

DESIGN CHRONOLOGY TURKEY

LIGHTING



This text is prepared for the

3rd Istanbul Design Biennial

ARE WE HUMAN?

The Design of the Species

2 seconds, 2 days, 2 years, 200 years, 200,000 years

by **Hülya Kılıç Sirel**

with contributions by **Pelin Derviş** and **Barış Gün**, and the support of **Studio-X Istanbul**

translated by **Liz Erçevik Amado**, **Selin Irazca Geray** and **Gülce Maşrabacı**

editorial support by **Ceren Şenel**, **Erim Şerifoğlu**

graphic design by **Selin Pervan**

LIGHTING

LIGHTING: FROM THE SOURCE OF LIGHT TO DESIGN

EXISTENCE OF HUMANKIND – SUN, SKY, TORCH, OIL LAMP AND CANDLE

If we are to classify lighting in categories of natural and artificial light, the sky and sunlight constitute natural light. First artificial sources of light emerge with the discovery of fire. “Is it Prometheus who brings the fire, or is it obtained through the trees set ablaze by lightning?” Either way, fire is ultimately transformed into a form more appropriate for domestic use, first into the oil lamp and then the candle. Candles and oil lamps become the designs that produce more opulent images and this process is followed by the emergence of chandeliers. For many years, chandeliers propped with crystal or cut-glass bell jars and ornamentations become the resplendent furniture of wealthy households or palaces.

For thousands of years, the humankind has lived dependent on natural light and a number of definitions used in present day lighting technique have evolved from this relationship. While benefiting from the light of the sun or that of the burning log, the human also warms up with its blaze, and this phenomenon implants the concept of “warm light” in the memory of humankind. Just like the perception of “cold light” created by the light from the winter sky seeping through the snow in cold weather.

EASTERN ROMAN – BYZANTINE ERA ISTANBUL

Some sources indicate the Kurtuluş Avenue of Antioch (present day Hatay in Turkey) as the world’s first street to be illuminated. There is no verified information as to the date or period of this action which was probably accomplished with torches. The torch, which in a sense can also be called a firewood lamp, is a primitive lighting tool made by tying the firewood or another readily inflammable wood usually to an iron pole.

It is said that during the reign of Eastern Roman Emperor Theodosius II (408-450) some shops near the Augustion were illuminated with oil lamps. This and similar practices are short lived. In the Late Roman Period, the palace and houses are illuminated with ceramic based oil lamps. There are metal and glass lamps during and after the Roman period. The lamps are usually made up of a bowl shaped oil holder, a hole or wall for the wick to pass through, and a handle or lugs to carry it. The oil used here is usually sulfated olive oil and the wick is papyrus or oakum.

In post-7th century Istanbul, oil lamps are replaced with candle lamps (kerion, keros) and there is reference to chandleries, candle workshops. Based on the information about the big fire of 931, it can be gathered that in Byzantium of the Middle Ages candlemakers had workshops around the Forum of Constantin. It can be assumed that palaces had their own chandlers since Hagia Sophia had its own chandler. This tradition has been continued and further enriched during the Ottoman times. For Christians, the candle symbolizes Jesus the light of God, therefore they even establish foundations to illuminate the churches. Lighting votive candles is still a rite observed in Christianity and also adopted by Muslims, especially during visits to the cemetery and shrines. Glass and metal chandeliers with multiple candles, that is *polycandelon* or *polycandela*, appear in the early centuries. Candelabras, which are large multi-armed candlesticks, used in the church altars and attached to the upholstery, are mostly made of silver. *Kaniskia* is a somewhat different oil lamp. Meanwhile, lanterns with numerous oil lamps are hung around the churches.¹

POST-1453, ISTANBUL DURING THE OTTOMAN PERIOD

After its conquest by the Ottomans, lighting devices used in Istanbul do not change. Basic means of lighting is the oil lamp and candle during the Ottoman period as well. Candle workshops belonging to the dhimmi, that is to say the non-Muslim Greeks usually referred to as *kefere tayfası* (infidels), are mostly located around Yedikule. Unlike the Byzantines, Ottomans use suet obtained from cattle and sheep instead of olive oil in candle production. This fat used mixed with wax. For a while, İznik made classical oil lamps are also among the famous examples of large scale tile crafting and classical ornamentation.

Oil lamps and candlesticks: In Istanbul houses, candles and oil lamps are used for lighting throughout centuries. In wealthy households the candles are placed in candelabra. Oil lamps are made in the form of glass bottles set on a flat surface, or cup-shaped bell jars hung from a chain. Examples of both kinds made in the 16th century and embellished with classical ornaments are currently kept in the Topkapı Palace Museum. Large ball-shaped metallic chandeliers are used especially in the palace, while the first glass oil lamps in Istanbul are found in bathhouses, mosques and similar places. Date of make is inscribed on some of the glass oil lamps, most of which are made in the ovens, ateliers of Jewish artisans and glassmakers who craft bottles. After the 16th century, copper (tombac) oil lamps are made polished with brass, bronze, silver, gold or mercury.

Light shows reach their peak in the Tulip Era (1718~1730). Boğaziçi Pavilion is the venue to host the shows called Lale Çerağanı (tulip lighting, adornment). (Later, Çırağan Palace is built on the site of this pavilion.) Flower and oil lamp fashions, oil lamps placed on moving objects, light arrangements created by mirrors and torches have constituted an impressive art of lighting during this period. During this time, the palaces, barracks, mansions and minarets are decorated with tens of thousands of oil lamps on special days. Despite all this splendor, until coal gas is available in Istanbul, the streets of the city are left in the dark. The streets are only somewhat illuminated on Ramadan evenings; the public can go on strolls with lanterns in their hands.¹

LIGHT AS A SYMBOL

Light as a symbol holds as considerable a place in Muslim-Ottoman culture as it does in Christian-Byzantine culture. Religious buildings, shrines are illuminated, oblations are made with candles. In Bektashi lodges, oil lamps with twelve corners (şebçırağ) are lit for the Twelve Imams; the word *kandil* (oil lamp), which is the main light source of the times, holds a significant place both in daily life and literature in depicting light. Just like in the poem Mehmet Akif Ersoy wrote for Çanakkale martyrs. In the poem, “The Chandelier and Süreyya (Pleiades) with seven oil lamps hung over the martyrs’ grave” symbolize the Pleiades (star cluster) comprised of seven stars in the constellation Taurus.¹

EARLY 19TH CENTURY, SPERMACETI WAX CANDLE

Spermaceti candle made of oil extracted from the head of the sperm whale replaces those made with suet. (Spermaceti is derived from Latin; *sperma* meaning seed, and *cetus*, whale.) In 1863, a spermaceti candle factory is founded in Beykoz. In later years, during the final decades of the Ottoman Empire, kerosene lamps in different shapes of bell jars ornamented with stained glasses constitute an important element of house decoration in wealthy houses and palaces.¹

STREET LIGHTING BEFORE THE 19th CENTURY

During the Ottoman era there is no street lighting until the 19th century. Only the night watchmen stroll the streets with lanterns. Going out at night is a very rare occurrence during those times, and going out without a lantern is prohibited. In the 19th century, lanterns begin to be more frequently used in the streets after it is required to hang lanterns in front of houses and shops. Portable lanterns are made of specifically prepared tarpaulin or paper which is cheaper. Glass lanterns

are usually the fixed ones hung outside doors. The most famous center of tarpaulin lantern makers is the Tirkayi Bazaar in Süleymaniye.¹ During this period, two kinds of light sources are used in the mosques: candelabras placed on two sides of the *mihrab* and chandeliers, mosques’ main source of light hung from the dome with chains, corresponding to the polycandelon of the Byzantine period and also called *top kandil* (sphere lamp). The word *avize* (chandelier), used to denote “large oil lamp”, is derived from Persian and means “hung from above”.

1802 EFFORTS BEGIN TO USE ELECTRICAL ENERGY AS A LIGHT SOURCE

Efforts to generate light from electricity that begin with British inventor Humphry Davy continue in the 1840s with Warren de la Rue. However, this lamp emits little light and its burning time is too short. The endeavors to produce a lamp powered by electricity are consummated by Joseph Wilson Swan in 1878 and by Thomas Edison in 1879. The same year, Thomas Edison applies for the patent of lamps he made using carbon filament in a high vacuum, and three years later these lamps begin to glow on the streets of New York.^{2,3}

1812-1870 SIGNIFICANT DEVELOPMENTS IN TERMS OF LIGHTING: FROM COAL GAS TO ELECTRICITY

Coal gas, that is gas obtained from pit coal, discovered in the West in 1812, begins to be used in London for heating and lighting the following year. In 1831, British scientist Michael Faraday’s research paves the way for the production of electrical energy. In 1870, small buildings start to be illuminated with the dynamos developed by the Belgian engineer Zénobe Gramme. Twelve years later, Thomas Edison opens the Pearl Street Station in New York (September 4, 1882).

1853 DOLMABAĞÇE GASWORKS IS ESTABLISHED

Ottoman monarch Sultan Abdülmecid (reign: 1839-1861) has a gasworks built for the Dolmabahçe Palace in 1853 thus bringing this invention to Ottoman lands. The Dolmabahçe Gasworks built by a French company behind the palace grounds is the first gasworks to be established as per a sultan’s ordain in Istanbul. All the candelabras, chandeliers and sconces of the palace are illuminated by coal gas.

In 1855, through the initiative of the municipality, the production surplus of Dolmabahçe Gasworks operating under the Private Treasury is used in city lighting. In 1856, streets in

Beyoğlu start to be illuminated with kerosene lanterns. First streets to be lit are Cadde-i Kebir (Grand Avenue, present day İstiklal Street) and Galip Dede Street. The same year, with Abdülmecid's special permission, the Beyoğlu Naum Theatre is also lit with the energy provided by Dolmabahçe Gasworks.¹

1857-1891 MAJOR STEPS ARE TAKEN IN EUROPE IN ELECTRICAL ENERGY USE: STREETS IN FRANCE AND ENGLAND START TO BE ILLUMINATED WITH ELECTRICITY

Rue Impériale in Lyons, France is among the first streets in the world to be illuminated with electricity (1857). This event realized through the use of arc lamps is followed by the street lighting of Avenue de l'Opéra in Paris again with electricity in 1878. These developments continue with the establishment of an electricity generating station in London. While Europe's first power plant is founded in 1882 in London, the Strasbourg Cathedral and the Arc De Triomphe de l'Étoile in Paris are illuminated in 1918 and 1928 respectively.

