

# Interior Lighting

## 室内灯光设计

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## 室内灯光设计

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# Is Your Lighting Application Efficient?

By: George C. Bosson, IES, LIRC

*Overemphasising luminaire efficiency, at the expense of application efficiency, can result in offensive glare or gloomy spaces, even while conserving energy.*

The "greening" of commercial construction and renovation is not a fad. More than 30 states, 135 cities and 10 Federal agencies now require or encourage new public buildings to register with the LEED green-building rating system. As public construction continues to benefit throughout 2010 and 2011 from the 2009 American Recovery and Reinvestment Act funds, green-building practices are more important now than ever before. By 2013 McGraw-Hill Construction predicts that the green-building market will grow to 25 percent of the value of all new construction starts, or about \$140 billion.

In the professional discipline of lighting, this is creating extraordinary opportunities to design lighting solutions that provide effective lighting output with optimal visual comfort, attract interest, and reveal form and architecture indoor and outdoor. It is also creating extraordinary risks, as designers are pressured to emphasise LEED points over the quality of lighting performance and efficiency metrics over people's needs. This is not to say that lighting should not be efficient: lighting should be very efficient; but the metrics of efficiency tell only part of the story of what lighting does. Overemphasising these metrics can still result in unintended offensive glare or gloomy spaces.

Good lighting design does not start with product; it begins with need: what emotional response does a professional lighting designer or architect want to stimulate in users of a space? What surfaces and objects should be lighted, at what intensity, to draw attention and shape spatial perception? How much light do users need on task surfaces to enable them to perform those tasks without headache, eye strain, glare or veiling reflections? Once these design decisions are made, light source and luminaires can be more accurately selected. The right luminaire for the job is often not the one that is most efficient in lumen output but, rather, in lumens onto worksurfaces or lumens on the ground or floor.

Luminaire efficiency may be judged based on input watts, luminous efficiency, efficacy rating (lumens per watt) and a coefficient of lamp utilisation. As luminous efficiency is published in most photometric reports and catalogue sheets, designers often focus on this one metric. It is an important metric, telling us the percentage of light produced by the lamps in a luminaire that is, in turn, emitted by the luminaire.

However, it only tells part of the story of luminaire performance. Overemphasising it can lead to ultimately weaker or improper lighting choices for applications at hand. After all, a bare lamp offers 100 percent efficiency but would not be a good choice in, say, a classroom. The most efficient luminaires—particularly unshielded luminaires with direct light distribution—can easily be "glare bombs" when installed with clear or no lensing, in applications with lower mounting heights, or by simply installing too many fixtures.

Attention to lighting choices and their design can result in luminaires that are not only energy-efficient and energy-saving, but provide more effective lighting solutions for offices, classrooms, stores, public spaces and grounds.

Application-efficient lighting, as contrasted with output efficiency-only criteria, is judged by entirely different goals:

- It provides adequate and proper light levels for good task visibility, and performance in specific applications;
- It distributes uniform illumination where needed, with shadow and contrast for interest;
- It maximises visual comfort by minimising glare, including irritating reflections on computer screens;
- It renders colours and skin tones naturally.

## 你的灯光运用高效吗？

文：乔治·C·伯森（美国照明工程学会会员、照明工业资源协会会员）

以灯光运用的效率为代价，过度强调灯具的使用效率，可能产生令人不快的灯效或是令人沮丧的空间，即使它实现了节能。

商业建筑和翻修的“绿化”不是一时的狂热。当今30多个国家、135座城市、10个联邦机构都需要或者鼓励新的公共建筑在能源与环境建筑认证系统（LEED）下进行注册认证。伴随着公共建筑在2010年到2011年间不断受益于2009年《美国恢复和再投资法案》基金，现在，做绿色建筑的重要性比以往任何时候都更大。麦格劳希尔建筑公司预测，到2013年，绿色建筑市场将占据所有新建建筑价值的25%，达到约1400亿美元。

