was first exhibited it provoked considerable adverse comment. Some Americans thought little of the Edison lamp, while Silvanus P. Thompson, an English psychiatrist expressed the view "that any system depending on incadescence will fail". By the end of 1880 Edison lamps, known as "burners" were producted in quantity (Fig. 16a), and in the first fifteen months some 80,000 were sold. Yet, Warner Simens shared the uncertainty in the future of the incadescent lamp, and declined to take up a European licence for the development of Edison patents.

The first indadescent lamp installation, after that of Swan's own house was in Sir William Armstrong's house near Rothbury, where current was obtained from a generator driven by a water turbine. This was said to be the first hydro-electric plant in England. The House of Commons, had enjoyed the amenity of incadescent electric lighting since June 1881. Also in 1881, the first British ocean going ship to be provided with the new lamp was also equipped. Shortly afterwards, lighting systems were instaled in some royal navy ships and also on some trains on initial trials. One of the most remarkable instalations compl1ted at the end of 1881 was that of the Savoy Theatre, London, where according to Swan's account, the stage was lit by 824 lamps. A further 370 lamps were used in other parts of the building. Among the public buildings to adapt Swans lamps in 1882 were the Mansion House, the British Museum, and the Royal Academy.

The bayonet cap bulb, which became characteristic of British practice, was introduced by the Anglo-American Brush Corporation about 1884, but the screw cap (still the normal fitting in the United States) was a feature of Edison's lamps from the outset. C.H. Gimingham's fittings are shown in Fig. 17.

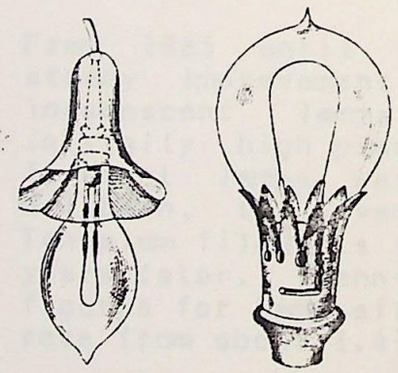


Fig.14 - Left- Lane-Fox glow lamp -1881. Right- Lane-Fox brush lamp with bayonet cap -1884.

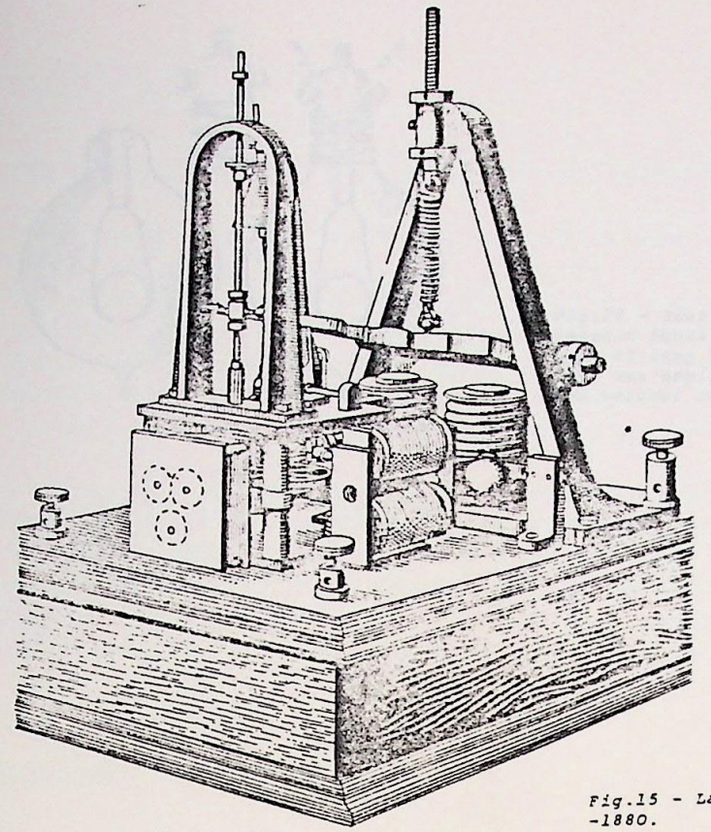


Fig.15 - Lane-Fox integrating energy unit -1880.

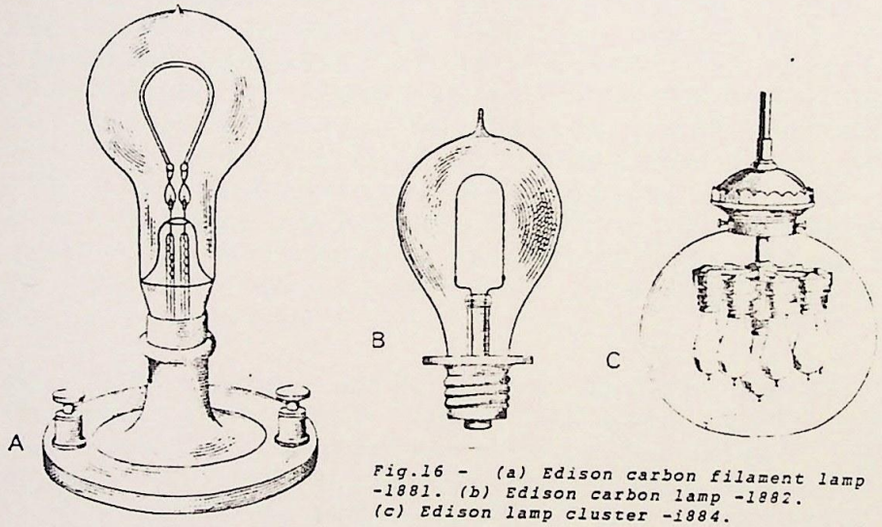


Fig.16 - (a) Edison carbon filament lamp -1881. (b) Edison carbon lamp -1882. (c) Edison lamp cluster -1884.

From 1885 until the close of the century there was steady improvement in the technique of manufacturing incadescent lamps and a gradual lowering of the initially high production costs. Successful osmium-filament lamps were introduced in 1898 by Aver Von Welsbach, the inventor of the incadescent gas-mantle. Tantalum filaments followed in 1905 and tungsten a few years later. Technical improvement is reflected by the figures for lamp-efficiency, expressed in lumens which rose from about 1.4 in 1881 to 4.0 in 1900.

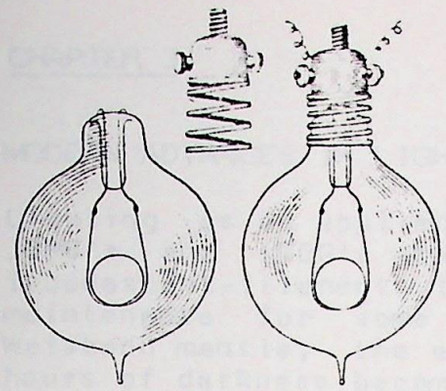


Fig.17 - Swan carbon filament lamp, showing contact hooks and spring loaded holder. This type of lamp holder, devised by C.H Gimingham, was employed until the introduction of the bayonet cap -1884.

CHAPTER 3

MODERN ADVANCES IN LIGHTING TECHNOLOGY

Lighting as an applied science was founded during the 1890's and 1900's when, with the development of the incadescent-filament lamp, the carbon arc, and the maintenance for some years of the supremacy of the Welsbach mantle, the extension of the working day into hours of darkness became possible. A massive expansion in artificial lighting technology resulted.

Lighting technology was advanced partly by unskilled and semi-skilled inventors and mechanics, and partly by trained psychiatrists and engineers who explored basic principles. The first group produced rapid results, while the second developed the theoretical knowledge upon which subsequent technology could be based.

FIXTURES AND VOLTAGE

The first requirement was to accommodate the light bulb where it was required on the ceiling, desk or wall. The Edison screw-lamp terminal (male) and power outlet (females) probably had as important an effect upon the development of lighting for domestic and industrial use as any other single invention. All that was required to instal electric lighting was for an electrician to fix the Edison-screw power outlet to the apropriate wall or ceiling surface with the necessary twin wires back to the supply terminal and then for the householder to screw into it a light bulb with an Edison screw cap.

Installation was safe, simple and reliable. Individual switches for each room and each lamp soon became sufficiently in-expensive to be universal. Controversy arose, not yet settled today, over the best method of distribution to avoid accident by electrocution. The same amount of light can be generated by a lamp carrying a small current (ampres) but subjected to a high electrical pressure (voltage), as would be given by a different lamp carrying a much heavier current but subjected to a lower voltage. It is much cheaper to distribute electricity at a high voltage, because the current can be less and hence the amount of expensive copper in the conductors can be reduced. On the other hand, the risk of death by electrocution is greater at higher voltages, and experience unfortunately showed that. In spite of instructions, people would occasionally touch the two terminals of the electrical supply together and subject themselves to full

electrical pressure. In the United States a decision was taken to supply households at no more than 110 volts. This meant that the distribution network had to be heavier and therefore more expensive. The United Kingdom, on the other hand, decided to use 200 volts, thereby approximately halving the cost of domestic distribution but considerably increasing the risk. Over seventy years neither country has seen fit to make a change. After a period of uncertainty, the whole of Europe followed the British rather than the American lead.

SAFETY DEVICES

All forms of electric lamps are liable to failure, sometimes immediate, sometims catastropic. Gradual failure only results in loss of light which may often be imperceptible over a period. Modern discharge lamps for example, last indefinitely but slowly loose their light output. Immediate failure, such as the breaking of the filament of an incadescent lamp, causes no more than temporary inconvenience. Sometimes however, a filament lamp or discharge lamp may fail, probably due to manufacturing flow, in such a way as to give rise to a surge of current against which the distribution system must be protected. Every circuit must have some form of fuse or contact breaker to cut off the current if it exceeds safe levels. With a fuse one need only detect the cause of the fault, remedy it, and replace the fuse. The contact breaker is a swich is tripped by an access of current. It can be reset at once without providing another fuse. The past pattern was to use fuses in domestic circuits and contact breakers in larger installations where a professional electrician was available to detect the cause of failure before re-setting the contact breaker. Modern usage relies on the circuit breaker.

DIRECTING LIGHT

The next stage in the development of lighting devices was to provide means by which the light from the electric lamp could be directed where it was wanted. At this point, the technology of lighting for seeing and lighting for effect parted company. In the first type of lighting, it is not desirable for the light source to be visible. Instead maximum light is directed onto the work and none allowed to escape elsewhere. In lighting for effect, however, it is sometimes desirable to see the source for its brilliance: in particular, the light is directed to

create effects, modelling, shadows, reflections, and high spots without considering wheather people can see to read or work. The lighting in a church, for example, maybe designed to enhance the appearance of the architecture.

To achieve lighting for seeing, two principles of optics - reflection and refraction, were used, either separately or in combination. Light, when received at a smooth polished surface is reflected in a predictable and calculable way. Likewise, light received at the (indident) surface of a transparent medium, such as glass, is changed in direction (refracted), and if the other (emergent) surface of the glass is not parallel to the first surface, the emergent ray of light is changed in direction. Thus by suitable choice of incident and emergent surface light can be refracted into any desired direction. The principle of lighting devices employing reflection or refraction is therefore to wrap such a reflecting device (mirror) or refracting device (lens or prism) around as much of the light source as possible, collecting all the light omitted in unwanted directions and re-directing it where desired.

Both forms of device can be used for a multiplicity of purposes. The search light reflector and the lighthouse refractor are both designed to concentrate the maximum intensity in the desired angle but for different purposes. The searchlight concentrates the light in order to illuminate and make visable a distant object. The lighthouse, on the other hand concentrates the beam to permit the maximum visability of the source itself from the greatest possible distance.

In the home, factory or office, on the other hand, a narrow concentrated beam is rarely required. The purpose is to illuminate the whole of a writing desk or an entire working area. Such lighting devices, therefore, must produce a wide but uniform beam, since it is irritating and fatiguing to work where light is bright at one point and dull at another. The lighting engineer aims at uniformity of illumination and uses reflector contours that calculation and experience indicate will give the most satisfactory result.