1870 KUZGUNCAK GASWORKS IS ESTABLISHED

When Sultan Abdülaziz (reign: 1861-1876) orders the construction of Beylerbeyi Palace, it is decided to build a gasworks for lighting. The initial site chosen for the gasworks is the Nakkaş Gardens, however, since this site is private property, the gasworks is built on the land belonging to the Imperial Estate located behind the Gardens. The Ministry of Finance's preparations for the gasworks site selection begin in January 1865; the construction is realized by the Ministry of Imperial Arsenal.⁴

Initial estimates put the construction cost of the gasworks at 878,000 *kuruş* (Turkish cents). However, the final cost calculated upon the completion of the work amounts to 1,169,000 *kuruş* after a 430,000 *kuruş* discount. The ensuing difference is justified by the lantern and columns placed inside the palace and the garden; main pipes paved from the palace gate to the İstavroz crossroads, that is all the way to Beylerbeyi; the warehouse built in the gasworks; ironworks; superintendent's quarters; barley straw warehouses; drilling of a well; and the ditches dug outside the fortification walls.

1876-1882 GENERAL ELECTRIC IS ESTABLISHED

Known with its acronym GE, General Electric is established in 1876 by Thomas Edison in the United States. GE, which monopolized electricity distribution in the United States for some time, is one of the biggest companies in the world.

Pearl Street Station in New York opened by Thomas Edison in 1882 is the world's first central power plant with a direct current generator. In its first year, the station provides electric lighting to five hundred customers. GE which operated in Turkey for many years currently provides services primarily in the exterior lighting industry.

1881 YEDİKULE GASWORKS IS ESTABLISHED

In the second half of the 19th century, the increase in demand for modern urban services among the wealthy districts of Istanbul like Beyoğlu soon necessitates a new gasworks project to serve the city. Meanwhile, the Dolmabahçe Palace Gasworks is handed over to the Mayor. The second gasworks to meet the city's need for gas is founded in 1880 by the French in Yedikule on the seaboard in order to facilitate transportation.

1891 HASANPAŞA GASWORKS IS ESTABLISHED

In response to the demands from the Anatolian part of the city, a third gasworks is established (1891) in Kadıköy Kurbağalidere in the district of Hasanpaşa, which is close to the railroad. Coal gas of Kadıköy, Üsküdar, and the entire Anatolian side is franchised to a Parisian railroad industrialist for 50 years starting in 1891.

1891 FUTURE WORLD GIANT PHILIPS IS FOUNDED (EINDHOVEN – THE NETHERLANDS)

Inspired by the rapidly growing electricity industry and his son Gerard's experience in making durable carbon fiber (filament), Frederik Philips purchases a modest factory in Eindhoven in 1891. The Philips factory is founded on May 15, 1891 by Gerard Philips and his father Frederik in the city of Eindhoven with the goal of producing and marketing a cost-effective and durable incandescent lamp. Carbon-filament lamps are the first products of Philips, which soon assumes a pioneering and innovative position in the field of lighting, especially after Anton Philips also joins the company in 1896. In 1914, the world famous "NatLab" Research Laboratory is founded within the company in order to research physical and chemical phenomena and accelerate new product innovation. Philips receives its first patent in 1905 on an invention that extends the burning time of light bulbs.⁵

Early 1900s STREETS OF ISTANBUL ARE ILLUMINATED

Istanbul's city lighting with gas peaks by the 1900s. Between 1900 and 1914, the arterial roads, avenues, streets,



**CHANDELIERS IN DOLMABAÇE PALACE (TOP) AND
BEYLERBEYİ PALACE**

Source: National Palaces Archive

townhouses, mansions, and government offices of Istanbul are being illuminated with gas. In the 1910s, there are 3943 street lamps or lanterns in Istanbul.⁶

After the 1910s, coal gas used only for heating starts to be produced and distributed by foreign capital and private companies. After a number of handovers, in 1945, the task of production and distribution is transferred to İETT (Istanbul Electric Tram and Tunnel Company) with transfer law no. 4762. With the transfer of Beyoğlu Poligon Gasworks whose franchise expires in 1984, İETT monopolizes coal gas production and distribution. As the coal gas technology becomes outdated and natural gas comes into play, coal gas is completely eliminated (June 1993).⁶

1901 A NEW LAMP IN WORLD MARKETS –MAKING OF THE FIRST DISCHARGE LAMP “MERCURY-VAPOR LAMP”

In 1901, Peter Cooper Hewitt invents the mercury-vapor lamp emitting a bluish-green light. This is a new lamp producing light with a technique very different from the incandescent lamp. The later-invented low pressure sodium vapor lamp emits a yellow light, which restricts its application to outdoor lighting. Meanwhile, another variety of the discharge lamps, namely the “high pressure sodium lamp” is released to the market in the 1960s. Since it emits a better color than “high pressure mercury” or “low pressure sodium” lamps, it is used especially in street lighting, outdoor lighting, and albeit to a more limited extent, in indoor spaces.⁷

The metal halide lamp, again a product of the 1960s, continues to be used extensively today.

1902 ELECTRICAL ENERGY PRODUCTION IN TARSUS, TURKEY

Sultan Abdülhamid II (reign: 1876-1909), who introduces noteworthy services to the country in fields of education, health, postal services, telephone, radio, railways, and coal gas, acts slowly when it comes to electricity due to certain concerns. He is especially wary of fires. Negative propaganda of coal gas companies who have long term franchises in the Ottoman Empire also stall the advent of electricity. Well aware of the fact that demand for coal gas will decrease with the advent of electricity, these companies try to forestall the use of this energy which conflicts with their interests.

Due to all these factors, production of electricity is attempted for the first time somewhere outside Istanbul, namely in Tarsus. In 1902, with a hydroelectric power plant

established in Tarsus, the production and use of electricity starts. Tarsus is provided with electric power for the first time on September 15, 1902 through the hydroelectric power plant founded on the Berdan River by Austrian Dörfler who works at the Tarsus Municipality. With the electrical energy produced here, first the streets of Tarsus are illuminated. First houses to be lit with electricity are the residences of Mufti Sadık Pasha (Sadık Eliyeşil) and Investigating Magistrate Yakup Effendi.⁸

1906 OSRAM IS ESTABLISHED

The brand of OSRAM coined from the names of two filament materials, osmium and wolfram, is registered as a trademark in 1906, and founded in 1919 by the merger of the lamp productions of SIEMENS, Auergesellschaft, and AEG. OSRAM is a high-tech company of the lighting sector: today over 60 percent of its turnover comes from energy-efficient products. OSRAM has over 5000 different products ranging from lamps used in general lighting to LED, automobile lighting to stage-studio-TV lamps.⁹

1905-1910 ELECTRICALLY WIRED OTTOMAN CITIES

There is major competition among British and German companies to bring electrical wiring to Ottoman cities during the second Constitutional Period. German Emperor Wilhelm II visits Istanbul to this end and presents the numerous projects he brings with him to the sultan. After a while, through substantial support provided by the German Embassy, Siemens & Halske receives a license to install electrical wiring in cities of İzmir and Thessaloniki. These two cities are illuminated with electrical energy in 1905. In 1906, a tender is opened for the lighting of Aleppo and Bursa. Also in 1906, the Municipality of Manastır takes the first official steps to produce electricity. Damascus is illuminated in 1907 and Skopje receives electrical energy by 1909.¹⁰

1907 SIEMENS & HALSKE OPENS ITS FIRST ISTANBUL OFFICE

Siemens, which is to become a company that works in numerous branches of lighting in subsequent years, enters the Ottoman Empire for the first time by building the telegraph system. In 1907, the weight of Siemens & Halske in electricity and communication increases. The first Istanbul office of Siemens & Halske opens, established under its Vienna bureau. The first major project of the firm is to build the electrical parts of Silahtarağa Power Plant. The firm realizes a first in Turkey in the 1970s by illuminating many archeological sites, starting with Ephesus. In present day

Turkey, Siemens is a company that focuses on electrification, automation and digitalization.¹¹

1910 FIRST STEPS TOWARD THE PRODUCTION OF ELECTRICITY IN THE OTTOMAN EMPIRE

For the production and distribution of electricity in the Ottoman Empire, first a law titled Menafi-i Umumiyye Mütteallik İmtiyazat (The Law on Concessions for the Public Benefit) is issued on June 10, 1910 (adopted in the parliament on June 23, 1910). Accordingly, a tender is opened by the state for the establishment of a power plant. The Austro-Hungarian-capital Ganz Electrical Company wins the tender and procures the franchising of electricity production-distribution for the Rumeli Region from the state for 50 years (October 1910). However, the company has to wait for the franchise/authorization period of Istanbul Gas Company to expire to begin undertaking the work it has planned.^{8, 10}

1910 DOLMABAĞÇE PALACE IS ILLUMINATED WITH ELECTRICAL ENERGY

The first ruler to bring electricity to the Ottoman Empire is Sultan Abdülhamid II. An electric generator is used in this period for lighting. Coal gas leaving its place to electricity in the Dolmabahçe Palace dates to the era of Sultan Mehmed Reşad.^{1, 12}

The chandeliers, candelabras, and all similar luminaires of the palace hold an important place in the lighting design history of Turkey as very special luminaire designs made from superior glass and crystals of Europe. All these chandeliers, candelabras, and similar luminaires are rebuilt to work with electricity. Designs made with the special fine glass of the Murano Island in Venice, Italy; the French Baccarat crystal chandeliers and candelabras; various glass and crystal fixtures from England bear witness to this process as the ostentatious lighting ornaments of the palace.¹

1913 COMMISSION INTERNATIONALE DE L'ÉCLAIRAGE (CIE - INTERNATIONAL COMMISSION ON ILLUMINATION IS FOUNDED

Holding its periodic meetings in Zurich in 1903, 1907 and 1911, Commission Internationale de Photométrie (the International Commission on Photometry) takes a decision to broaden its scope of activities during its 1913 meeting in Berlin, and turns into a new organization under the name International Commission on Illumination (CIE). Thus, for the first time, the concept of "illumination" is included in the name of an international organization. Illumination becoming an

important field dates to the 1940s and 1950s. The launch of mass production with the further advancement of new sources of lighting and the introduction of these lamps to living spaces continues until these years. Of course, the Great War plays a role in this delay. CIE continues to be the most important institution for countries worldwide in the field of lighting today.¹³