就照明设计专业领域来说，这带来了绝佳的机遇，让我们能够设计照明方案来提供高效的照明，最舒适的视觉效果，吸引注意力并将建筑及其形式在室内外进行表现。但与此同时，这也带来极大的风险，因为这就强迫设计师去强调整节能环保方面，而忽视灯光的表现力，强调灯光效率标准，而忽视人们的需求。不是说灯光不应该高效，事实上灯光应该是高效的，但是效率标准仅是灯光设计的一部分。过度强调这些标准可能无意识中就会导致令人不快的灯效或是令人沮丧的空间。

好的灯光设计不是始于产品，而是始于需要：一位专业的灯光设计师或建筑师想要在使用空间的心理引起怎样的情感反应？为吸引注意力并塑造对空间的感观，哪些表面和物体需要照明？以怎样的强度？在需要照明的表面上，空间使用者需要多少灯光才能让这些表面达到期望的效果，而不会因强光或反射而刺眼或引起头痛？做出这些设计决定后，才能具体选择光源和灯具。对于一个照明设计来说，恰当的灯具通常并不是在光输出方面最高效的那个，而是在需要照明的表面或者地面上光输出最佳的那个。

灯具效率可以用输入电量、照明效率、效能等级（流明/瓦特）以及灯具利用系数来判断。由于照明效率在大多光度测定报告和介绍目录里都会发布，所以设计师常常只关注这一个标准。这的确是个重要的标准，它可以告诉我们一个灯具中的灯泡产生的光的比例，也就是灯具发射出的灯光比例。

但是，这只是灯具表现力的一部分。过度强调这一标准可能导致在可供选择的灯具中，选取了表现力弱或者不恰当的灯具。毕竟，光秃秃的一盏灯能发挥100%的效率，但却不一定是好的选择，比如说在教室里就不适宜。最高效的灯具，尤其是不用灯罩遮蔽、直接让灯光照射出来的，如果安装时用透明的透镜或者不用透镜，安装位置又不高，或者数量太多，很容易变成刺眼的“炸弹”。

关注灯具的选择及其设计，可能会带来双赢的灯具——既高效节能环保，又能为办公室、教室、商店、公共空间和广场提供更有效的照明。

高效运用的照明，不同于仅考虑灯光输出效率的标准，而是以完全不同的目标来衡量：

- 提供充分、恰当的照明水平，保证照明任务的可见度，以及在特定应用中的表现力；
- 在需要的地方提供均匀统一的照明，并以光影对比效果增加趣味性；
- 通过降低光线刺激，包括电脑屏幕上令人反感的反光，提高视觉舒适度；
- 自然处理色彩和表面色调。

Application-efficient lighting employs a different, superior set of metrics:

1. Average maintained footcandles, which approximate Illuminating Engineering Society (IES) recommendations, adjusted if needed based on designer judgment;
2. Spacing criteria for luminaires, which should ensure a.) they are not spaced too far apart from each other, resulting in a visually fatiguing patchwork of light and dark spaces, and b.) they are not spaced too far from walls, resulting in dark walls and a gloomy atmosphere;
3. Luminous intensity measured in candelas, which avoids direct and reflected glare by a.) not being above 300 candelas at a viewing angle from a luminaire of 55 degrees in open offices, according to IES Recommended Practice for office lighting, b.) not being above 1,000 candelas at 65 degrees for luminaires in high-ceiling spaces such as warehouses, and c.) not being above 600 candelas at 65 degrees in other applications;
4. Colour rendition index (CRI) should be >80 CRI for most indoor commercial applications where skin tones and human interaction are important, and >90 for applications where colour matching is critical.

Saving energy is easy today with the new lower wattage linear fluorescent and some LED luminaires. Providing good and proper energy-saving lighting can be challenging to get right.

The most appropriate metric for efficiency is lighting power density (LPD), a measure of efficiency for a lighting application, not an individual luminaire. LPD establishes the basis of energy codes by providing a budget for lighting load based on maximum allowable watts per square foot. An energy-effective lighting design, therefore, is one that achieves specific design goals, for the lowest LPD. In offices, for example, LPDs as low as 0.7 Watts/sq.ft., or 30 percent less than ASHRAE 90.1-2004 using the Building Area Method, are entirely achievable with high lighting quality, using luminaires nominally less efficient than others that trade off efficacy for glare.