High skills were soon brought to bear on the design of optical controls for light, particularly in such areas as hospital operating theatres, where the maximum amount of entirely shadowless lighting is directed onto the surgeons task; or in street lighting, in which light omitted from a small source is directed along a narrow band of street and sidewalk with perhaps 60 metres between adjacent lamp posts. Street lighting equipment in particular has made use of refraction as the conrolling principle, in part because of its

greater accuracy but chiefly because the refractor units could be made in the form of glass bowls or dishes that could be tightly sealed to the lamp holding device to keep out weather and insects.

For interior lighting, however, the need for precise optical conrol progressively diminished as light became cheaper and more plentiful because of the more efficient generation and distribution of electric power, and because lamps became more efficient in producing light rather than heat. Interior lighting is now a matter of lighting the whole environment instead of only the working task. Fixtures have employed new methods of controlling light, such as the use of optical diffusion. Special techniques were developed, first in Central Europe and subsequently elsewhere, that permitted a white opal glass to be blown into attractive shapes, such as spheres and cylinders, in which the lamp could be placed as part of the fixture and its light diffused to give a uniform white-light source of large size and pleasant appearance. The Bahaus School of Architecture and Design in Germany under Walter Gropius combined with the skill of the Central European Glassmakers revolutionized interior lighting design during the 1930's. Other diffusing materials have since supplanted glass, and hence there exists an immense range of plastic diffusing light fixtures of all possible shapes and sizes. The reflecting light fixture still has its uses in general room lighting. A contemporary fashion among architects is to inset lighting into ceiling and direct it through small holes, almost invisable during the day; this has led to the development of ceiling - inset spotlights, which use all the old skills of the light-reflector designer.

THE LIGHTING DESIGNER

The most essential tasks of the lighting designer are to spread adequate light on the work for efficient and comfortable seeing, and to light the environment so that people can see well and enjoy what they see. The determination of the amount of light necessary for efficient and comfortable seeing is a matter for the specialist in psychological optics and in the relation between lighting and seeing. Experimental work in Britain, Geramny and the U.S. showed that visual performance could be analysed into three basic factors; sharpness of vision (visual acvity), detection of contrast, and detection of moement. International agreement was eventually reached on a method by which necessary levels of lighting for specific tasks could be prescribed. By breaking down a visual task - for

example, that of threading a needle - into its component parts, the amount of light necessary for efficient and comfortable seeing could be prescribed. This prescription forms the basis of the codes of recommended lighting practice that have been adopted in most countries.

The factors governing discomfort from bright light sources are also known and a glare prescription can be written, called a visual comfort index in the U.S. and a glare index in most other countries. Codes of lighting practice can therefore lay down the glare index based on the levels of tolerable brightness of lighting devices in their particular environment in order to avoid discomfort from glare.

It must be kept in mind that the eye can adapt to the kind of lighting in which it finds itself. The level of lighting by moonlight for example, is one 1,000,000th of that by sunlight, and yet the human eye can adapt sufficiently to moonlight to perform many tasks. This adaption to light not only affects the range of brightness but also has a profound effect upon the sensation given by any particular physical amount of light. A surface of a certain brightness (luminance) seen in a very dimly lit street at night, for example, will appear very bright, where as a surface of the same brightness (luminance) seen in daylight looks like a very dark shadow. Lighting designers must take this into account. Thus it is not physical brightness, but apparent brightness that determines the subjective effect. Thought apparent brightness is the ultimate criterion for the designer, experience and existing technology let him undertake almost the whole of his lighting design in terms of physical measures.

CURRENT INTERIOR LIGHTING PRACTICE

Interior lighting in most courntries tend to follow similar patterns, dictated by the availability of light sources, by architectural fashion, and by the special lighting requirements of the task or the environment, or both. The amounts of light now considered necessary for efficient and comfortable vision are very much higher than they were even ten years ago. Lighting levels have in fact increased up to 50 fold in the last 50 years. This is not because human sight has deteriorated. Ample evidence indicates that in spite of the fact that more people now wear spectacles than ever before, human sight remains much what it was in the past, and there is certainly no deterioration due to the use of artificial light. It is simply that

people demand perfect vision and thus wear correcting glasses for minor visual defects that were previously neglected. In the same way, people want to be able to see excellently everywhere, where as previously they were satisfied to move closer to the candle or oher light source, to read or perform other tasks.

Dwellings:

Light installed by a skilled lighting designer and or decorator can do much to create the character of an inerior environment. In modest homes, a central pendant fitting suplmented by one or two wall fittings or perhaps desk lamps or free standing floor lamps, remained in th 1970's, the best way of achieving good lighting on sound visual principles with the greatest economy.

The eye functions most efficiently (with greatest visual acquity and comfort) when the task is lit to a slightly higher brightness than the immediate surroundings, which in turn should be slightly brighter than the general environment. This standard is usually achieved in a home when a moderate level of general lighting is provided from a central fixture and a high level of working light from a desk or floor lamp. The use of a desk lamp alone in a room very often proves to be less satisfactory, because it leaves most of the room too dark thus giving rise to visual fatigue.

Recognising this, the Illuminating Engineering Society of the United States, as long ago as the 1930's, designed a study lamp which provided both working light on the desk and general light in the room: this unit is probably still the most efficient lighting fixture for the economic lighting of working rooms in dwellings.

Flourescent lighting has not yet found its way into homes to a great extent, apart fom utility areas, such as kitchens and bathrooms. This is partly due to the large size of the lamp, which is out of scale with normal rooms in small houses, and partly to the fact that the light which is emits is less compatable with the social character of dwellings than the warmer, yellower filament lamp. People apparently do not want to prolong the colour of dalight into their social lives after dark.

Lighting for telvision viewing has been a source of some controversy, but it has been demonstrated that people with normal sight can light television - viewing rooms as they please without harming their eyes, though eye muscles may become fatiqued more quickly in a

darkened room. The colours of a coloured television screen are adulterated by too much white light falling upon the screen and so, for watching colour television, the level of light should preferably be somewhat less than that for watching black-and-white. Lighting for television is more a matter for common sense and setting the light as the viewers want it, avoiding annoying reflections.

Persons with subnormal sight, however, my need care in the prescription of lighting for television viewing.

Offices:

Ceiling-mounted flourescent lighting is used in offices to create a uniform level of light over the whole of the working area, allowing maximum flexibility in office arrangement. The levels provided range from about one fifth to one tenth of the light from a natural sky. This apears to be about the optimum requied for work on white paper. Improvements in the colour of flourescent lighting are constantly being made, and the distortions in the appearance of the human complexion have been largely overcome.

The concept of office landscaping, created in West Germany has emphasised the need for a uniform level of lighting over the whole working space. The essence of the office landscaping principle is to permit every task to be placed anywhere in the office space and planned in relation to the flow of work demanded, and, for this, uniform lighting is essential.

Lighting practice in ofices nowadays sometimes makes use of the principle of permanent supplementary artificial lighting of ineriors (P.S.A.L.I) originating at the Building Research Station in England, in which the light from the windows and the light from the artificial - lighting system are planned together as part of an integrated whole. Before this, the artificial lighting was planned primarily for operation after dark, while the windows provided the working light during the daytime and had to be very large if light was to penetrate into a large deep office. P.S.A.L.I., means that windows no loner must provide all the working light during the daytime but are important simply because they provide a view and an awareness of the world outside. P.S.A.L.I., has been developed primarily in Britain and the Scandinavian countries and, to a lesser extent, in continental Europe. In the United States the contrary tradition has developed, of working by artificial lighting entirely, by day as by night, and even drawing blinds over the windows by day to eliminate glare.

LIGHTING IN DECORATION

The development for practical household use of a new source of illuminant seldom produced new "vehicles" for it at once. Older styles were changed and adapted to it but gradually new designs were created, as new as the new illuminant. Fortunately the technical requirements for the use of electricity were easily adaptable to older styles of lighting fixtures and we can achieve the benefits of good lighting without sacrificing the period atmosphere. Many of the older styles ´designed for candles and oil are apropriate for all but the most modern settings and are still being produced in large quantities. We may recognise contemporary furniture as a style which tends to recall various periods, but does not hesitate to adapt and change it in the light of more convenience, and new ideas. This is equally true of lighting, especially of lamps which can and are made from practically anything from a piece of driftwood or a flower vase to a statuette or an old riding boot. The saying goes, "if you can't eat it or sit on it, you can make it into a lamp", but except for a temporary instalation, most of us are happier with a certain amount of beauty and dignity in anything as prmanent and important as our lighting fixtures.

Fig.19 - Informal lamp with oil-font.

Fig.20 - Modern informal lamp;

With the advent of electricity, fashions in lighting have followed very definite trends and offered infinite possibilities. For a number of years, rooms were lit by a central ceiling light and permanent side brackets

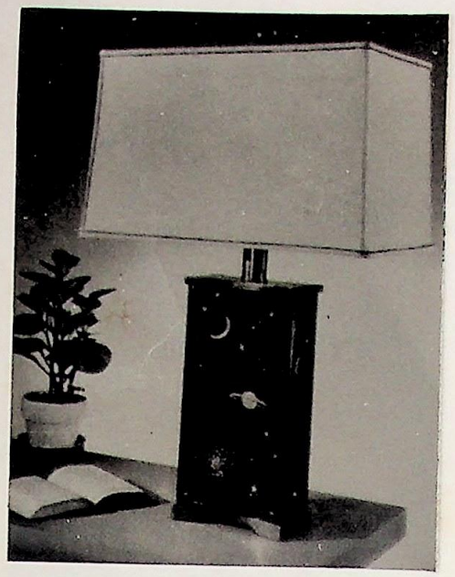


Fig.21 - Bent glass in a timeless design. *Fig.22 - Bent glass lamp for modern formality.*

at strategic intervals around the walls. Later the side lights were eliminated in favour of more desk lamps which could be moved around the room and gave more direct light for reading, as well as being decorative. Soom the overhead centre light was omitted entirely and lamps supplied the only light in many rooms, except for an occasional "torcher" which threw the liht towards the ceiling.

Fig.23 - Hand-made lamp look goes modern.

Fig.24 - Provincial and colourfull lamp.

Today lighting, almost more than anything else in the decorating field, has been subjected to thorough scrutiny and consequent revision. Lamps are retained but we insist on directing their light upwards, downwards, and outward, or all these at once, depending on the need and the effect desired. We are conscious of the relation of artifical light to eyesight and demand the maximum of comfort, convenience and effectiveness.

Fig.25 - Strictly modern lamp.

Fig.26 - Functional lamp.

The ideal situation would be to have the same light in a room at night as during the daytime - not too much and not too little. To do this the light should be diffused where it is concentrated or the source hidden entirely. The first problem can be solved by diffusers placed below the light bulbs and perforated baffles which can be inserted above the bulb. There was no further reason why someone should be blinded physically or aesthetically by the glare of a naked light bulb.

Electricity can no longer be called a modern invention, but great strides have been made in recent years in improving our use of electric light. Modern lamps and fixtures, however, do not seem to draw their inspiration entirely from modern design, nor are they limited to use in modern interiors. There are many examples of heavy and light, formal and informal, sophisticated and countrified decorative effects. The effect is the final criterion in choosing our lighting fixtures, plus their capabilities to give us the light that is essential.

Lamps are possibly the most important of all lighting fixtures because they figure so prominently in the

decorative scheme and are portable, where-as ceiling and other installations are permanent and are less likely to be changed by those who rent appartments or homes. For these reasons, lamps must be carefully chosen to harmonise with the decorative scheme of a room and fulfill the lighting needs.

Lamp design variety is seemingly endless and it should not be difficult to find a lamp that is the proper size, style, and material for a room, by day as well as by night. When selecting lamps, it is a good idea to make a rough plan of the room, circling groups of furniture which need illumination. This enables one to determine the number and type of lamps needed. It is recommended that table lamps should be used where possible, substituting floor lamps in areas where there are no tables or cabinets but taking care not to create a forest of ironwork.