OTHER IMPORTANT ASSOCIATIONS AND UNIONS IN THE FIELD OF LIGHTING

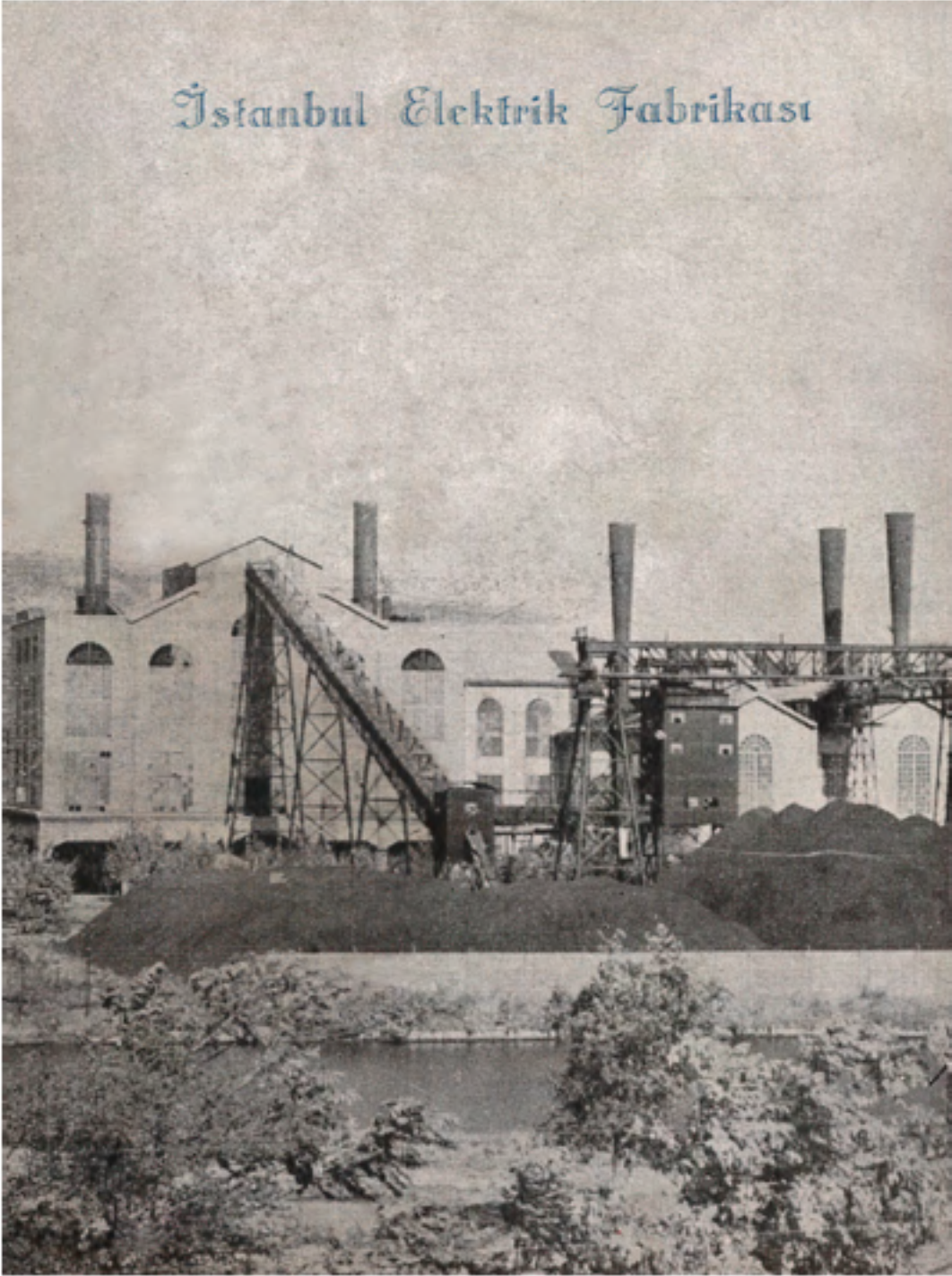
American Lighting Association, Asoc. Nac.de Fabricantes de Luminar, Ass. Naz. Produttori Illuminazione, Association of Finnish Lighting Manufacturers, Austria Association for the Electrical and Electronics Industries, CIBSE Lighting Division, German Electric & Electronic Lighting Portal, Illuminating Eng. Soc. of N. America, Institution of Lighting Engineers UK, Lighting Europe, Lighting Industry Federation Ltd, Lighting Research - Canada, Multisector Federation for the Technology Industry, Netherlands Lighting Association, Netherlands Association of Emergency Lighting Manufacturers, PIDA, The Lighting Association UK, The Portuguese Lighting Association, ZHAGA.

An expert working on lighting, Professor Şazi Sirel becomes the first Turkish citizen to be accepted as an associate member to CIE in 1981 upon his application to the organization with the unanimous approval of the board of directors.

1913-1914 SİLAHTARAĞA, THE FIRST AND LAST THERMAL POWER PLANT IN TURKEY, GOES INTO SERVICE

Ganz Company institutionalizes as an Istanbul based firm under the name Osmanlı Anonim Elektrik Şirketi (Ottoman Electricity, Inc.) at the Golden Horn. When the company cannot find the necessary water resources for the production of hydroelectric power, it decides to build a coal-fired plant. The operation launch of the plant, which is scheduled to be completed in June 1913, is delayed due to the Balkan Wars and the flood in September 1913. Finally, the first plant that can meet the electricity need of Istanbul, the Silahtarağa Power Plant opens on February 11, 1914. On February 20, power is given to Istanbul trams and the Dolmabahçe Palace, and three days later, to private facilities and households from three step-down transformers located in Beyazıt, Tozkoporan and İstinye. The plant, the entire shares of which are transferred to a Belgian company called SOFINA the same year, operates as the only electrical power plant of Istanbul until the 1950s and remains open until 1983.⁸

İstanbul Elektrik Fabrikası



SİLAHTARAĞA POWER PLANT

Source: *Elektrik* no. 3 (August 1939). Publication of the Municipality of Istanbul General Directorate of Istanbul Electricity, Tram and Tunnel Enterprises.

Source: Gökhan Akçura Archive

THE GREAT DISTRICT CREATED BY SMALL MANUFACTURERS IN LIGHTING: ŞİŞHANE

The Şişhane district is a neighborhood of Istanbul where chandeliers, sconces and similar luminaires are produced and sold; that is to say a district closely associated with its manufacturers and sellers. One runs into dozens of dazzling shop windows gleaming with the light of chandeliers on the streets descending from Kasımpaşa to the Golden Horn. The fact that Perşembe Pazarı and the electricians are located immediately next to it on Bankalar Avenue, make the neighborhood a center where lighting is both produced and marketed. These productions also support and incorporate fields like glass and mirror making. Now fallen prey to urban transformation, craftspeople who make chandelier parts, albeit few, still work in side streets of Galata; and streets of Şişhane, Perşembe Pazarı and Galata still bear traces of this craft.

The curious story of how this district turned into a market of chandeliers, sconces and luminaires can be briefly summarized as follows: The Golden Horn district undergoes a transformation during the era when steamships replace sailboats in maritime transportation in the Ottoman Empire. The fact that there is a need for a large number of brass parts for the construction of steamships leads to the opening of many workshops around the Golden Horn that process yellow brass. Later on, when diesel engine ships take over, these manufacturers and craftsmen begin to seek a new market. When the Silahtarağa Power Plant becomes operational in 1914 and dwellings begin to receive electricity, the need for chandeliers increases. And this creates the market brass craftsmen need. Using the same material they used for steamships, and easily procuring the components they need for manufacturing from Perşembe Pazarı, they turn to a new craft. Thus, Şişhane becomes the center of the most diverse designs of chandeliers, sconces, and luminaires in Turkey, or maybe even the world. In this neighborhood where Levantines and Armenians constitute the majority, not just luminaires, but also the furniture of the Ottoman palaces, which have entered a modernization process, are manufactured.

Unfortunately, this luminous district has begun to sink under the darkness. Like Tarlabaşı, the Şişhane district—which holds a significant place in the city’s memory and should in effect be included in historical heritage—is being subjected to urban transformation under Galataport and Haliçport projects. The important trade center of the past is now occupied by hotels and restaurants. In addition to all these adversities, Chinese production is overtaking the market

with cheap and largely inferior quality products and putting Şişhane craftspeople in a bind, as is the case in all sectors of lighting.^{14, 15}

1920 ISTANBUL STREETS BEGIN TO BE ILLUMINATED BY ELECTRICAL ENERGY

As gas and electric companies are given franchising rights, conditions are added to their contracts to provide gratuitous lanterns to the streets on behalf of the municipality. Dersaadet Gas Company is obliged to light 200 lanterns free of charge on behalf of the municipality. Gas companies responsible for Üsküdar and Kadıköy put up 2989 lanterns on the street, 70 of which are complimentary. Before the arrival of electricity, there is a total of 8747 gas lamps in the districts of Üsküdar, Galata, Beyoğlu and Eyüp. This number increases each year with the addition of new ones. After the transition to lighting with electrical energy, this number increases to 20,000 in 1957. Streets can only begin to be illuminated by electricity in the 1920s.¹⁶

1929 THE FIRST TRAFFIC LAMP OF ISTANBUL

The first traffic lamp of Istanbul is erected in Galata on August 23, 1929.¹⁷

1933 ILLUMINATION OF BUILDINGS AND SQUARES ON SPECIAL OCCASIONS

On the tenth anniversary celebrations of the Republic (and later on the 15th), the arches and light panel designs on the streets come to the forefront. In addition to arches, the illumination of large buildings and squares on special anniversaries begin on the celebration of the tenth anniversary of the Republic in 1933. The construction and illumination of arches for official celebrations in particular continue until the 1970s.

1935 A BRAND NEW PRODUCT IN THE WORLD OF LAMPS: THE FLUORESCENT LAMP

The initial idea for this lamp is conceived in the 1880s, while the development of this idea dates to the 1920s and its culmination to 1935. At the Illuminating Engineering Society meeting organized in Cincinnati, General Electric presents this new lamp. The first fluorescent lamps that are geared for use in architecture are put on the market by GE and Westinghouse in 1938.¹⁸



1934 REPUBLIC DAY, TAKSİM SQUARE NIGHT VIEW
Source: Gökhan Akçura Archive

1943 AND AFTERWARDS: SCIENTIFIC PUBLICATIONS ON LIGHTING TECHNIQUES

Research reveals that lighting has an effect on eye and neurological health, increasing work productivity, decreasing flawed production and work accidents, and various other areas. This increases the interest in lighting. One of the most prominent publications on lighting is published by Philips Technische Bibliothek in 1943. This is Louis Christiaan Kalf's work titled *Kunstlicht und Architektur*. Pioneering publications that broaden the horizons of architects in the field of lighting include James J. Gibson's *The Perception of the Visual World* on visual perception, and *Lichtarchitektur, Licht und Farb* by Dr. Walter Köhler published by Bauwelt Verlag in Berlin in 1956.