By addressing each element relative to the others, you may achieve a well-lit environment and the lighting plan then evolves into a contributor to:

- the natural environment via reduced energy, lamps, mercury & materials;
- people' s perception and appreciation of the architectural environment;
- and workers' capability to complete their tasks comfortably.

By using CIQ metrics—basing luminaire selection on efficiently satisfying an application's lighting goals, rather than simply converting more watts and lamp lumens into luminaire output—designers can develop projects with lighting that both satisfies actual and desirable human needs, while minimising consumption of energy and materials.

*(George Bosson is a longtime IES member. In his career to date, he has worked for Elliptipar and the former JJI Lighting Group. He is head of the a • light division of AmerillumBrands and a director of that corporation.)*

高效运用的照明采用一系列不同的、更高级的标准:

- 1.保持平均尺烛光, 接近照明工程协会(IES)推荐的标准, 如有需要, 根据设计师的判断适当调节。
- 2.灯具的空间标准, 应保证: a.彼此间距不太远, 否则亮暗空间交替会造成视觉疲劳; b.离墙不太远, 否则会造成墙面过暗, 氛围黯淡;
- 3.光线强度以坎德拉为单位测量, 这样能避免以下原因引起的直接强光或反射强光: a.据照明工程协会的办公照明推荐标准, 在开放式办公空间中, 从灯具处以55度的视角观看, 达不到300坎德拉; b.在高举架空间中(如仓库)灯具65度视角达不到1000坎德拉; c.其他应用中65度视角达不到600坎德拉。
- 4.对于大多商业室内空间照明, 表面色调和人的感官反应很重要, 显色指数(CRI)应大于80CRI, 而当色彩搭配是关键时, 指数应大于90CRI。

今天, 有了新的低瓦数线形荧光灯具和各种LED灯具, 节能已经变得很容易了。然而, 要提供良好、恰当的节能照明仍具有挑战性。

最适当的效率标准就是照明功率密度(LPD), 一种测量照明应用效率而不是某一个灯具效率的方法。照明功率密度通过对基于每平方英尺允许的最大瓦数计算出的照明负载做一个预算, 从而建立节能基础。因此, 一个节能的照明设计要能以最低照明功率密度达到特定设计目标。比如说, 办公室的照明设计, 低达0.7瓦/平方英尺的照明功率密度, 或比美国采暖、制冷与空调工程师协会(ASHRAE)90.1-2004标准低30%的照明功率密度, 都完全可以用高质量的照明来实现, 用到的灯具虽然名义上没有那么高效, 但却在光线效能上得以平衡。

通过权衡各种元素及其关系, 你可以打造一个良好照明的环境, 这种照明设计进而对以下方面做出贡献:

- 通过降低能源、灯泡、汞和材料的消耗来保护自然环境;
- 人们对建筑环境的感观与欣赏;
- 工人能够舒适地完成他们的工作。

通过采用CIQ标准, 将灯具的选择以高效满足照明应用目标为标准, 而不是简单地将更多瓦数和流明转变为输出光线, 这样, 设计师在设计照明项目时, 能够既满足人们的实际需要和期望, 又能够实现能源和材料的最小化消耗。

(乔治·柏森长期以来一直是美国照明工程学会会员。在他的整个职业生涯中, 曾为Elliptipar公司和前JJI照明集团效力。现全权负责AmerillumBrands公司的a • light分部, 并为该公司董事之一。)



# Important Aspects of Lighting Design

By: Rafael Gallego, PLDA professional member, APDI co-founder and professional member (Spanish Professional Lighting Designer's Association) and CEI member (Spanish Lighting Committee)

*Today the developing ways of lighting design, challenges we face, technologies being developed and going to be applied are of greatest concern for lighting designers.*