A table lamp should, of course, be in proporation to the table on which is to be placed. A massive lamp does not belong to a delicate table anymoe than a tiny lamp belongs to a huge table. Certified end table lamps are designed for the average end tables and will be the proper size, but if one is measuring their own, or making new lamps, the rules are simple. The base of

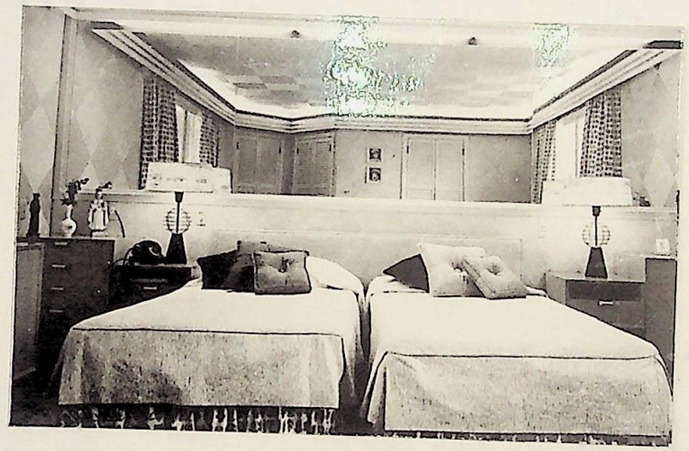


Fig.28 - General lighting from cove in ceiing with lamps at bedsides for reading.

a table lamp should be tall, level with a person's eyes when sitting on a chair. For the best placement, the lamp sould not be more than one foot away and in line with the shoulder. In this way, light does not glare into the eyes but will be focused on reading material, sewing or whatever task is at hand. Very often for specific tasks, such as sewing, piano playing or study, adjustable or swivel lamps are especially usefull if not as decorative as other types.

Lamp bases are made of a variety of materials - china, pottery, wood, metal, and plastic to mention but a few. Obviously the lampshade must be in accord with the base. A square base looks best with a square shade and an oval or round base takes a circular one. Bell shaped shades, either square or oval go on lamps of carved lines or for a soft effect. Drum and cylinder shades complement "modern" and straight lamps for a tailored style. Exotic pagoda, umbrella, or hourglass shapes are eye catching, but in-questionably tasteless except for a passing fancy. As for size the shade cannot be too large or it will dwarf the base; too small or it will make the base appear huge and heavy.

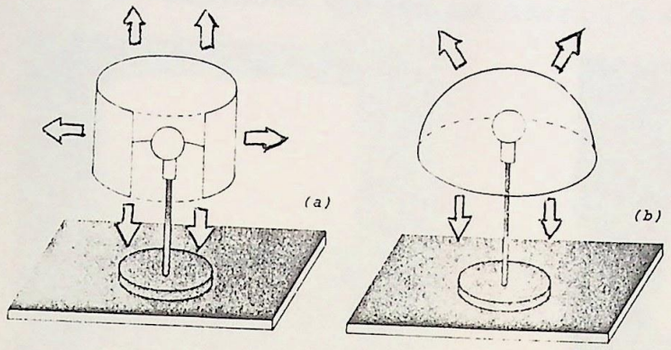


Fig.29 - The four principle types of table-lamps. (a)cylinder translucent shade. (b) Hemispherical translucent shade. (c) Angle poise. (d) Adjustable spotlight.

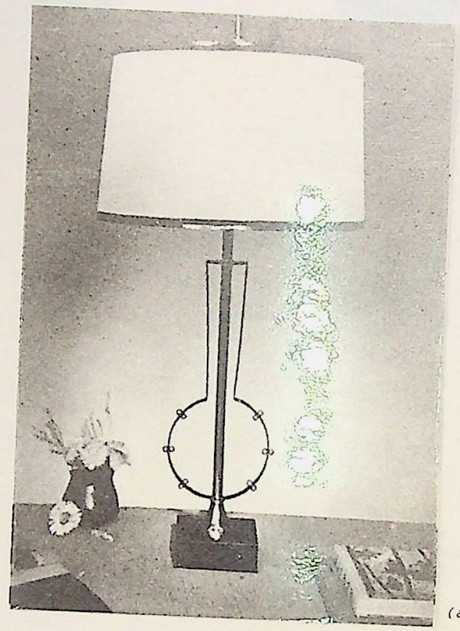
"A well proportioned shade has a diamater accross the bottom that is about two thirds the height of the lamp".

Aside from consealing the mechanism of actual lights, the shades main purpose is to shield your eyes from the glare of naked bulbs. Generally speaking, shades should be as plane as possible in solid colours, through occasionally a patterned shade is permissible, especially on an opaques shade. To tie a lamp in with the colour scheme of a room, one might use a simple trimming which repeats one of the main or accent colours of the room. It is best to avoid strong colours in transparent shades because the coloured light that filters through them will distort your colour scheme. When you want accent colour, use an

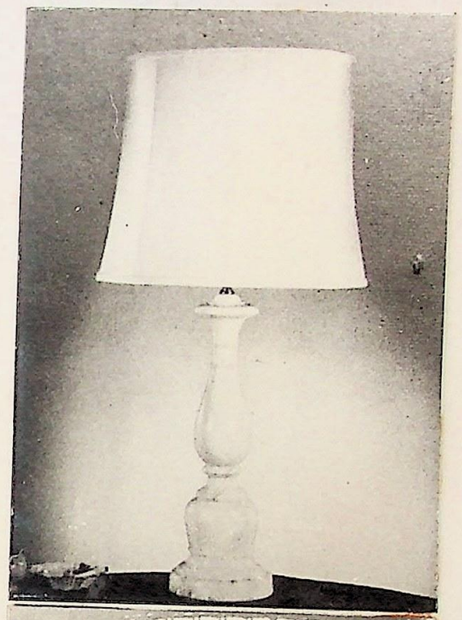
opaque shade, which is also the best choice for a lamp against a dark wall, as it will not stand out in contrasting brightness as a luminous shade dose.

Transparent shades of silk or cotton, plastic and thin paper or parchment give more general light in a room and make it brighter and gayer. Opaque shades of heavy dark paper, leather or metal throw the light downwards in a more dramatic effect and are useful where the room arrangement is such that many lamps are required.

Sooner or later almost everyone has the desire to turn some "objet d'art" into a lamp. It may be a treasured vase, a piece of driftwood brought back from the beach, an old fashioned coffee grinder, a duck decoy or a tea



(a)



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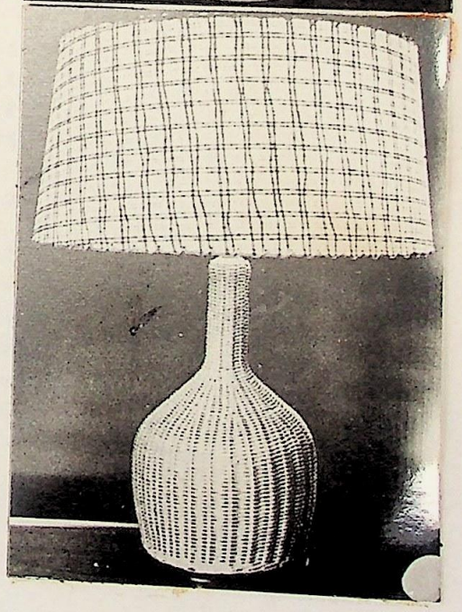
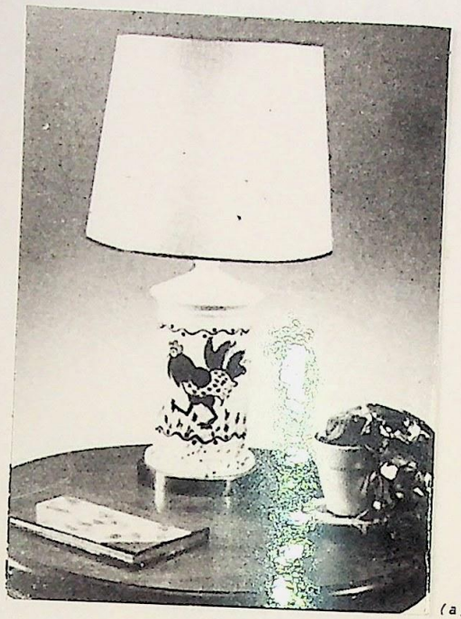


(c)

Fig.30 - (a) 28 inch table lamp with white parchment drum shade. (b) 23 inch alabaster lamp, with tissue-shanting bell shade. (c) 24 inch wicker lamp

canister, army boot, or baby shoe. The list is as endless as the imagination. Some of these tendencies should be curbed, however, by giving a little thought to the placement of the lamp after its creation. Therefore before proceeding to make a lamp from a favourite ornament, one should decide wheather the article in question will be improved when it is turned into a lamp and consider wheather there really is a suitable location for the lamp.

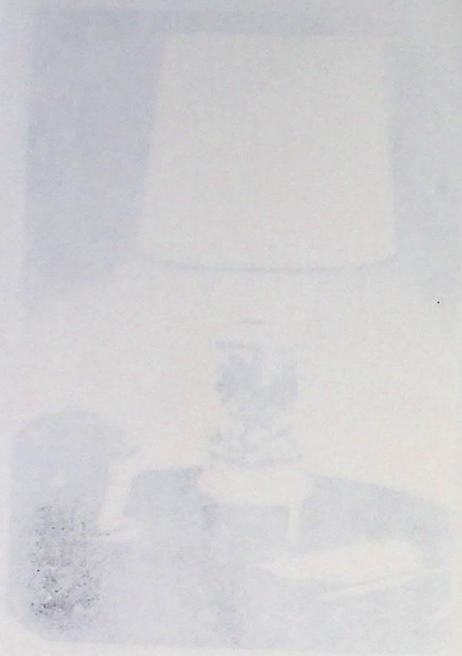


(a)

(b)

Fig.31 - (a) China jar mounted on brass base with textured fabric shade.(b) "Study in potatoe mashers" on wooden base with dark paper shade.

Tall lamps usually take open-top shades, since these are best for distributing light. Low lamps, with shades below eye level when you are standing, however should have baffles or some arrangement to diffuse the light and conceal the bulbs and fixtures which are most unattractive to view. In all cases, shades must be deep enough to cover the bulbs and fixtures and wide enough to prevent any possibility of the bulb touching the shade or causing an unsightly dangerous burn on the shade. Translucent shades should be heavy enough to keep lighting bulbs from showing through. This can be done with a lining, either white or matching the outside. White linings, even for dark opaque shades, will reflect much more light than dark ones.
Although a pair of lamps is often excellent for balance in a room, it is not necessary or even advisable to do much matching of lamps. Variety is achieved by using several single lamps which harmonise with each other.



Shades may be related in design without being repetitious or monotonous. Transparent and opaque shades can also be used in the same setting with good decorative results especially when considered from the point of view of daytime appearance. Dark shades go well in a room that is predominantly dark in background, while light shades are more in keeping with a pale colour scheme. The important thing with lamps is that the light which they provide must be easy on your eyes.

CHAPTER 4

ART NOUVEAU LIGHTING DESIGN

That era in the decorative arts now known as "Art Nouveau" provided, on the one hand and coincided wi'', on the other, the two ingredients that were to mak it the single most creative period in the history of domestic lighting. This was due, first, "to the philosophy within the decorative arts that was to spawn the 'New Art' moement: tired of, and exasperated by the dull pretensious of revivalism that had been the norm throughout most of the 1800's, "fin-de-siecle" designers decided, once and for all, to slough off such artistic bankruptcy. The "ancien reigm", if only in the aplied arts, was, as Edmond de Goncourt wrote, to be "tumbrilled and quillotined". The term "Art Nouveau" became, therefore, the international battle cry of common discent, allied to the attempted dissolution of the then hierarchy of major and minor arts, of artist and craftsman.

For these modernists, the new broom swept clean. That hotch potch of interior design and ornamentation known as "electicism" was "out", and "in" were totally integrated interiors, and such was the preoccupation with harmony - from a building's facade to the colour and shape of its furnishings, to the very key escutcheons on its doors - that everything had to be compatable. Even the architects of the stature of Gaudi, Horta, Van de Velde, and Guimard found themselves designing objects which would normally be regarded as being well beyond the boundries of their profession: hairpins, jewellery, bibelets etc.

It was this carving in the new aesthetic for unity which became the major constant of Art Nouveau in all its Manifestations and which led so many more turn-of-the-century "creators" (achitects, artists, artisans, and interior decorators) to design light fixtures that would be normal in ay one period. "Everybody", seemed, at some stage to have designed a table-lamp, chandelier, candlestick or wall-bracked (for a lamp). The main reason for this may be the fact that lighting constituted in effect, the lowest common denominator of such a pursuit of congruity: whereas certain furnishings suited to the design requirements of a particular room were not similarly suited to those of others, all rooms required a means of illumination. No other feature of interior design, such as chairs or cabinets, was as fundamental or as indispensable to every room as was its lighting.