1948 A FIRST IN TURKEY: A FOREIGN CAPITAL LAMP FACTORY

The first lamp factory of Turkey is established in 1948 through the partnership of Koç Group and General Electric. This factory is closed down on April 30, 2000, following 52 years of service.¹⁹ There is an interesting detail regarding the production of fluorescent lamps in Turkey: only the technical parts of this lamp are manufactured locally; there is constant foreign dependency when it comes to the fluorescent powder that is the primary material that produces the light of this lamp.

1954 CHAMBER OF ELECTRICAL ENGINEERS IS FOUNDED

Chamber of Electrical Engineers (EMO) is founded on December 26, 1954, as per Law no. 6235 on TMMOB (Union of Chambers of Turkish Engineers and Architects) with 672 members. It is one of the 24 chambers that is a legal entity under TMMOB, and presently has a wide organizational network countrywide with over 47,000 members and branch offices in 13 cities in addition to its headquarters in Ankara.²⁰

The chamber works to inform relevant individuals about the developments in pertinent professional, technical and social matters with the congresses, assemblies, panel discussions and symposiums it organizes. Except for the few individual initiatives prior to the establishment of the Turkish National Committee on Illumination, it is the most important organization working on lighting with the symposiums and conferences it organizes on illumination and it continues its activities in the field to this day.

1960s THE QUESTION OF "HOW LIGHTING SHOULD BE"

Following the many years when incandescent lamps were the only choice for lighting, there are now different types of lamps on the market. In addition to incandescent lamps, mercury lamps, sodium lamps, and fluorescent lamps are being produced and sold. Discharge lamps and particularly fluorescent lamps claiming their place in the market allows for the choice of lamps based on needs. Furthermore, the luminous efficacy of such new lighting sources, that is to say the luminous flux generated in relation to the energy consumed, is 4-5 times greater as compared to incandescent lamps even in that period. And this brings along questions of energy conservation.

In this period, options for the lighting designer and manufacturer have increased. These options compel the lighting designer to ask questions about "where and how to use which lamp". The answers to these questions lead to advancements in the lighting technique and its transformation into a specialty field. Sources of light are no longer only a part of chandeliers, but a part of luminaires / lighting fixtures that are the products of serious research.

CHANGE ON KARAKÖY BANKALAR AVENUE: THE SALE AND REPAIR OF ELECTRICAL COMPONENTS

It is not possible to provide an exact date, but around the years when the Silahtarağa Power Plant becomes operational it is possible to observe changes here and its neighboring district Şişhane. In addition to small enterprises that sell lamps and electrical components, electricians who do repairs and small-scale manufacturing begin to be established on Bankalar Avenue. The avenue is not just the production and sales site of electricians, but also like the laboratory of young people studying electrical engineering. As one climbs up along Bankalar Avenue towards Şişhane, there is a transition in stores from electrical wiring components, measuring devices and similar other similar components to luminaires.

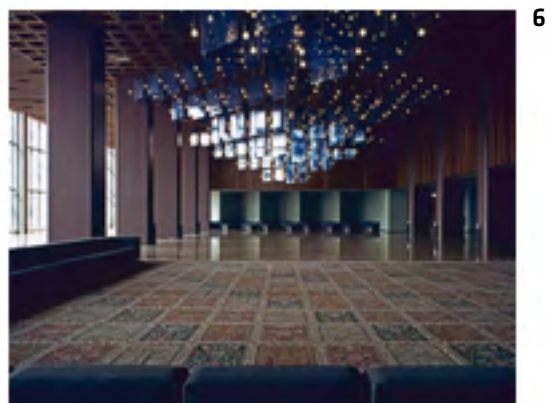
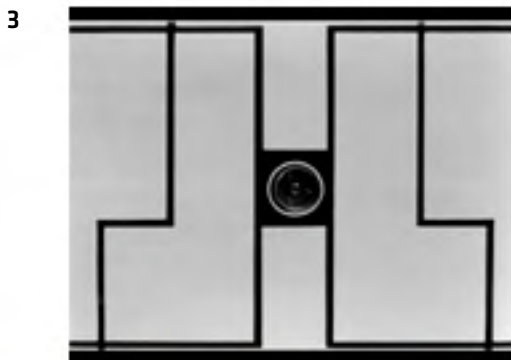
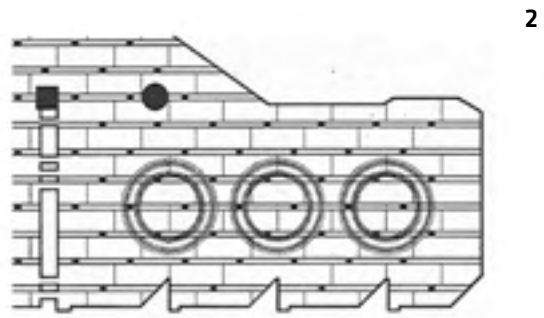
1950s ONE OF THE FIRSTS OF INDEPENDENT LIGHTING DESIGN: JOHANNES DINNEBIER

While working in a company that manufactures plane propellers in the post-war era, Johannes Dinnebieer begins to make simple lighting devices in his spare time. As the products he makes begin to be sold, he tries to create new ones. When he feels inadequate in this field, he gets in contact with architects and designs and produces fixtures for their projects. Since he does not want to begin mass



**IMAGES OF A LUMINAIRE FROM THE SABANCI MUSEUM
LIGHTING DESIGN**

Photos: Hülya Kılıç Sirel



**IMAGES FROM THE ATATURK CULTURAL CENTER
LIGHTING DESIGN**

- 1 - Grand Hall side foyer
- 2 - A lighting detail sketch
- 3 - Stalls foyer ceiling
- 4 - Stalls foyer

- 5 - Grand Hall
- 6 - Grand foyer

Source: SALT Research, Hayati Tabanlıoğlu Archive

production in this field, he opts for producing his own designs. Designing separate devices for each project, Dinnebier undertakes the lighting project for the historical municipality building of the Düsseldorf Municipality in January 1952. Subsequently, he gets the chance to work with renowned architects at the 1955 Brussels World Fair. This job provides him with the opportunity to do the entire lighting of the world fair in Montreal. In the meantime, he also researches the lighting devices of other countries. He orders luminaires designed in Denmark, Sweden, Finland and Italy respectively, most of which are extremely elegant. The common quality of all these is unfortunately they do not emit light (similar products have also been marketed in Turkey for a long time). Finally, Dinnebier reaches an agreement with an Italian. This person is Gino Sarfatti, the owner of the famous lighting company Arteluce which manufactures very exceptional luminaires.

The majority of Johannes Dinnebier's customers are architects and his work is published in the most important publication of the lighting world, *International Lighting Review*. One day he crosses paths with the architect Hayati Tabanlıoğlu. The architect is in need of a special lighting design for a project he is doing, but major obstacles await him on the path to attaining his goal.²¹

1960 THE FIRST AND SIGNIFICANT EXAMPLE OF COLLABORATION BETWEEN LIGHTING DESIGN AND ARCHITECTURAL DESIGN IN TURKEY: ATATÜRK CULTURAL CENTER (AKM)

Hayati Tabanlıoğlu, the architect of Atatürk Cultural Center (AKM; previously known as Istanbul Cultural Palace), is a modern and visionary professional. While addressing all sorts of problems of the center with diligence, he also feels the need to do something distinctive in terms of lighting. He cannot find a firm to assist him in this matter in Turkey. Thus, he wants to go to the Netherlands which is considered the epicenter of the lighting industry. The rest of the story unfolds as follows, according to the lighting specialist of AKM, Johannes Dinnebier. One day, as Dinnebier arrives home and takes the elevator going upstairs, he sees a man leaving his store with a very sad face. He immediately approaches him and begins to talk to him. The man tells Dinnebier that he is building an opera house in Istanbul and he has visited Philips in Eindhoven for its lighting, but was unable to find what he was looking for. Just as he was feeling dejected, someone had given him Dinnebier's address and told him that Dinnebier was the one who illuminated the opera houses in Dortmund and Bonn, as well as the theatres in Solingen and Würzburg. After this

conversation, there is an agreement between these two men that lighting for each building must be done differently. Dinnebier takes Hayati Tabanlıoğlu to Dortmund to show him the opera house. And later on the two designers meet in Istanbul. Their collaboration begins for the lighting of AKM, but the problem is substantial. There is a significant import restriction in Turkey and it is impossible to bring the material for the necessary luminaires from abroad. Therefore, all the luminaires designed for the opera house are produced in Turkey. Thus, AKM takes its place in Turkey's history of lighting as one of the first instances where brand-independent luminaires are designed and produced by a designer in line with architectural necessities.²¹

1962 THE FIRST LIGHT EMITTING DIODE LAMP IS DEVELOPED

Nick Holonyak Jr. Makes the first diode that emits light. LEDs entry to the market occurs much later, following a very slow development phase.

1963 TRANSITION FROM SALE OF ELECTRICAL COMPONENTS TO LUMINAIRE DESIGN: FOUNDATIONS OF LAMP 83 ARE LAID

Initially named after its founder (Ceyişakar Electric), the firm later changes its name to the door number of its very first store and begins to work only on lighting devices. Thus starting its half century long saga, LAMP 83 becomes a first in many ways in the lighting industry. Breaking new ground in window displays with the "spot production" it makes for shop windows is one such example.

Wishing to further develop its lighting device designs in the 1990s, LAMP 83 signs a design contract with Yapı Fiziği Uzmanlık Uygulamaları AŞ - YFU (Building Physics Applications Co.). With reflectors specially designed by this firm, the luminaire efficiency of LAMP 83 lighting devices further increase. In 1993, it realizes another first and develops a "computer supported lighting program" specific to LAMP 83 that operates with DOS, and presents it to its customers. Thus, it achieves integration between light sources and the luminaries/ lighting devices it produces. LAMP 83 continues to sustain its presence in the lighting industry at its new factory it relocated to in the beginning of 2015 with completely modernized machinery /equipment, exporting products to over 40 countries with an increased annual production capacity.²²



TEKFEN LIGHTING INSTITUTE TESTING STANDS AND SEMINAR ROOMS

Source: Şazi Sirel, Yapı Fizik Uzmanlık Uygulamaları YFU (Building Physics Applications Co.)

1964 INCANDESCENT LAMP PRODUCTION WITH LOCAL CAPITAL BEGINS: THE FIRST STEP TOWARD INDUSTRIAL PRODUCTION AT TEKFEN

While developed countries are benefitting from all the blessings of lighting techniques, the efforts to bring and promote this technology in Turkey also start at a relatively early date as compared to certain other industries. The important development in the first half of the 1960s is the decision of three partners, later to make a famous name for themselves as Tekfen, to enter the lamp business. The lamp factory founded in Istanbul in order to invest in industry in face of the irregularities in business and cash flow in the construction sector, becomes operational in mid-1964 and quickly takes over one third of the lamp market.