Lighting is a social necessity. We need light to develop our activities and to create security. The basic need of lighting is to illuminate a space, full of light in general. In many underdeveloped countries and even in some parts of the developed countries, the only approach of lighting is: a bulb or a fluorescent light in the ceiling of a room... It is light to see. However, concerning spaces, it is important to communicate them. To do this we must create hierarchies of light levels and emphasise its architectural peculiarities, order, and rhythm. To generate both emotion and surprise aesthetically, it is light to watch and contemplate, and even to delight. This is the present situation of most lighting design projects. Emotion is generated through order and rigour. Today, the projects are composed of two core "ingredients". The technical aspects such as consumption, lamp life (in hours as in performance), colour temperatures, type of luminaries to be used, accessories, and control systems are measurable data, easily manageable with the possibility of regulating standards. The aspects that will set values for items include efficiency, sustainability, maintenance, etc. And of course the subjective aspects, which are as important or more than technicians, even if more difficult to define, quantify and include in legislation. In the metaphor of an iceberg, the technical aspects represent those parts of it that remain above water. They are visible, measurable and quantifiable. Instead, the subjective aspects would be those parts of it that are under water. We know that it is the most part of the block of ice, but we can not see, and we do not know its shape... Though we are developing tools to acquire knowledge about it with all our accumulated experience. We have very well solved the technical problems, and further developed to have better characteristics, but the subjective part is not the object of major studies and developments because it does not provide economic benefits, at least for now. The technical aspect of lighting projects has experienced significant development, but this is done by, for example, engineers. We, as lighting designers should incorporate this technical development to the subjective part, which we define as the added value of the project. What are those subjective components that make completely different a project done by a lighting designer from another professional?

**The importance of the user**  
A design should be developed with the user of it taken into account. A lighting design that does not take into account the user of it is doomed to failure. On one side, it is very important to know the space from the architectural point of view. Their volumes, prominent architectural elements, finishings and also the concept that the architect had in mind to develop this architecture. The same happens for interior design and landscaping. Once those architectural aspects are known, we need to know how will be the use(s) of the space to illuminate it properly. Realising a comprehensive exercise of "putting yourself in the place" of the user, "travelling imaginatively" through the space, and "making" the activities of the place should give us a wealth of information we use to implement the lighting design. Finally we need to know the user. How people perceive spaces, how we see, what issues make the vision easy, how to empower them, what the difficulties are and how to avoid them...

**Factors influencing the vision**  
Perhaps the most important factor influencing the vision is the contrast. The contrast is caused by differences between colours or luminance (portion of light reflected by a body arriving on the eye) and between an element of the visual field and the rest. The sharper the contrast, the better we will distinguish details and we will produce less fatigue during the process of vision.

## 灯光设计的几个重要方面

文：拉斐尔·加列戈（专业照明设计师协会（PLDA）职业会员；西班牙职业灯光设计师协会（APDI）职业会员和创办者之一；西班牙灯光协会（CEI）会员。）

当今灯光设计的发展方式，我们面临的挑战，不断发展、应用的技术，都对灯光设计师具有重要意义。

灯光设计是一种社会需要。我们需要灯光来开展活动，增强安全感。其基本需要就是给一个空间提供照明，一般来说就是让空间充满光线。许多发展中国家，甚至发达国家的个别地方，照明方式只是在屋顶安一个灯泡或荧光灯，为了可见度而照明。然而就空间来说，表达空间更重要。要想表达空间，我们必须创造不同层次的照明，强调建筑的独特之处、秩序感和韵律感。要从美学上引发情感和惊喜，就要利用灯光来让人注视、冥想甚至给人带来愉悦。大多数灯光设计项目都是这样，通过秩序感和严密的设计来触发情感。当今的项目多由两个要素构成。技术方面，包括耗能、灯泡的寿命（能工作多少小时）、色温、要用到的灯具类型、装饰、控制系统等，都是可以测量的，通过调节标准很容易掌控。而赋予项目以价值的则包括效能、可持续性、易维护性等。当然还有主观方面，这跟技术方面同样重要，甚至更重要，尽管在定义上很难体现出来，因为无法定义或者界定具体标准。如果用冰山来隐喻的话，技术方面代表了水上的部分。这部分可见、可控、可计量。而主观方面则是水下的部分。我们知道，这是冰山的绝大部分，但是我们看不到这部分，也不知道其形状，尽管我们正在利用我们积累的全部经验来开发能了解它的工具。我们已经很好地解决了技术方面的问题，并进一步发展完善，但是主观方面却不是研究和开发的主要课题，因为这方面并不能带来经济效益，至少现在还不能。灯光设计项目在技术方面已经取得了长足的进步，但是这进步却是别人的，比如说工程师。而我们作为灯光设计师，将主观方面界定为“为项目增值”，应该将这些技术进步引入主观方面上来。同一个项目，不同的灯光设计师来做就会带来完全不同的效果，那么这是哪些主观因素造成的呢？