Another contributing factor was the concidence of the birth and first wobbly steps of the infant electricity. Between the need for Art Nouveau exponents to provide light fixtures, and the discovery that the incadescent bulb, so newly commercialised, would as magically liberate them from all the design constraints imposed by combustion lighting as it would magically glow, lay the preoccupation ith lighting between 1895 and 1905. Not only "designers", but sculptors, glass artists, ceramicists and metal workers joined in the pursuit of the new discovery.

Interpretation of is best application varied accordingly - the Belgian Philippe Wolfers, for example, used it to heighten the jewellery - like effects of the enamel "eyes" in a bronze peacock as illustrated in Fig. 32 below.

Fig.32 - A marble and bronze group called "La Fee au Paon" (peacock fairy).Electric bulbs are positioned in the peacocks tail so that the light rays are transmitted th-rough the"eyes" to produce a heightened effect normally associated with jewellery.

Philippe Waffers principally practiced as a jeweller until 1904 when he turned to sculpture. His contribution to Art Nouveau lighting was probably limited to the lamp illustrated in Fig. 32 (peacock fairy) and one other caled "caress of the swan" which is of similar inspiration. Totaly non-functional, the bulbs positioned in the peacock's tail (Fig. 32) show how quickly Wolfers had adapted the new electricity to

his aesthetic needs. No form of combustion lighting would have allowed the incorporation of a consealed light source in this manner.

With reference to the work of Wolfers and also that of the Franch Sculptor, Emmanuel Fremiet, a heading critic wrote an article in a publication on lighting "movilr et Decoration" in 1927 that so desperate were the approaches to home illumination in lighting's embryonic years that "its main feature was its non-functionalism", which is probably very true. The incadescence that Louis Tiffany obtained in his Favrile shades was due to the light rays being intercepted and trapped by the opalescent glass in order to highlight the latter's innate luminosity.

Fig.34 - A silver-bronze and favrile glass student oil-lamp.

Fig.36 - A sixteen-light Lily table-lamp.

Whereas the effect was incomparable from an aesthetic stand point, only those rays that escaped downwards were of any practical use. Tiffany concentrated on the art of lighting (as against the science of lighting which was an Art Deco pursuit), for which he found the contemporary commercial glass that he first purchased from Louis Heidi and other Brooklyn "glass-houses" to be totally inadequate. From this he began his own research to create in glass those effects, for example, iridescence, mottling and incadescence, which he desired. It is for his favourite shades that Tiffany is best known. An example of which can be seen in Fig. 34. These can be divided into two general categories - those of floral and those of geometric design. The former includes a great part of the botanical kingdom - for example, the peony wistaria, pansettia, rambling rose, and woodbine. The latter often incorporating

turtleback tiles or glass jewels as a decorative "fillip", rely on fundamentally sound geometry allied to the inimitable qualities of translucency in the glass. The individual pieces, in their lattice of soldered copper foil, resemble enamel when seen by reflected light (i.e. when light is off) and a latticed, stained-glass window appearance when seen by transmitted light. By and large, Art Nouveau lamps generated more heat than light.

Fig.37 - A small table-lamp in the form of a palm-shoot, bearing on its base the inscription "La Verite Comme une Lampe"(truth will shine like a lamp).

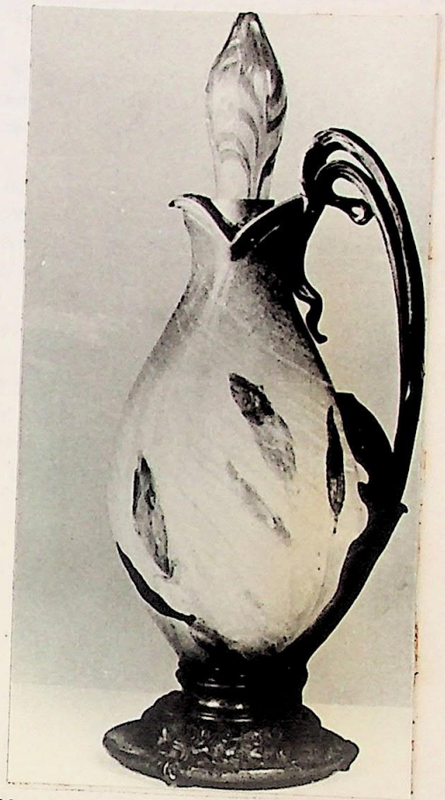


Fig.38 - A Cameo Flagon table-lamp bearing the inscription "Lumiere' tu ne seras pas eteinte" (light, you will not be put out).

For the motifs of their light fixtures, most Art Nouveau designers resorted to the same range of themes that they applied to other aspects of their interior decoration. The lamps of Emile Galle (one of which can be seen in Fig. 37) for example, employ the same botanical and entomological motifs s prevalent throughout the decorative arts of the "Nancy School". Machintosh's (an architect) lamps (Fig. 39 and 40) show the architectonic interplay of verticals and horizontals so characteristic of his Glaswegian buildings. The three most common themes, e.g. lights outside Shelbourne Hotel, however, were the flower, "Woman" and the combination of the two.

The most frequently used motif for light fixtures was the flower. The floral aesthetic of 1900 and the incadescent filament bulb formed the most natural and immediate of artistic liasons. Sap-conducting stems were transformed into the metal conduicts for the wires for the electric bouquets. "Corollas" became the glass shades that shielded the viewer from the lights glare - "Calyxes" became the wax-pans for candlesticks - the "fluted corona" in such plants as the jouquil formed candle nozzles - whorls of leaves or petals acted as the reflectors for a centrally positioned bulb, or cluster of bulbs. The advent of electricity also made it possible to simulate the angle at which a flower naturally hangs - usually downwards. The design no longer had to allow for vertical flames.

Specific flowers were either copies or styalised. The entire botanical spectrum became a limitless wellspring of inspiration for artists and designers. Phantom species likewise blossomed, for example, unrecognised helitropes whose energy giving light came from within. But identity seemed not to really matter. The only criterion was that the flower should enhance, and be enhanced by, the electric light. Among the most popular of the flowers used was the convalvulus family - an electric bulb seemed almost to belong in its trumpet-shaped flower. (eg. Fig. 39). Others favoured

Fig.39 - A typical table-lamp ; in this case the young woman holds a flower in which the electric bulb is set. - by Jonchery.

were the orchid, poppy, cyclamen, and "sprays of honesty" while the Nancy School had a partiality for the cow parsley, an umbel of its native lorraine.

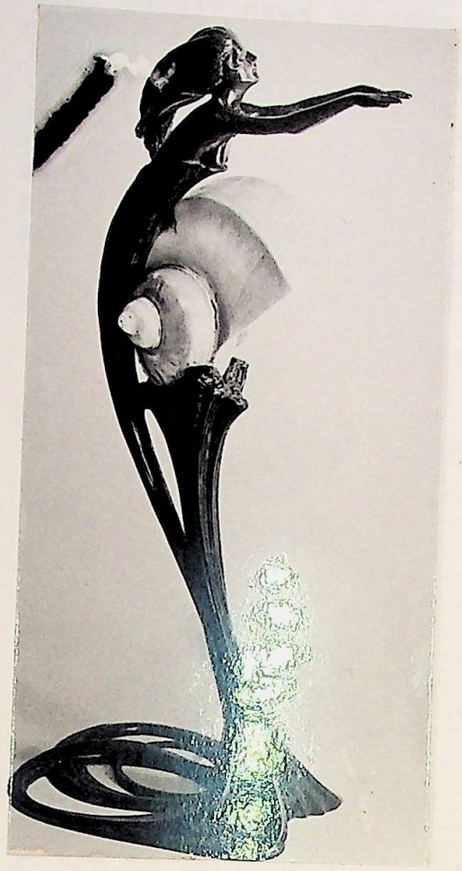


Fig.40 - A bronze and turbo Marmoratus shell table-lamp - by Gurschner.

Fig.41 - An elegant bronze table-lamp with a typically Art Nouveau housing for the glass shade - by Gurschner.

The year 1900 was both the birth of the new century and the coming-of-age of electricity, and the spectacular setting of the paris International Exposition was a fitting celebration of both events. For the five million visitors who flocked to the exposition, the "Palace of electricity" resembled something out of a fairytale. The lines of the palace (outside) were picked out by thousands of coloured electric bulbs, and vast galleries inside housed both the latest achievements of industrial technology that were powered by electricity, and sections an electric bulbs and lamps. Electricity's cause could not have been better window-dressing, and the wide range of models of modern electric lamps inside the palace and in various other displays throughout the grounds reinforced this first impression. Some of the models were discussed in an article by Gustave Soulier in "Art et Decoration" in

which the autor stressed the need for new forms for this new, repidly expanding system. The shape of electric lamps was not governed by the fuel requirements of combustion lighting. This of course was hardly news to lamp designers, but what followed must surely have been un-anticipated; soulier felt that the lamps shown at the exposition were, for the average viewer conditioned to the heaviness of gas and oil fixtures, "strangely light and stripped". Thus the public would feel that it was not getting its money's worth, either visually or literally. Yet the 1900 exposition represented, all in all, the single most successful event up to that time in the electric light's campaign to win-over the average householder.

CHAPTER 5

ART DECO LIGHTING DESIGN

For the decorative arts, World War I constituted the dividing line between the 1900 and the 1925 aesthetics. Art Nouveau had reached its highpoint at the 1902 Turin International Exposition and by 1913 it was drained of new ideas or departures. The philosophy of the 1920's, expressed in a number of parallel movements such as the Odeonesque, Jazz style, Modernist, represented the antithesis of Art Nouveau. At the 1925 "Exposition Universelle des Arts De Coratifs et Industriels Modernes" in Paris, the term Art Deco was coined and became the umbrella name for all similar movements.

It was becoming more and more apparent that simplicity was not synonymous with poverty and that civilization had also different attitudes. It is more sensative to the beauty of proportion, harmony of surface, volume and line, and more offended by obvious and exterior ornamentation. "Simplicity of design appeals to the intelligence." The characteristics of the new epoch became simplicity of line, richness of material, and "sobriety" of decor. "Beauty demanded the perfect adaptation of an object to its use".

The difference in lighting between the Art Nouveau and the Art Deco periods could hardly have been more pronounced. Gone, first of all, were the spectral delights of Art Nouveau lamps - the azure blues, moss greens, magentas and lavenders etc. In their place came the glass lamp shades relying on factors other than colour for their effect. (At that time glass was considered to have the best light-diffusing qualities required for artificial illumination). By etching, enammeling, or sandblasting the glass, the glass artist could orchestrate the light. By pressing or engraving it he could achieve sculptural effects and by combining such processes he could obtain any number of finished. In place of the spectrum there were milkiness and limpidity, infinite richness and imagery.

Gone also, to a great extent, were the major, turn-of-the-century motifs for example the flower, the volute and the insect. Art Deco exponents turned to sunbursts, crescents and the zig-zag, though such motifs were incorporated into light fixtures far less frequently than into other home objects. Even the looks of 1900 "woman", although not rejected, hardened into those of a woman of action. No longer a "lotus-eater", woman busied herself by doing things, as well befitted a member of the fast moving age of Jazz, open sports cars and air travel.

Even the materials changed. Bronze, the indisputable champion of the Art Nouveau era, fell totally out of favour. In its place were painted metal, alabaster, marble, lacqure, mirror, and sharskin. No longer was nature found to be alluring. Now designers looked to the pre-columbian pyramids at Chichen Itza and Tikal for their inspiration. Seldom before had an art movement, concieved in part by its immediate predecessor, turned so fully on this parent. In lighting, the distinction was further compounded by the new 1920's philosophy of the role that illumination was to play in modern interior. During the 1900's designers had concentrated on turning lamps into really decorative works of art. The fixtures primary function, ie. its ability to provide the required amount of light for the specific situation, had become obscured in the pre-occupation to make the lamp itself beautiful. Such non-functionalism was, to the 1920's purist, symptomatic of the whole Art Nouveau "malaise" and one to which he would certainly not himself fall prey. A light fixture had a specific and very important part to play in an ensemble. It had to ensure a logical distribution of the light - one that would meet, in each instance, the requirements of visibility and ambience. Fixtures elements were therefore to e subordinate to its lighting function. No longer were the rays to be imprisoned behind panels of opalescent glass or have to manoeuvre their way out from behind openwork bronze shades. "The light wanted to search out dark cornices, to chase away the shadows, and, above all, to be free".