The firm approaches the issue of lighting not just as a limited commercial activity, but also as a field of engineering and public education, and to this end establishes the Tekfen Lighting Institute on the ground floor of the factory, under the guidance and technical supervision of Professor Şazi Sirel who is an expert in lighting. The preparation and implementation phases of the project take a few years. On one hand this institute embarks on an effort to promote the basic principles of lighting technique by publishing a pamphlet, on the other, it organizes sessions to visually explain this technique with experimentation stands. The multipronged approach of Tekfen to lamps is further enriched through the foundation of a second factory in İzmir in partnership with Philips to manufacture incandescent light bulbs and fluorescent lamps (1966-68). When the factory is damaged because of the 1999 earthquake and since Turkey is no longer an attractive market for lamp production, it is decided in 2002 to continue production in China.^{23, 24}

It is not all that easy to constantly sustain one's standing in the market. An excerpt from Ali Nihat Gökyiğit's memoirs on the sale of Tekfen lamps:

“Instead of one distributor per city, however many wholesalers there are, we considered giving merchandise to all of them. And we established our own marketing fleet in order to give products directly to retailers such as grocery stores and electricians throughout Istanbul. This strategy turned out to be very successful. We soon reached thirty per cent of the market. Subsequently, our competitors used similar methods. After our market share reached thirty four per cent, our growth slowed down. One day, our general manager Kamran Sertel and our director in charge of bulb (lamp) marketing came to

us and said, “We've got to enter the milk business!” Our first reaction was, ‘Are you crazy? We sell bulbs, what have we got to do with milk!’ They said, ‘There is now pasteurized milk, it is put on grocers’ shelves in cartons like pasta and sold next to bulbs.’

Milk was manufactured in İzmir by Yaşar Group under the brand Pınar Süt, but its largest sales network in Istanbul was run by Düzey Company under Koç Group. Salespeople of this company would go to stores as they were marketing General Electric bulbs and if there were Tekfen bulbs on shelves, they would say, ‘We see, you don't want milk today!’ Upon which the grocer would ask, ‘What's this got to do with that?’ and the salesperson would respond, ‘then what are Tekfen bulbs doing on your shelf?’ Thus pressuring them with the much sought-after pasteurized carton milk of the time, they began to obstruct the sale of our bulbs. In face of such pressure, we came to the conclusion that in addition to bulbs, we had to enter the pasteurized milk business.”

1965 THE FIRST DICTIONARY OF LIGHTING TERMS IS PUBLISHED IN TURKEY BY TÜRK DİL KURUMU (TURKISH LANGUAGE INSTITUTE)

Studies in the field of lighting terms and their scientific definitions that are initiated around 1968 are continued by Turkish Language Institute, and in 1973, *Aydınlatma Terimleri Sözlüğü* [Dictionary of Lighting Terms] compiled by Professor Şazi Sirel is published by this institute. A more comprehensive dictionary, also compiled by Şazi Sirel and including CIE terminology, is published much later, in 1997, by YEM Yayın as a 216 page volume.

1960-1970 ARCHITECTURAL LIGHTING BEGINS TO BE WIDELY INCLUDED IN THE CURRICULA OF ARCHITECTURE FACULTIES

As the use of electrical energy for lighting becomes widespread, the subject begins to be considered as a field pertaining to electrical engineering and is included as a course in electrical engineering in universities for many many years. Following the 1950s, particularly in the 1960s, first the faculties of architecture at Istanbul Technical University and the present day Yıldız Technical University espouse the subject. Both faculties include lighting in their undergraduate curricula. In those years, at Istanbul Technical University Faculty of Architecture, lighting courses are mostly daylight illumination based, and additionally, architect candidates are



REFLECTORS

Custom design reflectors cast by Master Dikran exhibited at Yıldız Technical University Faculty of Architecture Lighting Laboratory.

Photos: Leyla Dokuzer Öztürk

introduced to artificial lighting. As for Yıldız, its Faculty of Architecture concentrates more on artificial lighting. At the State Academy of Fine Arts (present day Mimar Sinan Fine Arts University), a limited scope elective course on lighting is taught, focusing mainly on uniform illuminance calculations and the installation of luminaires accordingly. As can be discerned, in the 1960s, architects have begun to espouse lighting as an element of the architectural environment. Courses and research on architectural lighting technique begins to find its place in other state and private universities over time, albeit somewhat slowly.

1968 A SMALL GIANT IN LUMINAIRE DESIGN: MASTER DİKRAN

Between 1968 and 1973, numerous lighting projects are developed and implemented in which the lighting technique of the time is applied to the full extent and luminaires that do not belong to a specific brand are used. The paraboloid and ellipsoid reflectors that are designed directly according to need are produced in Turkey for the first time by Master Dikran. Some of these products are exhibited at the Lighting Laboratory of Building Science at Yıldız Technical University.²⁴

1969 A PIONEERING MUSEUM IN TERMS OF MUSEUM LIGHTING IS OPENED

The Gulbenkian Museum (Museu Calouste Gulbenkian) under Gulbenkian Foundation is opened in Lisbon, the capital of Portugal. Constructed as a new building, the lighting project of the museum is one that employs the most recent techniques and knowledge. In addition to details regarding the preservation of highly light-sensitive objects, innovative solutions are devised for the inner volume use of windows that are very problematic in dim volumes. Also among firsts in museum lighting design is the creation of dark ceilings in order to reduce the mirroring effect problem in display cases.

Since museum lighting is an issue that requires utmost diligence, many architects renowned in museum architecture begin to work with lighting experts as early as at the design phase and strive to find the right approach to the issue. The effect of lighting in the shaping of museum buildings carries much more weight as compared to other architectural fields.

1978 THE FIRST LIGHTING LABORATORY FOR STUDENTS IS FOUNDED AT YILDIZ TECHNICAL UNIVERSITY FACULTY OF ARCHITECTURE

A lighting laboratory is founded under the Department of Building Science of the Faculty of Architecture at the higher education institution formerly called Istanbul State Academy of Engineering and Architecture. At the time, it is the first and only lighting laboratory in the Middle East and the Balkans that is established for students and provides them with research opportunities (the second lab in Turkey following Tekfen Lighting Institute). After the Building Science Graduate Program is launched in 1979, students find the opportunity to undertake graduate and doctoral studies benefitting from this laboratory.²⁴

1979 BUILDING SCIENCE / PHYSICAL ENVIRONMENTAL CONTROL GRADUATE PROGRAMS AT UNIVERSITIES

Subjects of architectural lighting and lighting design are included in education in the scientific field established with the name Building Science or Physical Environmental Control. In this framework, lighting courses which are initially taught at the undergraduate level at Yıldız Technical University Faculty of Architecture (1965) are later taught in much wider scope in the Building Science Graduate Program that is launched in 1979. This is the first graduate program among universities in Turkey with courses largely devoted to artificial lighting and luminaire design. The subjects addressed by the faculty members who have conducted research on architectural lighting pertain mostly to illuminance calculations and the quality of lighting. In addition to these, luminaire / lighting device design, reflector geometry, and similar specialty courses are included in the curriculum of this department.²⁴

One of the firsts in Turkey in terms of educating architecture students on architectural lighting is Istanbul Technical University (ITU). Lighting courses, which are part of the ITU Faculty of Architecture Building Science graduate programs and include various subjects such as daylight illumination, are transferred to Physical Environmental Control graduate program that is launched many years later in 1999. The graduate program later retitled Environmental Control and Construction Technologies with a strong academic faculty comprehensively addresses different issues in lighting under various courses.



**THE LIGHTING LABORATORY OF YILDIZ TECHNICAL
UNIVERSITY FACULTY OF ARCHITECTURE DEPARTMENT OF
BUILDING SCIENCE, 1978**

Source: Şazi Sirel, Yapı Fiziği Uzmanlık Uygulamaları YFU
(Building Physics Applications Co.)

Architectural lighting design is taught in courses of faculties of architecture of many state and private universities such as Bilkent University, Gazi University, Karadeniz Technical University, Kültür University. In addition to architecture, electrical engineers and industrial designers also tackle the subject with different approaches.

Subjects in lighting and lighting design, which are initially addressed by universities in Turkey, are now an important aspect of the architectural design process. Making significant progress in espousing, advancing, promoting, and applying this subject, architects, designers and academicians in Turkey at times surpass their European counterparts.

1980s THE ONLY IMPORTANT REVOLUTION IN INCANDESCENT LAMPS: INCANDESCENT HALOGEN LAMPS ON THE MARKET

Incandescent lamps have always been a problem due to their low efficacy (emitting very little luminous flux in contrast to the energy they use), overheating when they work, their dimensions, and short life span. Used only in car lamps and similar restricted fields until the 1980s, halogen lamps enter the market as normal incandescent halogen lamps after this date. Manufactured in higher power, in various types and sizes according to its working principles, these lamps quickly make a place for themselves in the market as their color rendering index is very good and their life span twice that of normal incandescent lamps, even though the heat emission problems still exist.

POST-1980 COMPANIES MAKING LIGHTING DESIGN CLAIM THEIR PLACE ON THE LOCAL MARKET

In addition to large luminaire and lamp manufacturers such as Philips and Osram, small manufacturers also begin to gain awareness about lighting. Many small-scale manufacturers, as in the case of LAMP 83, enter the lighting business and try to create a space for themselves in this field. While many of these manufacture lighting components such as ballasts, starters, switches, jacks or dimmers, some also begin to make luminaires. Luminaire, that is to say lighting fixture manufacturers aspire to also do the indoor and outdoor lights of spaces in time. Thus, the firms which work in this field diversify. There are those who only advance themselves in the field of lighting technique and theory among these, while there are also those who open lighting laboratories with different aims. As exemplified below, many firms work to technically keep up with the developments of the age and meet its demands, thus increasing the level of competition in the field.

The following information is compiled from the websites of the companies:

Elektromotor Spot Sanayi (Electromotor Spot Industry, Inc.), which enters the lighting market with a small workshop in 1959, is among the first spotlight producers of Turkey and one of the first companies to export spotlights. It continues to renew and expand its product portfolio every year, and also manufactures custom-made spotlights or lighting fixtures. ("Spotlight" is the market name for a luminaire which contains an incandescent lamp, or a similar point source of light, and at least one reflector surface.)

EAE Lighting Company is founded in 1982 under EAE Group, which is among the leading manufacturers of the electromechanical industry in Turkey. Focusing on providing products of modern lighting technique in indoor lighting, the firm places special emphasis on industrial lighting. Also aiming to create comfortable, productive, safe working spaces with environmental conformity, the company provides services with its expert staff for pre-sales project development and post-sales project care.