**使用者的重要性**  
设计一个项目，必须要把使用者考虑进来。一个灯光设计如果不去考虑使用者，那么它注定是失败的。一方面，从建筑的角度去认识空间很重要。各个房间、突出的建筑元素、表面装饰以及建筑师设计这座建筑的理念。室内设计和景观设计也是如此。了解了这些建筑方面之后，要想设计恰当的照明，我们需要知道这个空间的使用者是什么样的。把自己放在使用者的位置上，凭借想象力在空间中游走，模拟空间中会发生怎样的活动，这一系列方法会给我们很多信息，帮助我们实施灯光设计。最后，我们需要了解使用者。人们怎样去认识空间？我们如何去审视？什么元素让视觉更舒适？怎样利用这些元素？我们面对哪些困难？如何去避免这些困难？

**影响视觉的因素**  
影响视觉的最重要的因素可能就是对比。对比是由颜色或亮度（经由物体反射进入眼睛的光线）的差别以及视觉领域的元素跟其他元素的差别造成的。对比越鲜明，我们就越容易注意到空间中的细节，并且能够让人们的视物过程减少疲劳。



The care in lighting helps a lot, as it can get to compensate low contrast in colours by increasing the luminance. The contrasts allow us to separate planes, generating hierarchies, etc. What is more important is that it is not fatiguing.

Vision is not ocular; it is cerebral

The "picture" that has taken by our retina is sent to the brain where a compendium of psychological aspects (past experiences, cultural factors, interest, etc.) will permit the same information acquire different aspects to different people.

For a person with normal vision, over 70% of all the information he receives is through the sense of sight. The conscious vision consumes a very high amount of our energy (remember a visit to a museum, we went out exhausted) and for this reason, most of our vision is not conscious.

Given the above, it is easy to understand that lighting designs should take full account of this unconscious and cerebral vision and brain. Propose effects very easy to capture, operate in different cultural environments (now globalisation helps) and hardly requires the use of our rational brain. Do not fatigue.

The nature cycles

Aspects such as light levels, spectral composition of light, and colour temperature are technical and generate reaction in the body influenced by the characteristics of light. These aspects must be taken into account as positive factors for the design, which improve it rather than creating "noise" in perception.

Recently, a new photo-receptor in the retina has been discovered, unlike rods and cones, whose function is the circadian photoreception for the adjustment of the biological clock. Studies are being conducted on its photopigment (melanopsin) to know the wavelength of light most effective in this role.

Psychological aspects

Shadow is another important aspect in lighting design where management is more complex. The generation of shadows enhances the contrast and also the presence of shadows shows partially some objects. Our brain is responsible for "supplement" and also as a side effect, we will create some "curiosity" attraction.

Many of the ways we have behind us look for these improvements. Technological developments are those with more widespread (and also financial investment) leds, oleds, discharge lamps of lower power, improved regulation of discharge lamps; they are just some of the ways in the name of the efficiency. We will walk through in the future within the technical field of lighting, the measurable, and the legalised.

Outstanding in the subjective aspects is that all the studies are directed towards comfort and even to health by lighting, as the lighting spectrums improved the production performance by making users feel more comfortable.

The use of colour in hospitals, and improvement of mood even in offices, etc. are the ways to enrich the subjective factors of lighting and the vision process. It would be nice to coordinate the results between the technical and subjective developments, since it seems that the former ignores the latter; there is a border between them.

I want to reuse the "image of the iceberg" expressed at the beginning of the article. Both aspects are one unit, indivisible. The technical aspects have their subjective counterpart.

One example of the lack of dialogue between the two sides is worldwide regulations for the immediate elimination of incandescent lamps. How the prevalence of interest in the name of efficiency, and certainly in business, is going against health.

The famous artist and producer Ingo Maurer predicted the increasing of visits to psychologists after the disappearance of the incandescent lamp.

It seems only lighting designers are aware of the complexity of the effects generated by the lighting. We have a great task. We should communicate to the rest of society what is important and that a large group of professionals ignore light or do not take it into account.