The 1900 "art" of lighting thus gave way to the 1920 "science" of lighting. Lamps became simple vehicles relaying light to wherever it was needed. This explains why Art Deco lamps often appear to be upsidedown. The inverted shade's function is to project the light onto the ceiling which, in turn, softens and diffuses it. The reason that the light was reflected off a secondary source (such as a ceiling) and not seen directly, was explained by Desney in a January 1929 article in "Lux". "It is very wrong to think that a room is well-lit because one is dazzled by the intense burst of the luminous points of light. The essential, to the contary, is that there is no specific point to tire the eye".

From this it may be argued that if a lamp is solely to project the light and concentrate the attention of the inhabitants of a room away from itself, it would itself cease to be a distinct element in the interior design of that room. Lamp designers were faced with a choice, either to make their models as quietly-functional and "un-showy" as possible, or to do away with them entirely and find a means of illuminating the objects

to be viewed themselves, for example, walls, ceilins, lintels and fountains. The reason that most Art Deco fixtures continued, however, to contain a measure of ornamentation was that neither alternative was, in practice, found to be satisfactory. As lamps were still needed to provide localised light for reading purposes etc., so most designers refused to take their designs to the extremes of excessive logic to which, for example, Jacques Adnet, with his frosted naked tubes (fig. 42) took his.

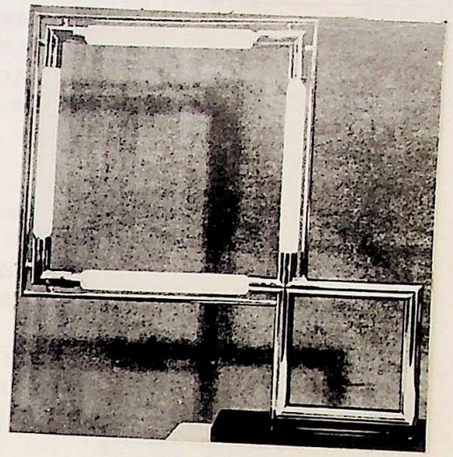


Fig.42 - Desk-lamp(1929) of tubular frosted lass and nickelled copper mount.

Based on sharp geometric design principles, Adnet's light fixtures show an exciting kineticism and spirit of invention which is heightened by the freshness that his use of nickle imparted to the design. Almost nowhere in his work is their a concession to ornamentation, the influence of contmeporary "machinisme" being every present.

On those occasion when circumstances called for the use of a visable fixture, then the latter would be visably worth looking at, and whereas, its appeal was less spontaneous than that of its Art Nouveau Predecessors, it was aesthetically more subtle. As an antique dealer in Munich recently wrote, "A good Art Deco lamp does not have to be lit in order to justify itself. It is pure form, and can exist on is own terms. Art nouveau lamps, on the other hand, had to be lit in order to exist. Light was needed to bring it to life.

So the 1920's lamp survived as an "object d'art", while its ability to meet various illumination needs was continually extended. Perzel (Fig. 43) and Sabino, for example, at various times offered no fewer than five different forms of lighting - direct, semi-direct, mixed, semi-indirect, and indirect - the subtleties of which were lost on most of their customers. The visible fixture remained as a reminder of the past, and the new fasination was with a new development ie.

invisible lighting. As M.J. Wetzel wrote in an article in "Lux" (April 1928), "It is an advantage to hide the light source, as the effect is more striking when one cannot see its origin. Hence the disappearance of bulbs into walls, ceilings, and behind pilaster where they are masked by diffuser screens".

Art Deco lighting was best seen, paradoxically, when it was not seen! Architectural lighting had arrived. Designers of both visible and hidden lighting had ample opportunities to display their creations at a "Grand Competition of Light" which was arranged in Paris in 1924 by the Syndicated Union of Electricity. In 1925, the International Exposition provided another excellent show-case. In the 1930's fine "salons of light" were held and also in 1933, 1934, 1935, 1937 and 1939.

The transition from direct to indirect lighting led to a spate of interest in this new art form. Groups such as the "Societe Pourle Perfectionnement de L'eclairage formed to gather and disseminate information for the householder on the fundamentals of hygenic and psychological illumination. The International Commission of Lighting, which had last met in 1921, reconvened quickly in Bellagio in 1927 to proclaim the new aesthetic as its own. Magazines were launched to inform an expanding readership on recent developments. The speed of which the latter took place provides the best indication of the enthusiasm that had been generated. In 1912 there were however, only three specialist lighting reviews in the world but by 1928, the one most concerned with the alliance of lighting and Art Deco was "Lux", published in Paris from 1928.

Due to its proximity to the Paris Salons, Lux quickly established iself as "the mouthpiece" on lighting while promoting, in addition, the science of photometry. The latter for long, a 'bona fide' discipline, but one that had been considered largely theoretical and thus anything other than laboratory purposes, took on a new, greatly enhanced status. Photometric units such as footcandles, lumens, lux and intensity were measured. So was transmission of light. Even the size of retinal images was recorded. This preoccupation with photometry created, in turn, a new vocation - that of the lighting engineer. The need to define, from an optical viewpoint, the brilliance of the surfaces to be lit, the distribution and accentuation of shadows, which colour (if any) to use, and the position, number and power of the light sources, led to the need for a specialist technician, one to whom both the architect and the interior decorator could turn. The lighting engineer was to serve such a purpose. He was to apply, in each new setting, whatever physiological, ssychological and artistic considerations were necessary. The foremost of the 1920's lighting

engineers were three Parisians - Andre Salomon, Jean Dourgnon, and Juget. Solomon, a director of the Enterprise Perfecla, emerged as the periods leading spokesman on lighting. Expounding frequently on his philosophies in both "lux" and "Art et Decoration", he was consulted at some time or another by most of the leading architects and designers to advise them on their illumination requirements - eg. Herbst and Chareau - Fig. 44, 45 and 46.

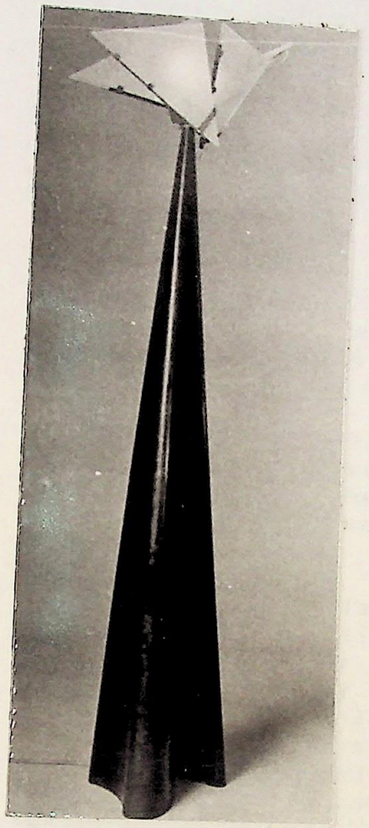


Fig.44 - Pierre Chareau's ingenious polygonal floor-lamp. Slices of alabaster are supported by a wooden base.

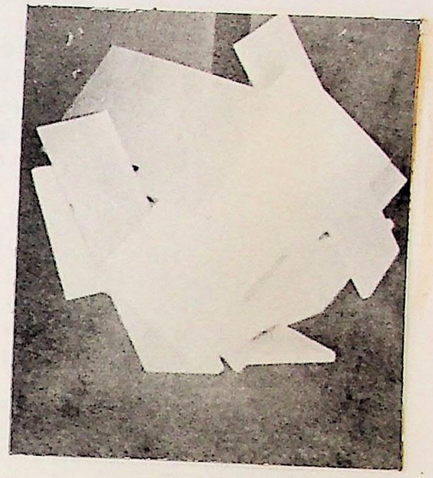


Fig.45 - The chandelier version version of Chareaus floor-lamp. Here the slices of alabaster are linked to the central shaft by matal clips.

Fig.46 - A dining room ceiling fixture was first exhibited at the 1928 Salon d'Automne. The curvature of the two wings was determined by the lighting engineer, Andre Salmon, to ensure the correct reflection of the light's rays on to the table below.

Some of the most important of the Art Deco adherent's who designed various forms of desk lamps are discussed in the following section, thus creating an overall picture of the influences, and themes, and importance of function, in Art Deco design. It is difficult to catagorise Art Deco designers by country because of

those people who involved themselves with the genesis and subsequent growth of the Art Deco style of decorative lighting almost all were French and based in Paris.

"Iron is worked by art to unite it with architecture, and has become as supple as wood. It is turned at will and is given the form of liht leaves and moving bodies. The roughness is removed to give it a sort of aliveness". (Sebastian Mercier, "Tableau de Paris 1778). Edgar Brandt was one of the first to adapt his designs to the possibilities of the new machinery then emerging. The hammer, anvil and burin were replaced with mechanical lathes, balances, stamping-presses, and oxyacetylene welding, a transition that for Brandt allowed no compromise to artistic quality.

In the sinuosities of its vegetal and floral enhancements, the work of Edgar Brandt showed a clear Art Nouveau influence, but from the mid-1920's, his style, though always diverse, became markedly more angular. The entire wrought-iron spectrum was covered. His light fixtures were limited mainly to table-lamps, chandeliers and wall brackets. Metal mounts, usually in wrought iron, housed shades of blown or moulded glass, marble, onyx, Sevres porcelain and even pleated cloth. The themes for these were frequently derived from nature - less frequently they were allegorical: "Force".

If anyone were to claim that Chareau's floor lamp (Fig. 44) was the finest light fixture to emerge from the Art Deco epoch, he or she would get a most sympathetic hearing. So simply concieved, yet such a visual "tour deforce", this lamp is most representative of Chareau's abhorrence of any superfluity that would concea! th sincerity of an object's form. Before all else, it is an objects function that determined its shape. But yet always created good, so, whereas Chareau always strove for unity, he often realised beauty.

In lighting, his series of floor - and bedside table-lamps and chandeliers in slices of alabaster or glass (Fig. 44 and 45) are best known. The base of the floor-lamp which is made of wood and in pyramidal form, was also sometimes used to support a cloth shade. His predilection, however, was for concealed lighting. In the study of the French Pavilian at the 1925 Exposition, he used a domed cornice to reflect and diffuse the light, the projector consisting of glass slates that could be adjusted to vary the intensity of light. At the second and third salons of light in 1934 and 1935 Chareau teamed up with Andre Salomon to produce corner illumination in "Dallesde Verre".

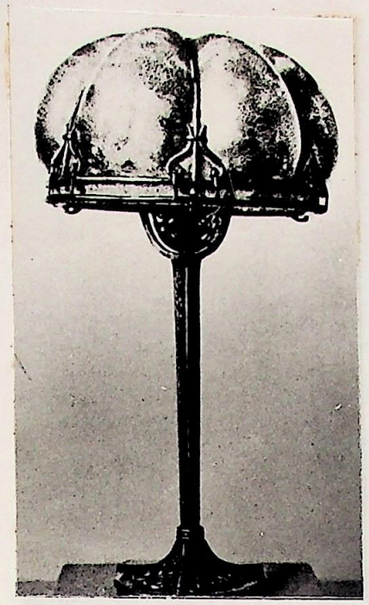


Fig.47 - A wrought iron and glass table-lamp by Brandt. - the glass, probably by Daum, was blown into the mount, hence it's imprisoned look.

Fig.48 - A chromed metal swivel reading-lamp exhibited at the Salon d'Automne in 1928.

An iconoclast who dismissed pressed glass as suitable only for architectural lighting, Damon concentrated on th aesthetic inadequacies of frosted glass for his own purposes, ie. a range of standard light fixtures for home interiors. He claimed that frosted glass was not a perfect translucence - the points of light formed by the bulbs were clearly visible through the glass. Several lighting designers had applied themselves to the elimination of this "eyesore" by interposing an opaque screen between the light sources and the frosted glass shade: but this had generated another problem: either the screen acted to reflect - rather than transmit - the light before it reached the shade, or the screen/shade combination itself absorbed to reflect a proportion of the light reducing the function of, say, a reading - lamp to that of an illuminated bibelot or night-light.