Founded in 1982, Pelsan starts ballast production in 1985, and opens its metal processing plant in 1988. Adopting the ISO quality system for better quality products in 1997, the company constantly seeking innovation begins to make a name for itself also in the field of lighting design with plastic injection production in 2000, and begins exports in 2001. Having been in the industry for 34 years to date, the company's Lighting Laboratory founded in 1997 has been accredited by Turkish Accreditation Agency (TÜRKAK) in 2015.

VEKSAN Lighting (founded 1986), another company working only on lighting devices since its foundation, has channeled all its knowledge and energy to this field and become an expert in lighting fixtures. VEKSAN Lighting has been exporting in high volumes mainly to the United Kingdom and Germany and to other countries such as Denmark, Sweden, Belgium, Hungary, Bulgaria, Ukraine and Romania; custom manufacturing not only for its own brand but also for the pioneering brands in the European lighting industry.

Founded in 1991, TEPTA is a firm with 25 years of experience in lighting design, which they define as the fourth dimension of the creation of space in the architect, electrical engineer and end-user triangle. One of the company's most distinguishing qualities is that it has the capacity for custom-made manufacturing. In its own words, the firm offers lighting service to the market.

LUMİNA, Inc. is a company founded in 1993 to make professional lighting projects and is the representative office of many European lighting firms in Turkey.

In addition to companies producing wiring and lighting components and accessories, firms that manufacture lamps and luminaires also rapidly increase in the lighting market and begin to make a name for themselves. While the lighting industry is mostly concentrated in Istanbul, there are also new ambitious firms opening in different cities of Turkey over time. ARLIGHT among these is founded in Ankara in 1991 to create designs that integrate with the architectural structure of spaces. The firm markets its products and projects not just in Ankara but also in various other cities of Turkey. With an accredited lighting laboratory, the firm also works in the field of LED lighting and conventional lighting.

Founded in 1968 in İzmir, CEMDAĞ invests in eccentric press machines, and also begins to produce ballasts for fluorescents. It receives its first quality certificate the same year, and gets its first quality standard certificate in 1972. CEMDAĞ begins production of ballasts for mercury lamps in 1974. Starting to produce road and street lighting devices in early 1980, it establishes its R&D laboratory in 1981. Renowned for its wide variety of products, the company founds its TÜRKAK accredited photometry lab in 2010.

The companies briefly introduced above, and many others such as İKİZLER founded in 1982 and LİTPA founded in 1992 continue to play an important role in the market.

1987 AND AFTERWARDS: COMPANIES WHICH CAN MAKE PROJECT BASED AND BRAND-INDEPENDENT CUSTOM LIGHTING DESIGN ARE ESTABLISHED

Yapı Fiziği Uzmanlık Uygulamaları – YFU (Building Physics Applications Co.) established in 1987 can be considered the first private company to design lighting projects or luminaires / light fixtures for diverse needs. The company uses any product that serves its purpose without being dependent on any particular brand, and in the absence of a suitable product, it designs and has the product manufactured itself. YFU becomes a first not only in the field of design, but also with the laboratory it establishes for photometric measurements. Furthermore, the firm supports the advancement of lighting technique with its publications mainly on lighting, and also on subjects such as acoustics and noise control.

NA LIGHTSTYLE, established in 1996 by architect Nergiz Arifoğlu, is among the first brand-independent architectural lighting design firms. Tackling each project with the approach: “work which does not rely on products of particular brands provides flexibility to the designer; making the design dependable, affordable, and creative”, the founder of the company is an architect with a master’s degree in lighting design. This makes her well-equipped to address architectural lighting professionally.

Founded in Istanbul, ZKLD Lighting Studio is among the few lighting design companies focusing solely on architectural lighting, and has realized the lighting of several notable projects in Turkey and abroad. Its founder Zeki Kadirbeyoğlu has long term prior experience in the same field in another company. The company specializes in lighting design, product design, and consultancy services for shopping mall, office, store, hotel, museum, facade, landscape, housing, and restaurant projects.

It is possible to include universities among the institutions working on lighting projects and luminaire design. Academics developing lighting projects and luminaire designs for the market through working capital collaborate with students to instruct them on the practical application of theoretical subjects.

1990s A NEW CONVENIENCE FOR ARCHITECTS, LUMINAIRE / LIGHT FIXTURE DESIGNERS AND ALL USERS: FLUORESCENT LAMPS GET SMALLER – COMPACT FLUORESCENT LAMPS

Early compact fluorescent lamps which were developed in the 1970s are not released due to high manufacturing costs. Philips’s work in this field is particularly noteworthy. It is only in the early 1990s that the desired costs are met, and compact fluorescent lamps are introduced to the market. Gradually overtaking several areas where incandescent lamps were previously used, these lamps come to be known colloquially as “economical lamps” owing to their low energy consumption and long service life.

1991 TURKEY’S FIRST LIGHTING MUSEUM IS OPENED

Museum of Illumination and Heating Appliances is opened on June 25, 1991. Established entirely through the personal efforts of civil engineer Mehmet Yaldız, the museum’s collection features heating appliances as well as diverse lighting fixtures from past to present, most notably oil lamps, candlesticks and kerosene lamps.²⁵

1995 ATMK, FIRST NATIONAL COMMITTEE ON ILLUMINATION IN TURKEY, IS ESTABLISHED

Turkish National Committee on Illumination (ATMK) is established in 1995.²⁶ The first unanimous decision is taken for a national committee to be established and start working as soon as possible at a meeting convened on February 16, 1982 at the Dean's Office of Istanbul Technical University Faculty of Engineering and Architecture in Maçka. Nevertheless, it is not until much later, with a regulation published in the Official Gazette No.: 22449 on October 31, 1995, that the committee is established and begins its activities.

1996 TURKEY BECOMES AN OFFICIAL MEMBER OF CIE

Founded in line with the charter of the International Commission on Illumination (CIE), ATMK becomes a member of CIE in March 1996. Established with four main objectives, the national committee delineates its name, headquarters, membership criteria, organs, function of the board of directors, financial provisions, term, and conditions of dissolution and executive principles with its 12 article statute.²⁶

1996 ATMK BREAKS NEW GROUND IN TURKEY: THE 1st NATIONAL LIGHTING CONGRESS AND FAIR

The first national congress on lighting in Turkey is organized by ATMK on November 28-29, 1996. Also held concurrently with this congress, the Lighting Fair is the first fair in Turkey featuring solely lighting products. ATMK still continues the national congress events with the IstanbulLight Fair with a much wider scope and outreach.

1997 LIGHTING EXPERTS' ADDRESS TO ARCHITECTS

Transforming lighting from the work of an electrician to a field of science, namely "lighting design", has required longstanding and strenuous efforts. The struggle to this end has been ongoing in Turkey since the 1960s.

A significant number of the lighting experts who take the floor at a congress held in 1997 in France issue important calls to architects and urban planners at the end of their speeches. These calls, which focus on 15 main topics, state that lighting, in this day and age, must definitely be considered as part of architectural concept and design, and beyond being a mere technical installation, accentuates architectural functions and creativity with its defining,

emphasizing, demarcating and distinguishing structural aspects. Statements propounding that an urban area is better comprehended when illuminated with the proper technique; incorrectly illuminated outdoor or indoor spaces are incorrectly perceived; many buildings suffer a loss of identity/style particularly in urban lighting are included in these calls. It is further highlighted that correct lighting helps save energy.²⁷

1997 TURKISH LIGHTING LUMINAIRE MANUFACTURERS ASSOCIATION (AGİD) IS FOUNDED

Turkish Lighting Luminaires Manufacturers Association (AGİD) is established in 1997 by 19 companies manufacturing luminaires and lighting components. After the foundation of ATMK, which is a milestone in organizing the field of lighting, the foundation of AGİD is another very significant step to bring together the luminaire industry.²⁸

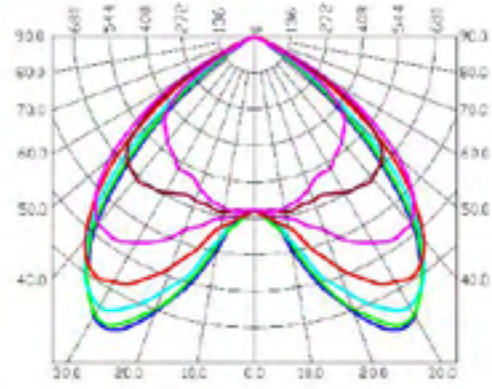
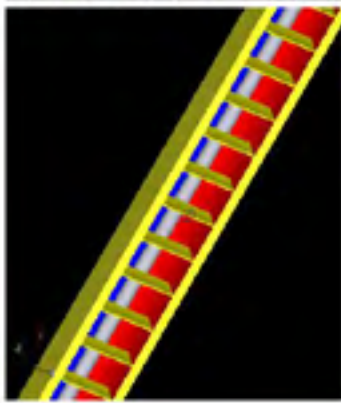
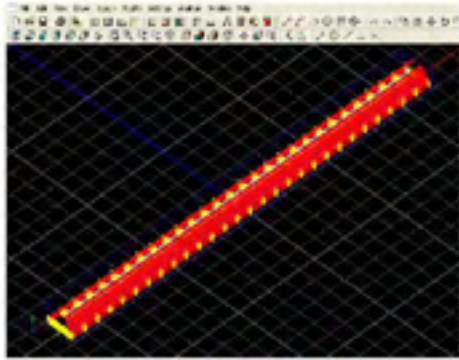
The association is established with the following main objectives:

- Instating a sense of identity in the industry
- Cultivating individual and collective relationships among the actors in the industry
- Improving institutional / academic relationships through joint efforts and agreements
- Ensuring compliance with international standards
- Facilitating the representation of Turkish manufacturers in the global market
- Protecting consumer rights

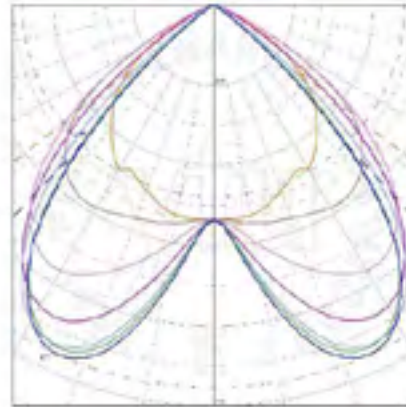
Today, with over 80 members, the association is an important institution in the lighting industry with its member briefings and other similar events.