Damon's remedy was to merge the independent attributes of the screen and shade into a single body. By manufacturing glass that was enameled on the inside and frosted on the outside, he claimed that the resulting hybrid was the best of all worlds: it was diphanous and provided an even diffusion of light, but it was of a sufficiently opacity to make it impossible to discern the number or position of the bulbs behind it. He suggested also, as a decorative fillip, that it could on occasion be interposed with frosted glass or "dalles" of cut crystal to create ornamental contrasts: happy oppositions of lively and matt tones.

In his marriage of glass and metal, Damon's main theme is sober elegance - a search for beauty in a perfect adaptation of the object to its use.

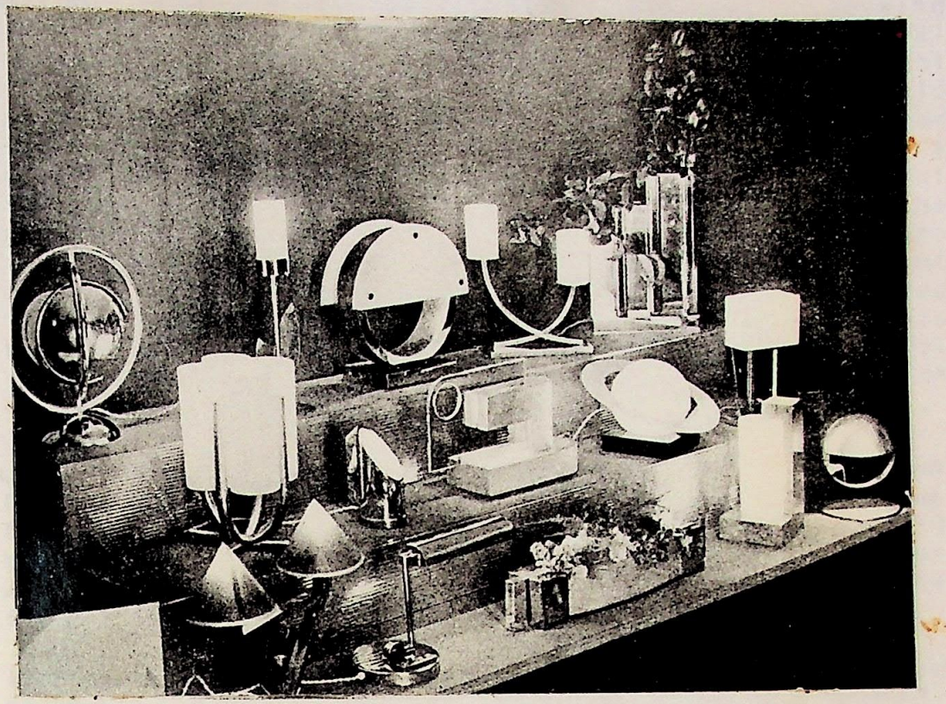


Fig.49 - A wide range of light fixtures marketed by Damon's studio. Included are several Lacroix lamps and Gorinthes "Saturn"table lamp.

Fig.50 - 1930 suspension entitled "Saturn". A very similar design as a table-lamp was produced by Gorinthe and marketed by Damon in the same year. - see fig.49.

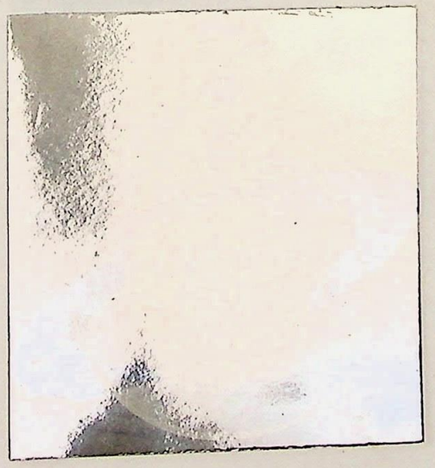


Fig.51 - Lamp produced by D.I.M. more likely to have been intended for pedestal than a table or desk. The theme of cylindrical glass shades on attenuated arms was a popular one, used by many artists.

The firm of D.I.M. - an acronym for "Decoration Interieure Moderne" - was founded in 1914 by Rene Joubert in Paris. Strict disciples of "Le Style" 1925. D.I.M. achieved all "fallacious" ornamentation, seeking in their interiors the qualities of architectural asceticism - simplicity and logic. It was a natural corollary of this streamlining process that they should progressively eliminate visible light fixtures from their interiors. In addition to their own designs, a great number of artists designed lamps for them, but such output decreased towards 1930 in proportion to the number of consealed light fittings that were incorporated into their interiors. Localised light sources - especially for reading - were still required to supplement general room illumination, and for this D.I.M. usually opted for the simplest of designs ie. pleated and unpleated cloth or parchment shades on spherical or amphora-shaped bases. eg. Fig. 50 and 51.

Lacroix claimd that his lamps had "no" other goal than to be inharmony with modern interiors until the supreme transition, after which "light fixtures" as such would become history. He envisaged a future where rooms would "be totally bathed in light that did not iminate from any discernible point".

In describing his range of lamps as being merely "in harmony", Lacroix was understating his creativity. With his designs which were produced by Damon, he turned his attention to almost every form of domestic lighting, from table-lamps to illuminated ceilings and picture frames, examples of which were exhibited regularly from 1927 through the Salon d' Automne and the Societe des Artistes Decorateurs.

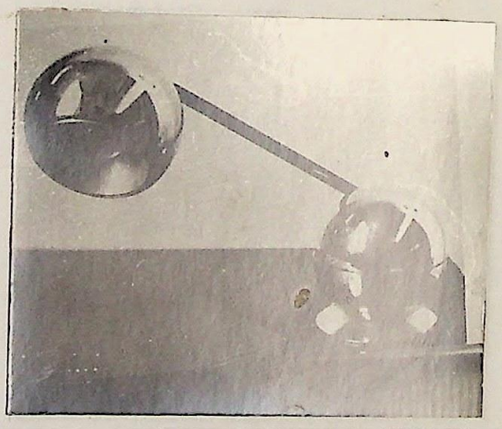


Fig.52 - Desk-lamp by Lacroix, 1928, shows his remarkable versatility and modernity . Made of nickelled metal, it was rotatable.

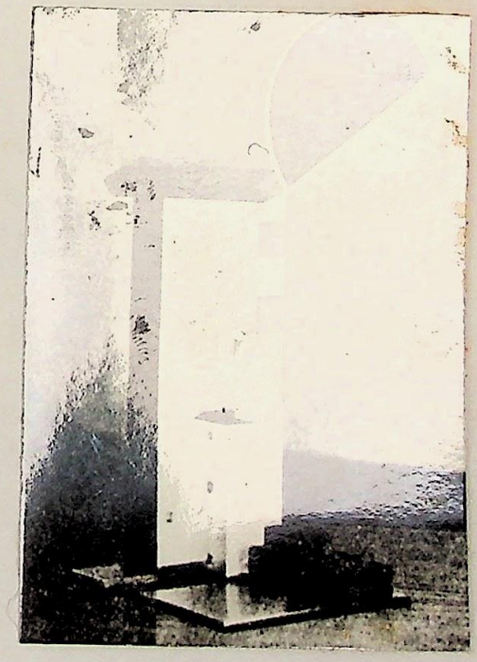


Fig.53 - An intriging table-lamp in aluminium, -1929. This model has a much more finished appearance than most of Le Chevalliers lamps.

Some of his lamps were in metal only (eg. Fig. 52) with a polished or matt nickel finish, but most incorporated glass - either Damon's special enamelled diffusing variety or plain frosted glass. In addition Lacroix paid great and effective attention to the functionalism of his models. Utilising direct and indirect lighting, or a combination of the two, in 1929, for example, he exhibited a lamp which, due to its mobile arms and light-reflecting mechanism, was to provide three functions in one. It could, on the simplest level, act as a desk lamp. Secondly, by adjusting the arms until they were horizontal, it could be used to read music on a piano (to this end the lamp base was specially weighted to prevent its toppling on the pianist). Thirdly, by using a hooking device attached to the base, it could be transformed a wall-bracket to spotlight a painting.

One of the artists commissioned by D.I.M. to supply the various components in their ensembles, J. Le Chevallier concentrated on forms of illumination, as did his D.I.M. stablemates Venini and L. Lesage.

In 1929 a critic in "The Studio" wrote that the distinguishing feature of that years "Salon d' Automne was the introduction of metal into the domain of furnishing. This was an opinion no doubt influenced by the several light fixtures in alluminium and nickelled metal exhibited there by Le Chevallier. Utilitarian to a fault, some of his lamps are brozenly functional- pieces of machinery composed of hulking slabs of metal and are held together by unconcealed screws. Others are more refined, for example (Fig. 53) a rotative desk lamp in polished alluminium, very similar to one by Lacroix - shows a much closer alliance of the technician and the artist.

Pauls Lamp designs, from the early 1930's to the outbreak of World War 2, are so avante-garde in conception that they only bearly fit into the category of Art Deco. His work, in any case, shows a certain forpeiture of individualism, since it was clearly designed for the production line. Paul had a great affinity for his subject matter. He was well-versed in the shibboleths of the new science of lighting, and his chromed chandeliers, standard lamps, illuminated vases, etc, were designed for direct, indirect or semi-indirect lighting.

An Ironsmith whose work spanned two decades of French decorative art, Subes seemed originally to draw his inspiration from the Lous-Philippe style of furnishing. A student and spiritual son of Emile Robert, he was in the 1920's more of a traditionalist than the majority of his ironworker colleagues. From about 1930, however, his styling adjusted significantly. to the spartan angularities of "High" Art Deco.

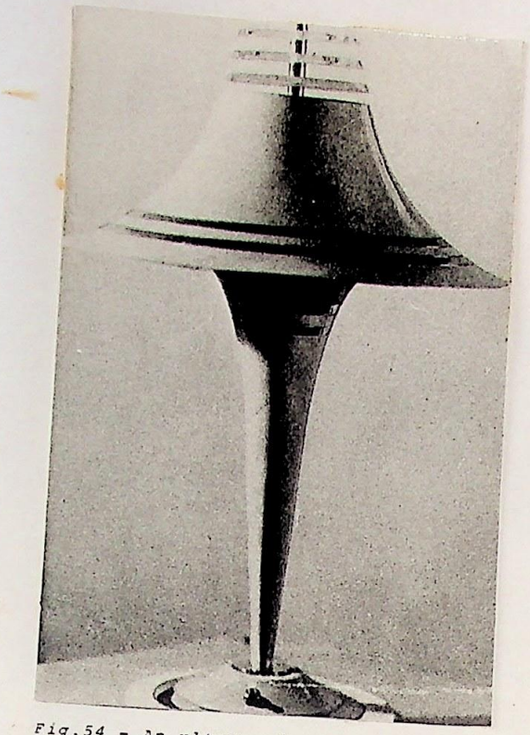


Fig.54 - An ultra-modern copper table-lamp exhibited at the International Exposition in Paris, -1937.

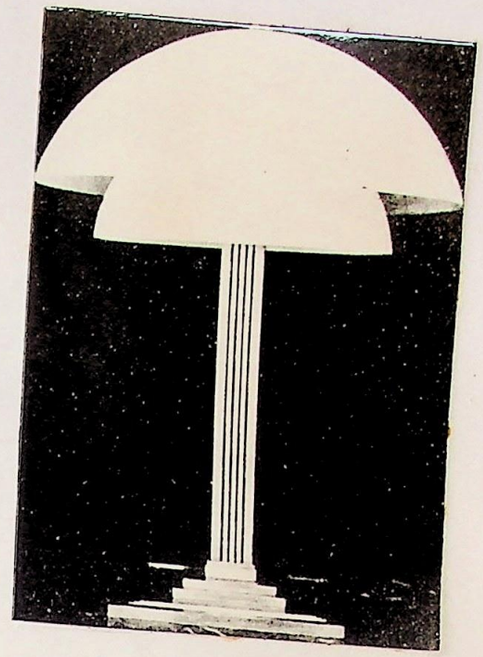


Fig.55 - A wrought iron and marble table-lamp of 1932.

In addition to standard wrought-iron furnishings Subes regularly marketed a wide range of light fixtures through the Salon d Automne and the Societe des Artistes Decorateurs from 1919 till the outbreak of World War II. Working mainly in wrought-iron, sometimes patiated, gilt, or chromed to vary the effect, he occasionally turned to polished steel, bronze, and "repousse" copper, often using these as a decorative fillip to the iron, as in the bronze cabochons and innerlacings on some of his floor-lamp bases. For the shades he used alabaster, levantine marble, frosted glass and, in the early 1920's embroidered silk.

Subes' illuminated vases, (table lamps) on fluted and lacquered "stelae", were a great success in their bold simplicity of form. When one examines photographs of his work, a common denominator emerges - that of the fixtures durability. There would be no easy way of breaking them, a factor which makes it even more mysterious that so few of his creations have emerged in the antiques market.

CHAPTER 6

BAUHAUS LIGHTING DESIGN

The Bauhaus in Dessau 1925-1932:

It is important to remember that in Autumn of 1923, less than two years before the Bauhaus moved from Weimar to Dessau, the post war inflation in Germany had reached such staggering proportions that a decent meal had to be paid for in millions of marks. But between 1925 and 1929, the year of the fatal Wall Street Crash, things looked brighter, with heavy private American investment being made in Germany. That these events affected the Bauhaus as an institution, and the attitudes towards art and life of the Bauhaus students, ought to be obvious.

If there is one absolutely clean-cut distinction which marks the change from the Weimar period to the mature Bauhaus phase at Dessau, it is an increase in material prosperity, commissions and productive optimism. It was only after 1923 that real activity in all the workshops became evident, and, even then, little was produced for industrial manufacture. At Dessau, on the other hand, Bauhaus work began increasingly to penetrate the industrial marketplace, so that Bauhaus lamps, chairs, buildings etc., began to crop up increasingly in the national and international trade fairs and exhibitions.

Yet, despite the radical changes which came about at Dessau, there was a seamless continuity between the first and second main phases of the history of the Bauhaus which can be percieved primarily through the general continuity of staff and students. The basic aesthetic and practical principles of the Dessau Bauhaus, were all pre-figures in the work of 1923-1924, in Weimar, and this example set the stamp on later development up until 1928. In that year, another major change occured, with the resignation of Walter Gropius, along with several of his closest friends, and the short reign of Hannes Meyer and the so called functionalist faction in architecture and design.

The move from Weimar to Dessau was symbolised rather neatly in the different characteristics of the two towns. Weimar, the capital of the republic, was laden with traditions and memories and was the centre of a flourishing craft industry. Dessau, on the other hand, was a tough new centre of large scale industry in the heart of Germany's coal and heavy industry belt. The presence of the Junkers Aircraft Works in Dessau, and

the tangible evidence of low-flying aeroplanes around the town, gave the Bauhaus community a direct symbolic contact with progressive industry which helped to reinforce the change in tone of the move. Within a short journey on the railway, the industrial centres of Magdeburg, Leipzig and Berlin were ready to offer a challenge for aspiring industrial designers. Avove all, the circumstances which made it possible for the Bauhaus to have its own building set the seal on the change from an art school atmosphere to that of a semi-industrial enterprise, since the building which Gropius designed for them was a living embodiment of that marriage between aesthetics and functionalism which was the key-note of the mature Bauhaus.

As we will see, the Dessau Bauhaus confirmed the position of the artist at the centre of the teaching curriculum, despite the increased concentration on practical production and design for industry. When we come to look in detail at Moholy-Nagy's "Van Material zu Architektur" (from material to architecture), we will see that the last thing he wanted to do was eliminate art, although he himself had made the move away from conventional easel painting towards an art dependant on light, movement, industrial materials and typograghy.

"The Bauhaus student studies materials principally by means of the sense of touch. He would gather a great variety of materials together so that he may register as many different sensations as possible with them. He would put them together into tactile tables, which contain some related and some contrasting touch sensations. After a period of experimentation, he would be able to assemble these elements in such a way that they will correspond to a previously planned expression".

Design for Industry at the Bauhaus:

The Dessau Bauhaus had a wide variety of craft workshops whose products might have been intended as prototypes for industry. In fact some areas were much more successful than other in finding commissions or applications in industry. By 1932, when the Bauhaus had to close down in Dessau, the most commercially successful applications of Bauhaus designs to industry had taken place in the field of electric lamps. In 1928, the general feeling still remained, that most of the work in the workshops was still only indirectly onnected with genuine industrial production.

Metal Workshops:

The metal workshop had already made a promising start under Christian Dell in Weimar, but Dell himself did not make the move to Dessau, but took up an appointment in the metal workshop of the Art school in Frankfurt an Main, and he continued to design some of the best desk lamps and other light fittings throughout the 1920's. At Dessau, Marianne Brandt, one of his best pupils, gave a lead in intelligent and practical applications of Bauhaus aesthetics to lamp design.

Fig.56 - Unknown Bauhaus designer- table-lamp ,1928.

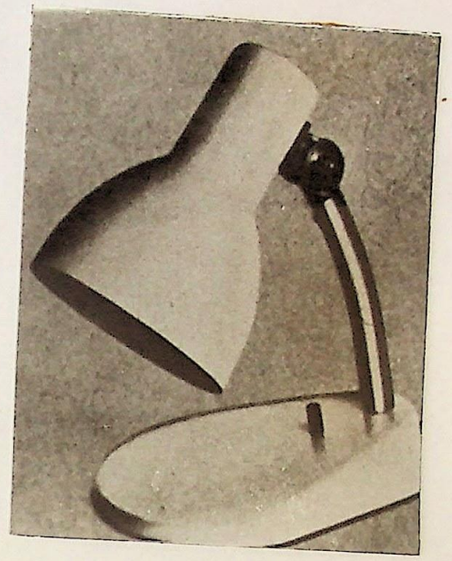


Fig.57 - Marianne Brandt's "Kandem" table-lamp manufactured by Korting and Matthissen, - metal, nickle plated and lacquered, -1927.

The designer of the lamp shown in Fig. 56 is not known, but the lamp was manufactured by a Leipzig firm, probably Korting and Matthiesson, in 1928. Typical of the future of Moholy-Nagy on the metal workshop in Dessau is the subtle contrast of material colours - the matt alluminium shade and the heavy nickelled brass base. Whatever the actual functional efficiency of these lamps in terms of light dispersion, robustness and contriked forms, strictly geometrical. Notice, in Fig. 56, how the thick nickelled shaft rises up under the hemispherical shade in such a way that it seems to be detached from a supporting function. At the same time, this places the supporting shaft in a good position to fix the light bulb centrally under the shade. On can percieve where the bulb is placed beneath the shade even from the view of the lamp in Fig. 56.

Another design manufactured by Korting and Matthiesson (Fig. 57) was one of the most commercially successful of Marianne Brandt's designs. This little table lamp, part of the "Kandem" range, was manufactured from 1928. An ivory lacquered finish was used, as in several of th cheaper Bauhaus lamps. Between 1928 and 1932, around 50,000 lamps were made by this firm according to designs based on the prototypes of students and staff in the Bauhaus metal workshop.

It is often pretended that the Bauhaus designs were the first to apply the principles of simple efficiency and clear, geometric form to electric light fittings, but this is clearly an exaggeration. Utterly simple spherical globe lamps and cheap metal reading lamps had been produced before the war. "The great conribution of the Bauhaus was to encourage firms to produce consistent ranges of fittings which "went together" well and which were not only robust and well made, but relatively luxurious and imposing as well". The materials and form training of all Bauhaus students helped them to create functional objects which were also beautiful. After the effect of Bauhaus publicity, expressed in the coinage of the term "Bauhaus style", enabled firms to glamourise these products as "modern" and adventurous.

Apart from Christian Dell, there were several other designers in Germany who contributed to "Modern" lamp design. The firm of Zeiss-Ikon commissioned designs from many excellent designers, including Adolf Meyer, and was generally considered to be a pioneer in the field. By 1927 "Modern" desk lamps were generally available and recognised as a fashionable innovation throughout Germany and Switzerland.

The International Exhibition of Modern Decorative and Industrial Arts, Paris, 1925:

The purpose and aims of the 1925 exhibition in Paris may best be realised by looking at some of the detailed entry regulations which were published in 1922 - (Ref. - Design 1920's - The Open University Press).

- The exposition is open to all manufacturers whose produce is artistic in character and shows clearly modern tendencies, ie. all copies or counterfeits of historical styles will be banned.

- Any manufacturer is eligible since everyday objects are as capable of being beautiful as the most exclusive objects.

- All industrialists, artists and artisians, in whatever material they specialise, in whatever form they use it, and for whatever purpose, can and should be modern - just as their illustrious ancestors were in their time - in giving each object a logical, well proportioned, and perfectly executed form fit for the conditions of modern life.

- If these conditions are fulfilled, the exposition cannot but have the most beneficial influence on export trade and on the general economic climate of the country, if we can maintain that artistic superiority which has always been ours. "Has not taste always been for France the most seductive of its wares"?

- Invention has too often given way to imitation which is absolutely contrary to the aim of art, which is to create, and to the purpose of industry, which is to adapt to scientific and traditional progress in order to benefit from them.

- The real way to be modern is to find the form which best fits the function, taking into account the material, which should be used to the utmost.

- The public has allowed itself to be taken in by this error of imitation, to confuse admiration of antiques, which is praiseworthy, with the wish to have copies.

- This is regretable since works of the past correspond with ideas, needs and techniques of the past.

- Today the public is responding. It is realising, more or less clearly, that in an age of railways, automobiles, aeroplanes, electricity, there should be lighting, furniture etc., more appropriate than that of the past, however beautiful it may be.

At the opening of the exhibition, many of the leading critics of the time and even some of the exhibition organisers expressed discontent at the quality and tone of the designs entered.

On the whole, standard lamps were treated not conventionally, whereas table or desk lamps and wall or ceiling light attachments were more adventurous. What was most striking about many of the lamps exhibited was their self-consciously artistic treatment. They

appeared as objects to which the attention should be drawn, like pictures or sculpture. Fig. 58 illustrates a desk lamp (exhibited at the 1925 Exhibition), which apears to have derived, its form from recent avant-garde art rather than decorative art. Ducret's lamp (Fig. 58) is an example of considerable technical virtuosity, but its smooth, rounded forms and shining surfaces are deliberately formalistic and are reminiscent of the kind of qualities to be found in some of Brancus's sculpture. Many other lamps exhibited had qualities quite like those to be found in some kinds of post-cubist assemblage sculptures, with its rather rough and ready craftsmanship (exposed screws etc.) and overlapping planes.

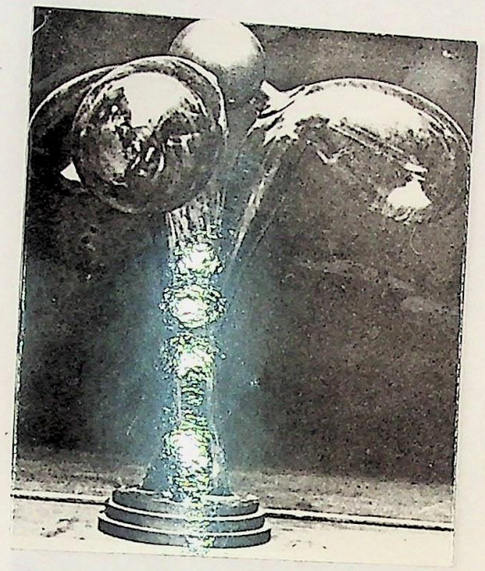


Fig.58 - Ducret- desk-lamp. Exhibited and designed by B.J.Klotz.

COMPARATIVE ANALYSIS - "Bauhaus and Modern"

In the latter part of this chapter is a critical analysis and comparison, (from the design point of view) of two similar desk lamps - one designed by Marianne Brandt in 1928 and the other recently manufactured in Britain and at present on the market in this country.

The following section is an analysis and comparison of two table lamps of different periods. The two lamps are: (1) a desk lamp designed in 1928 by Marianne Brandt (Fig. 59) and (2) a similar lamp purchased in a department store in Dublin in 1975 (Fig. 60).

Fig.59 - Kandem desk-lamp designed by Marianne Brandt, -1928.

Fig.60 - Desk-lamp, British made, purchased in Dublin, -1975.

Both lamps are evaluated with reference to the following headings:-

(1) Balance.
(2) Colour.
(3) Texture.
(4) Proportion.
(5) Function.