2000 AND AFTERWARDS: COMPUTER PROGRAMS ENTER THE WORLD OF LIGHTING

Endeavors in the world of software encompass the subject of lighting design, eliciting highly beneficial results. Today, lighting designs are generally done using computer programs; primarily DIALux and Relux, but also others. The photometric quantities of a luminaire are also determined through the assistance of simulation software. With these programs aimed at luminaire analysis, the need to manufacture a certain number of prototype devices is eliminated and the expected outcome can be monitored concurrently with the design phase; thus making it possible to prevent any waste of time, money, and labor during the luminaire design process.



Bilgisayar programı sonuçları



Ölçme sonuçları

2000 AND AFTERWARDS: LIGHTING FAIRS BECOME MORE WIDESPREAD IN TURKEY

For a long time, those who wanted to follow developments in lighting technology in Turkey had to go to international fairs, primarily Hannover and Frankfurt. In time, this necessity expires chiefly with the contributions of ATMK (which organizes the first lighting fair in Turkey in 1996). Followed by a wide audience, fairs begin to be organized mostly in Istanbul, but also in different cities. IstanbulLight – International Lighting Technologies Exhibition and Congress continues its activities in collaboration with ATMK. Among other fairs catering to the world of lighting in Turkey are LIGHTTECH – International Electricity, Lighting and Installation Fair, the International LED, Lighting and Interior Electric Installation Exhibition, and LED&LED Lighting Exhibition.

2007 DECLARATION OF THE OFFICIAL ESTABLISHMENT OF THE ARCHITECTURAL LIGHTING DESIGN PROFESSION (PLD)

The plenary session of the Professional Lighting Design Convention (PLDC) adopts and proclaims the Declaration of the Official Establishment of the Architectural Lighting Design Profession on October 27, 2007. Following this historic act, the plenary session calls upon all lighting and lighting related associations, organizations and publications to publicize the Declaration, and disseminate, display, and present the text in international, national and local government circles, all official educational institutions, schools of various design, architectural and engineering disciplines, and among the memberships of relevant associations and organizations.

The preamble states that “the special qualities, knowledge, know-how, expertise and experience constitute the foundation of the profession; the understanding of light, lighting, its tools, its control and manipulation have become very complex and multifaceted; the impact of light on human beings is known today to have many more ramifications than just the visual/perceptual one, intricate as that alone may be; the responsibilities of those dealing with designing and specifying lighting for the human environment have become very significant; and therefore the Plenary Session of the Professional Lighting Design Convention proclaims the Declaration of the Official Establishment of the Architectural Lighting Design Profession a fact to be officialised by individual governments and by all international bodies dealing with the recognition of professions and independent disciplines.”³⁰ Following this preamble, it is underscored that lighting design is a profession and discipline distinct

from the fields of architecture, interior design, landscape design, urban design and electrical engineering, and its boundaries are defined. The article propounding that lighting designers are part of the design chain of an architectural project in a way underlines the position and significance that architectural lighting, and in turn the designer itself, hold in our present day and age.

2007 SİLAHTARAĞA POWER PLANT REOPENED AS THE FIRST ENERGY MUSEUM IN TURKEY

Silahtarağa Power Plant, the first urban-scale power plant in the Ottoman Empire which supplies power to Istanbul between 1914 and 1983, is designated to Istanbul Bilgi University by the Ministry of Energy and Natural Resources in May 2004. The project to transform the power plant into a center for culture and arts is undertaken by Istanbul Bilgi University together with Ciner Group and Doğuş group, sponsored by Kale Group and Istanbul Metropolitan Municipality.³¹

2009 THE EUROPEAN UNION AND SOME OTHER COUNTRIES BAN THE MANUFACTURING AND DISTRIBUTION OF INCANDESCENT LIGHT BULBS

Effective as of September 1, 2009, the European Union puts a ban on the entry and sale of 100 W and above incandescent light bulbs in the European markets, due to their low efficiency and short life. New production or import is not allowed after the announced date; only the existing stock can be sold. The same decision is extended to 75 W incandescent light bulbs as of September 1, 2010; 60 W bulbs as of September 1, 2011; and 40, 25, 15 W bulbs as of September 1, 2012. As a candidate country for EU accession, Turkey is also liable for implementing the bans.³²

2010s THE WORLD OF LIGHTING IS ENRICHED AND RELIEVED WITH THE NEW LIGHT SOURCE: LED

Laboratory studies for LEDs date back to the early 1900s, and the efforts continue steadily after the first LED is developed and made commercially available by American scientist Nick Holonyak in 1962. Today, LEDs can be used to emit a desired color, or as part of static or dynamic lighting designs with white or colorful light. With lighting technology moving fast in the direction of LEDs, several companies are concentrating on LED production and use of LED products in their projects. Moreover, the number of companies providing lighting services using solely LED products is rapidly increasing. Nevertheless, the use of LEDs is not entirely devoid of problems; there are issues yet to be resolved.

2010-2016 INNOVATIVE STEPS BY PHILIPS AND THE SHUTDOWN DECISION THAT MARKS THE END OF AN ERA

In 2010, Philips creates the City Touch system, and using it in the lighting design of landmark buildings such as the Eiffel Tower, the Pyramids of Giza, the Empire State Building redefines the standards for sustainable outdoor LED lighting systems. Later in 2011, it wins the Bright Tomorrow Lighting Prize (L Prize) for the 60W Replacement Competition, and initiates the LED era in lighting.³³

By the end of 2012, Philips introduces Philips Hue, the first example of connected lighting. Currently, Philips aims at taking light beyond the level of lighting; using the internet of things to transform houses, buildings and urban spaces, it aims to improve people's lives with meaningful innovations.³⁴

After all these positive developments, a news story about the giant enterprise strikes attention. According to this news story, Philips has decided to close down its fluorescent lamp plant employing 200 workers in Thailand. The declining demand for fluorescent lamps and the former gradually being replaced by LEDs are cited as the reasons behind this decision.³⁵

LIGHTING JOURNALS IN TURKISH

Elektrik Dünyası Dergisi (The World of Electricity Journal) published by HCS Yayıncılık has been on the market for 26 years. Later on, the journal *PLD* begins to be published in 2005, *LightWord* in 2006, and *LEDs-Lighting* in 2012 informing Turkish experts on lighting. Vestel LED Lighting reaches out to relevant institutions and individuals online, through collaboration with *PLD*. Another magazine, which has been catering chiefly to the electrical and electrotechnical industry for 36 years, is *Kaynak Elektrik* (The Source, Electricity Journal).

A NEW COUNTRY, A NEW GIANT IN THE LIGHTING INDUSTRY IN THE 21st CENTURY: THE REALITY OF CHINA

Many corporations in the lighting world move their production to China, as illustrated in the examples of Tekfen and Philips. In keeping with this change, not only lamps but also lighting components and luminaires or lighting fixtures, as they are known to the market are produced in China. However, the decrease in quality due to low-cost production currently constitutes an important problem in the industry.

AFTERWORDS

LIGHT - THE EYE - LIGHTING = VISUAL COMFORT

Humans perceive their surroundings with their five sense organs. They hear with their ears: auditory perception. They smell with their nose: olfactory perception. They see with their eyes: visual perception. They touch and feel the heat with their skin: tactile and thermal perception. They taste with their tongue: gustatory perception. Through all of these senses, the surroundings are perceived. The scientific field of building physics addressed in the text, supplies, evaluates, and studies the knowledge that helps humans to live comfortably in regard to these phenomena.

Visual perception makes up more than ninety per cent of total perception. That is, we perceive our environment mainly through sight. The data, the raw material of visual perception is light. Light is defined by CIE as visible radiation; optical radiation which stimulates visual sensation. There are no strict limits for the spectrum of visible radiation. The lower bound is generally considered to be 360-400 nm wavelengths and the upper bound as 760-830 nm wavelengths. The phenomenon we call sight, as defined by *Aydınlatma Sözlüğü* (Dictionary of Lighting), is the perception of the details in our external environment through the sensory traces stimulated by the light entering the eye.³⁶

Returning from these definitions to the living environment of human beings, we could say that the one who creates this environment for humans is the architect. The working material of the architect is the human being. The most important subject of the field of building science, or physical environmental control, is lighting. Other subjects are not less important; but what constitutes our first impression of a space or a building is mainly the light illuminating it.

Human beings carry certain characteristics in their genes attesting to their being a part of nature; for example, they always turn towards light. Their affinity to warm light in dim surroundings is a deep-rooted trait embedded in their genes. There is a highly crucial set of rules connecting visual perception and light. The quantity as well as the quality of illumination humans need for each activity is different. The architect creates the space befitting an activity, which must be complemented by lighting. This is why oftentimes selecting a set of luminaires/lighting fixtures available on the market fails as a solution for a space or activity. A luminaire conceived by the architect will both ensure that the activity or the function defining the space takes place smoothly, and also not contradict the style, the expression,

that is to say the statement of the space itself. The lighting elements chosen should contribute to the visual aesthetics of the interior space and not stand out. Since this is not always possible, architects should be able design luminaires themselves or describe what they want to lighting designers to have it designed by them.

The previous paragraph contains information about the qualities of lighting designers we hope to see more of in the world of lighting. There are several companies in Turkey placing higher quality products on the market with each passing day, most of them producing light sources and luminaires, i.e., lighting fixtures. But lighting technique is not the production of luminaires and light sources per se. Lighting, or illumination, is the application of light on objects, their surroundings, or to a region, an urban region, so that these can be seen. This, in itself, is a field of science.

A WARNING ON LUMINAIRE DESIGN THAT NEVER GETS OLD AS THE NEW LIGHT SOURCE LED IS BECOMING MORE WIDESPREAD

For a long time, the common feature of luminaires both produced in Turkey and imported from Europe, mostly sold for very high prices and some very fancy, has been that they do not emit light. These products were not luminaires, but luminous furniture. This example is given to emphasize concerns for the future. Right now, the world of lighting is moving fast away from conventional light sources towards LEDs. LEDs are lighting sources which would bring lighter designs, convenience in architectural details, and of course less spending for the consumer throughout use. Yet, lighting done without knowing the rules of the lighting technique brings wrong results, whether it involves LEDs or fluorescent lamps. In short, what saves lighting designers from wrong results is not the type of lamp they use, not the lavish luminaire of a particular brand, but knowing the rules.

LIGHTING OF OUTDOOR SPACES

Road Lighting: Throughout history, the lighting of streets has been an issue both for the people and for governing authorities. Street lighting, which begins in the 1900s with coal gas, rapidly spreads with the use of electricity. Having reached a whole new dimension today, road lighting occupies a significant place in luminaire / light fixture design. Successful examples of fixture design come to life as a result of modifications for directing the luminous flux emitted from the lamps entirely to the focus the road; minimizing the loss of luminous flux; protecting the lamp from outside effects such as wind, rain, or dust. The fierce competition in

the market in this field is also a factor which leads to these developments.

Airport lighting: Another area of expertise very similar to road lighting is airport lighting. Important studies have been conducted in this field and special lighting fixture designs have been produced. Road lighting and airport lighting are specialties that mainly belong to the working field of electrical engineering.

Lighting of urban resources and archeological sites: Lighting designs to mark, attract attention to, or provide guidance in historical or contemporary urban sites are a part of outdoor lighting that primarily requires architectural expertise. Lighting of squares, towers, architectural sites, parks, gardens, pedestrian roads, as well as the prestige lighting of several company buildings belong in this field. The key here is to provide a lighting design which would evoke the day view of the subject. In cases where to the contrary, a lighting design is detached from the day view of the subject, it represents not the building itself, but a new outdoor space created by the lighting designer; examples of which are fairly abundant.

AUTHOR'S NOTE ON THE CONTENT

From the building of the very first dwelling up until today, illumination with daylight has been among the architects' primary areas of concern and occupation. A vast accumulation of knowledge, calculation methods, window and skylight details exist pertaining to this field. It has been difficult to address such a comprehensive topic in this brief chronology. Therefore, illumination with daylight has been left out of the scope of this text to be tackled on another occasion.

The names of domestic companies or institutions mentioned in the chronology have been chosen arbitrarily from among others operating in the same field.

Universities and academics conducting important studies in this field, and books, articles, and proceedings published on this subject have not been addressed due to space limitations.

NOTES

1 Doğan Kuban and Zafer Toprak, "Aydınlatma" [Lighting], in *Dünden Bugüne İstanbul Ansiklopedisi* [Encyclopedia of Istanbul from Past to Present] Vol. 1 (Istanbul: Joint publication of Ministry of Culture and History Foundation, 1994), 474-481.

2 "Joseph Wilson Swan", *Wikipedia*, accessed September 9, 2016, https://en.wikipedia.org/wiki/Joseph_Swan.

3 "Thomas Edison Lightbulb", *Edison muckers*, accessed September 9, 2016, <http://www.edisonmuckers.org/thomas-edison-lightbulb/>.

4 T. Cengiz Göncü, "Beylerbeyi Sarayı'nın İnşa Süreci, Teşkilatı ve Kullanımı" [Beylerbeyi Palace: the Construction Process, Organization and Utilization] (master's thesis, Istanbul University Institute of Social Sciences, 2006), 101-102.

5 "Our heritage", *Philips*, accessed September 9, 2016, <http://www.philips.com/a-w/about/company/our-heritage.html>.

6 "Havagazi" [Coal Gas], *İETT* [Istanbul Electric Tram and Tunnel Company (İETT)], accessed September 9, 2016, <http://www.iett.gov.tr/tr/main/pages/havagazi/29>.

7 "Lamp Inventors 1880-1940: Cooper Hewitt Lamp", *The National Museum of American History*, accessed September 9, 2016, <http://americanhistory.si.edu/lighting/bios/hewitt.htm>.

8 Tefrik Çavdar, "Türkiye'de Elektrik Enerjisi" [Electrical Energy in Turkey], in *Cumhuriyet Dönemi Türkiye Ansiklopedisi* [Encyclopedia of Turkey in the Republican Period] Vol. 3 (Istanbul: İletişim Yayınları, 1983-1996), 690-698.

9 Olaf Berlien, "The opportunities of the digital economy", *OSRAM*, accessed September 9, 2016, <http://www.osram-group.com/en/our-company/110-years-of-osram/the-third-economic-miracle>.

10 "Türkiye'de Elektrik Enerjisi: Sektörün Yapısı ve Tarihsel Gelişimi, EMO Enerji Komisyonu Raporu" [Electrical Energy in Turkey: The Structure and Historical Development of the Industry, a report by the Energy Commission of Chamber of Electrical Engineers (EMO)], *Elektrik Mühendisliği* no. 278 (1981), accessed September 9, 2016, http://www.emo.org.tr/ekler/8dfff4676a47048_ek.pdf?dergi=58.

11 "Siemens", *Wikipedia*, accessed September 25, 2016, <https://en.wikipedia.org/wiki/Siemens>.

12 Mehmet Mazak, "İstanbul'da İlk Modern Aydınlatılan Mekan: Dolmabahçe Sarayı ve Dolmabahçe Gazhanesi" [First Venue to be Illuminated by Modern Lighting in Istanbul: Dolmabahçe Palace and Dolmabahçe Gasworks] (presentation, TBMM 150. Yılında Dolmabahçe Sarayı Uluslararası Sempozyumu [TBMM International Symposium on the 150th Anniversary of Dolmabahçe Palace] Istanbul, November 23-26, 2006), accessed September 9, 2016, <http://www.mehmetmazak.com/makale/3/270-istanbulda-ilk-modern-aydinlatilan-mekan-dolmabahce-sarayi-ve-dolmabahce-gazhanesi-tbmm-150-yilinda-dolmabahce-sarayi-uluslararasi-sempozyumu-2006#.V62IOU0cQdU>.

13 "Tarihçe" [History], *ATMK* [Turkish National Committee on Illumination (ATMK)], accessed September 9, 2016, <http://www.atmk.itu.edu.tr/Icerik.aspx?sid=9809>.

14 Ceren Büyüktetik, "Avizeciler Şişhane'den Giderse Avizencilik de Ölü" [If Lamp Stores Leave Şişhane Lamp Making Will Also Die], *Yurt* daily newspaper, November 30, 2011.

15 Aslı K. İngin, *Made in Şişhane: On Istanbul, Small Scale Production, and Design*, ed. Pelin Derviş (Istanbul: A4 Offset, 2011).

16 Osman Ergin, *Cumhuriyet ve İstanbul Mahalli İdaresi* [The Republic and Istanbul Local Administration] (Istanbul: Matbaacılık ve Neşriyat Türk Anonim Şirketi, 1933).

17 *İETT Ajandası* [Istanbul Electric Tram and Tunnel Company (İETT) Diary] (2016).

18 Rick DeLair, "Fluorescent Lamp Development: A comprehensive history covering the 1930s and 1940s", *Edison Tech Center*, accessed September 9, 2016, <http://www.edisontechcenter.org/fourescentlampdev.html>.

19 "Founder: Vehbi Koç", *Koç*, accessed September 25, 2016, <http://www.koc.com.tr/en-us/about/founder-vehbi-koc>.

20 "EMO ve Amaçları" [Chamber of Electrical Engineers (EMO) and Objectives], *TMMOB Elektrik Mühendisleri Odası* [The Union of Chambers of Turkish Engineers and Architects (TMMOB) Chamber of Electrical Engineers], accessed September 9, 2016, http://www.emo.org.tr/emo_hakkinda/tanitim_01.php.

21 "AKM Buluşması / AKM Reunion: Aydın Boysan & Johannes Dinnebie", *Youtube*, accessed September 9, 2016, <https://www.youtube.com/watch?v=bPhil0oCXvA>.

22 *Lamp 83*, accessed September 25, 2016, <http://www.lamp83.com.tr/en/>.

23 "History", *Tekfen Endüstri* [Tekfen Industry], accessed September 25, 2016, <http://www.tekfenendustri.com.tr/history.html>.

24 Şazi Sirel, "Aydınlatmanın Geçmişi" [The History of Lighting], *Yapı Fizigi Uzmanlık Uygulamaları* [Building Physics Applications], 1996, accessed September 9, 2016 <http://www.yfu.com/yazilar/AydYaz-2.pdf>.

25 *Çağlar Boyu Aydınlatma Isıtma ve Çeşitli Koleksiyonlar Müzesi* [Museum of Illumination and Heating Appliances], accessed September 9, 2016, <http://www.aydinlatmaveisitmaaraclarimuzesi.com/Default.asp>.

26 "Aydınlatma Semineri 2016-2" [Illumination Seminar 2016-2], *ATMK* [Turkish National Committee on Illumination (ATMK)], accessed September 9, 2016, www.atmk.org.tr.

27 Şazi Sirel, "Aydınlatma Uzmanlarının Mimarlara Seslenişi" [Lighting Experts' Address to Architects], *Yapı Fizik Uzmanlık Uygulamaları* [Building Physics Applications], 2011, accessed September 9, 2016, <http://www.yfu.com/yazilar.aspx>.

28 *Turkish Lighting Luminaires Manufacturers Association (AGID)*, accessed September 25, 2016, <http://www.agid.org.tr/en/>.

29 Leyla Dokuzer Öztürk, Togan Tong, Şensin Aydın Yağmur, and Onur Yiğit, *Düzensiz Yayılmış Aydınlik Sağlanmasına Yönelik Yansıtıcı Tasarımında Temel İlkeler ve Öneriler* [Basic Principles and Recommendations on Reflector Design to Provide Uniform Illumination] (Scientific and Technological Research Council of Turkey (TÜBİTAK) project no: 1041037, 01.07.2004-12.12.2007).

30 "Declaration of the Official Establishment of the Architectural Lighting Design Profession", *PLD Community*, accessed September 25, 2016, http://community.pld-c.com/wp-content/uploads/2014/06/PDF_Declaration_english.pdf.

31 "Energy Museum", *santralistanbul*, accessed September 25, 2016, <http://www.santralistanbul.org/pages/index/enerji-muzesi/en/>.

32 Rengin Ünver, "Aydınlatma Ders Notları" [Lighting Lecture Notes] (YTÜ, Faculty of Architecture Department of Architecture Division of Building Science and Theory, Master's Program, 2016).

33 "CityTouch", *Philips*, accessed September 9, 2016, <http://www.lighting.philips.com/main/systems/connected-lighting/citytouch.html>.

34 *Philips hue: Personal Wireless Lighting*, accessed September 25, 2016, <http://www2.meethue.com/en-us>.

35 "Philips to Shut Down Fluorescent Bulb Factory in Thailand in 3q16", *LEDInside*, accessed September 25, 2016, http://www.ledinside.com/news/2016/5/philips_to_shut_down_fluorescent_bulb_factory_in_thailand_in_3q16.

36 Şazi Sirel, *Aydınlatma Sözlüğü* [Dictionary of Lighting] (Istanbul: YEM Yayın, 1997).

BIOGRAPHIES

HÜLYA KILIÇ SİREL

Hülya Kılıç Sirel received her MArch degree from Istanbul State University of Fine Arts (now Mimar Sinan Fine Arts University). She completed her PhD and became an associate professor in Building Physics at Yıldız Technical University's Faculty of Architecture. She worked independently in various building physics projects and as a lecturer on Museum Lighting and Preservation, Architectural Lighting, Outdoor Lighting and Physical Environment Control in various universities. She currently teaches at FMV Işık University and supervises master's theses. She has several publications on museum lighting and sun control.