(1) Balance

Brandt's lamp (Fig. 59) manufactured by Korting and Matthiesson was one of the most commercially successful of her designs. Firstly, with reference to balance, Brandt appears to have well protected the lamp against any danger of toppling over. The base appears (similar to a duck's foot) to be projecting sufficiently in the

same direction as the overhanging shade thus providing sufficient stability both physically and visually. The "stem" of the lamp, which is formed from a semi-circular steel bar, comes across quite vividly as being excessively "strong", and more than capable of supporting the top section of the lamp. This feature, I think is characteristic of an age free from the "modern engineer" who carries out an intensive "value-analysis" operation on every component within a design, thus often resulting in a relatively "cheap" product at the expense of its appearance.

The more recent desk lamp (Fig.60) apears to be a close copy of Brandt's lamp which was designed and marketed some fifty-five years previously, yet I feel that much of the richness of the simple original design has been lost. In this "department stone lamp", the manner in which the "stem" of the lamp connects to the shade, close to the apparent centre of gravity of the shade, gives the impression that the shade would balance on the "stem" without any jointing fixture thus creating a sense of calmness ie. eliminating point of tension. A certain amount of tension exists in Brandt's lamp due to the fact that the stem enters the shade at one end, resulting in an "overhanging" shade. Any fear of this top section collapsing is perhaps eliminated again by the use of a robust jointing system between the stem and top section. The use of such a robust and conspicuous joint for this application is most positively a reflection of the manufacturing and jointing techniques of the time. Today, jointing mechanisms and fixtures have become much more refined and sophisticated.

Two points of visual weakness with regard balance in this later desk lamp are the apparent weight of both the stem and the base. The stem, a flexi-rod through which the electric cable passes - because of its small diameter and its relatively large length appears as if it would deflect under little pressure. The base of the lamp is a metal casting and is quite heavy, but because of its relatively complex shape, appears to e formed from sheet metal by a "stamping" process thus, resulting in a light weight appearance. Hence, if the top section of the lamp is extended to either side of the base, the lamp appears as if it may topple over.

(2) Colour

Colour, when discussed in the context of lighting fixtures, has to be examined into very different modes ie. when the fixture is lit and when un-lit. Marianne Brandt's lamp, I feel is most appropriately white in

colour. When the lamp is unlit it appears quite radiant, "cheery" and life-like. Its bright colouring enables the lamp to blend in with a typically light coloured study/office environment. When the lamp is lit, there is no sharp contrast in brightness between the light itself and thelamp thus leading to little eye strain. This more recent lamp (Fig. 60) which is dark brown in colour tends to lead to eyestrain because of the sharp contrast between the light itself and the dark shade. Modern lighting engineers recommend that when introducing specialised lighting (eg. desk lamp) for a specific task, that the immediate environment should not be left unlit or appear dark (including dark surfaces) because it will lead to visual discomfort. When this more recent lamp is viewed in the un-lit mode, it appears very drab and quite unlike something which would radiate light.

Both the switch and the flex in this recent lamp, appear quite out of place because of their white colouring which appear quite anaemic against the rest of the lamp. A dull coloured switch and flex I feel would blend in much better but perhaps were not used because of unavailability at time of manufacturing.

(3) Texture

Today, because of development in the field of injection moulding and other methods of moulding and casting, and its ability to accommodate intricate detailing within a design, many present day designer's feel the need to avoid the occurance of large flat surfaces especially in plastic moulded products. The belief among many today that simplicity in design is synonymous with poverty has basically led to era where simple design has become unpopular. This I feel is a tragedy as the best designs are "always" simple, but perhaps is understandable when one compares the richness of materials used in 1928 to the rather inexpensive tone of moulded plastics so common place in modern design.

Much of the richness of Brandts lamp design, (Fig. 59) is absent from this "modern" lamp. Most noticably is the "stem" of the lamp whih in Brandt's model is simple, appropriate and expressive of th basic function which it has to perform ie. to support the top section of the lamp and allow certain directional movement. The stem of this more recent lamp however, appears quite sharp, aggressive and rather un-sightly. It is, visually, constructed of numerous small sections which when together in the form of a long "flex" which appear quite weak and prone to breakage. Also, when one compares the bases of both lamps the same complex surface pattern (as in the stem) appears on this later

model. All this looks so un-necessary and misplaced when compared to the "simple" surfaces on Brandt's lamp which simulates a sense of "peacefulness and ease". The glossy and very much plastic-like finish on the small switch embedded in the base gives it the appearance of an "off the shelf" component. A brass plated switch would belend in much better with the brass plated stem and the fixture at the end of the shade, but was probably not used because of cost and perhaps unavailability.

(4) Proportion

Proportion in the design of any object is probably the most silent yet important feature of a design. In Brandt's lamp I think that the proportions of the different parts of the lamp are linked most appropriately. The diameter of the large opening of the shade corresponds with the large curved end of the base and similarly the diameter of the smaller end of the shade corresponds to that end of the base. The lamp as a "whole", I feel is visually well balanced. Fig 61 shows a representational drawing of the different sections of the lamp, highlighting their proportions.

The shade (~~Fig. 1002~~) tapers from right to left and the base tapers from left to right thus forming visually balanced total unit. This is not so in the case of this more recent lamp in which the base and shade have little in common in terms of proportion. The lamp appears to have inhabited its form almost solely from the function which it has to perform. Many of the design details were governed by the restrictions associated which the manufacturing method chosen - this method so very often chosen for its lower cost rather than for design related reasons. Little effort has been made in this instance, to harmonise both the shade and base thus resulting in a badly proportioned lamp.

(5) Function

Function, as a general rule, I feel is the most important feature in the design of any product, and this is especially true in the case of desk lamps or any lighting fixture. One of the greatest problems with selecting a lighting fixture is that normally they are displayed in their un-lit mode at their place of sale. The true value of any lighting fixture cannot really be apreciated until it is installed in its place of use. Thus I feel that too many lighting fixtures bought

today are chosen purely on their appearance rather than for the effect which they can achieve. Both Brandt's lamp and the more recent model shown in Fig. 60 have to perform the same function - ie. to provide concentrated light for a specific task. Both lamps have white shades (inside) which reflect the light ommitted from the bulb but which I feel could have been better designed. Much light is tunnelled into the back of the shade and wasted, as the form of the modern domestic light-bulb results in some light being transmitted "backwards".

A design defect in this more recent lamp (Fig. 60) which was not apparent at the time of purchase, is that when it is lit, the user is dazzled by direct rays of light transmitted through the "slats" on the side of the shade. This is quite annoying from the users point of view, leads to visual fatique, and proves to be quite distracting. These slats apparently were meant to release any excess heat generated by the light bulb but I feel that this need for ventelation could have been better dealt with, thus eliminating this rather serious functional defect.

In Marianne Brandt's lamp, another problem, from the functional viewpoint comes to mind, ie. the problem of monovering the top section of the lamp to send the light in the desired direction. The shade can quite freely be moved vertically but to achieve horizontal movement, one has to rotate the whole lamp, (ie. both top section and base). This may prove to be quite a disadvantage especially if one is restricted in the space available in which to manouvre the base. Also the stem of the lamp is quite short, thus restricting its range of movement, meaning that the lamp may have to be quite close to the user to be effective.

In the more recent lamp (Fig. 60) the head and base of the lamp are held "together" by a relatively long flexi-rod which allows the head of the lamp to be adjusted both horizontally and vertically thus allowing a good range of adjustment. The only criticism which I would make regarding the flexi-rod on this lamp (from the point of view of function) is that it is quite stiff. (lighter duty flexi-rod may have sufficed). This, in effect means that to adjust the head of the lamp, you have to hold the base with one hand to prevent it from also moving.

SUMMARY AND CONCLUSIONS

Light cannot be defined in terms of anything simpler - or more directly appreciated by the sences - than itself. It is a form of energy passing through space at high speed. It is frequently harnessed to convey information from one place to another.

In the world in which we live today, where artificial light would most certainly be counted as a necessity, it is seldom used skilfully and with proper knowledge of the principles which governs its employment. Too often the eye is treated as an indifferent optical insturment, rather than as a human, physical organ, having the characteristics brought upon it by its evolution. It works best over a rather limited retinal area and through a range of intensity of light which is quite small. These basic principles are quite often neglected by the lighting engineer and designer. In recent times, the type of lighting installed in most new houses is governed more by cost rather than actual lighting requirements, meaning that the modern lighting engineer is very restricted in what he can do to correct the situation.

Early experiments towards the practical use of the "arc" for illumination failed because it was near impossible to obtain a steady light. Further experiments with incodescent metallic filaments showed that their life in air would be brief as a result of oxidation. The eventual success of the filament lamp was directly linked with the problem of operating the filament in an oxygen-free atmosphere. In 1865 Hermann Sprengel invented the mercury vacuum pump which led to the phenomena of high vacua. Following this great new invention, both Edison, Swan and many others directed themselves towards getting their lamps mass produced. For all practical purposes. Swan's lamp went into production early in 1881 even though he was not enirely satisfied with his moercerised cotton thread filaments and felt that it should be possible to design a more uniform, non-fibrous filament.

From 1885 until the close of the century there was steady improvement in the technique of manufacturing incadescent lamps and a gradual lowering of the initially high production costs. Successful osmium filament lamps were inroduced in 1898 by Welsbach and tantalum filaments followed in 1905 and tungsten a few years later. Since the early part of this century the novelty and excitement generated by the birth of electric lighting, to a large extent had died. Few major breakthroughs in lighting technology have taken place since then (except for specialised applications

in industry and in the field of medicine etc.). Today we still see fit to use the same bayonet and screw cap type bulbs which first came into production about 1890. Also the method in which we transmit electric power from one place to another has not changed. We still supply households with electricity at 200 volts, even though we fully realise the serious risk of death by electrocution. This unwillingness to update the hardware of now historical lihting technology, is largely due to cost constraints. This was the reason why Ireland and Mainland Europe followed the British lead in instaling the cheap, light cable, high voltage distribution network rather than the more expensive heavy cable, low voltage, American system which is much safer.

Following the coming of age of electric lighting around the turn of the century came that era in the decorative arts known as "Art Nouveau" which provided, on one hand, and coincided on the other, the two ingredients that were to make it the single most creative period in the annals of domestic lighting. It was this carving in this new aesthetic for unity which became the major constant of Art Nouveau, and which lead so many more turn-of-the-century "creators" to design light fixtures than would be normal in any one period. Everybody seems at some stage to have designed a table lamp or some other lighting fixture.

For motifs for their light fixtures, most Art Nouveau designers employed botanical and entomdogical motifs so prevalent throughout the decorative arts of the Nancy school. The two most frequently used motifs were woman and the flower. Specific flowers were either copied or stylised and after some time, the entire botanical gamut became a limitless wellspring of instiration for artists and designers. Woman on the other hand, freed from the harness into which fashion had locked them, literally threw caution, clothes and corsets to the winds. She later became the most instantly recognisable theme of the Art Nouveau movement.

World War I formed the dividing line between the Art Nouveau and Art Deco era's. The characteristics of the new Art Deco movement became simplicity of line, richness of material, and "sobriety" of decor. The difference in lighting design between the two periods could hardly have been more pronounced. The 1900 "art" of lighting thus gave way to the 1920 "science" of lighting. Lamps became simple vehicles, the transition from direct to indirect lighting lit to a spate of interest in the new art form. A light fixture had a specific and very important role to play - it had to ensure a logical distribution of light which would meet the requirements of visibility and ambience. A

fixtures elements were therefore to be subordinate to its lighting function. No longer were the rays of light to be imprisoned behind bronze shades - they were now to be free.

On a general assessment of desk lamp design during the Art Nouveau and Art Deco eras, one wonders how modern lamp design would rate in comparison. By comparing and contrasting a desk lamp designed by a student of the Bauhaus School of Design in Germany to a similar model designed quite recently in Great Britain, one cannot help but feel that modern day design lacks the richness of form and material so evident in design in the early part of the century. Today, in many areas of design, designers too often copy or adapt themes from the past and simply alter minor design details so that the product can be made using the most economical production methods of the day.

Invention too often has given way to imitation which is absolutely contrary to the aim of art (which is to create) and the purpose industry (which is to adapt scientific and technical progress in order to benefit from them).

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