*(Rafael Gallego, lighting designer since 1998, PLDA professional member, APDI co-founder and professional member (Spanish Professional Lighting Designer's Association) and CEI member (Spanish Lighting Committee). In 2004, he co-founded the first lighting design studio in Madrid. Later in 2007, he decided to open his own studio, aureolighting (www.Aureolighting.Com). )*

细心在照明设计中很有用，因为细心能够通过亮度来补偿色彩上不鲜明的对比。对比让我们能够区分层次，产生等级等等，更重要的是它能够避免让人产生疲劳。

视觉不只是眼睛的事，它涉及心理

眼睛的视网膜捕捉到的图像会送达大脑，进行心理上的汇总（涉及过去的经历、文化因素、兴趣爱好），这样，相同的信息在不同人的处理中就会侧重不同的方面。

对一个视力正常的人来说，他接收到的所有视觉信息中，70%要借助光线。有意识的视觉会消耗我们极高的能量（如参观博物馆，出来时总感觉精疲力竭），因此，我们大多的视觉都不是有意识的。

鉴于此，我们就会很容易理解，灯光设计应该充分考虑到这种无意识的心理和大脑视觉。设计容易捕捉的景象，在不同的文化环境中做设计（现在我们从全球化中受益匪浅），并尽量不用理性视觉。注意不要产生疲劳。

自然循环

某些方面，如灯光高度、光谱的构成、色温等，涉及技术，会产生受灯光特点影响的人体反应。这些方面必须在设计中作为积极元素来考虑，它们改进设计，而不是为空间的感知设置障碍。

最近发现了一种新的视网膜图像接收装置，它不是杆状，也不是锥状，其功能是通过调节生物钟来决定图像接收的生理节奏。关于这一新发现的感光色素（黑视素）正在研究中，以期了解其最高效的光波波长。

心理方面

“影”是灯光设计中的另一重要方面，其处理更加复杂。影的产生会突出对比效果，同时影的存在也能凸显某些物体的一部分。我们的大脑负责“补充”剩余的部分，伴随发生的，还有我们由于好奇而被吸引。

我们的许多灯光设计方法都寻求在这些方面有所改进。技术发展带来使用更广泛的（资金投入也更多的）LED、OLED照明、低耗能的放电式灯泡、经过改进的对放电式灯泡的管理，这些只是“高能效”名下的一些方法。未来我们会在灯光照明的技术领域、测量以及定义方面走得更远。

主观方面的研究，突出的特点就是所有研究都以舒适照明甚至健康照明为目标，灯光光谱通过让使用者感到舒适，不断改进产品表现。

在医院里运用色彩，在办公室里改善情绪，等等，都是丰富照明和视物过程的主观因素的方法。最好能够将技术发展和主观方面的进步结合起来，因为前者似乎容易忽略后者；二者之间存在界限。我想要再用开篇提出的冰山的隐喻。两个方面构成一个整体，不可分割。技术方面有其对应的主观方面。

二者之间缺乏对话的一个例子就是全世界都存在的严格杜绝白炽灯的规定。我们可以看到利益——当然还有商业——是怎样以“效能”之名与“健康”相悖的。著名艺术家、生产商英戈·毛雷尔预测，白炽灯消失后，去看心理医生的人数将增加。

似乎只有灯光设计师才会注意到灯光产生的效果的复杂性。我们的任务很重。我们应该跟社会上的其他力量进行沟通，告诉人们灯光的重要性以及许多专业人士对灯光的忽视。

（拉斐尔·加列戈，灯光设计师，自1998年以来一直是专业照明设计师协会（PLDA）职业会员，西班牙职业灯光设计师协会（APDI）职业会员和创办者之一，西班牙灯光协会（CEI）会员。2004年，加列戈在马德里与人合办了第一个灯光设计工作室，此后又在2007年决定开办自己的工作室。）

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## Lighting, Design and Concept: Designers' Approaches to Lighting Design

### 灯光设计理念——大师谈灯光设计

From the invention of light bulb by Thomas Edison in 1879 to the application of LED to interior lighting in 2000, the interior lighting design history has witnessed incessant progression and innovation in more than one hundred years. The application and development of lighting in interiors are not only an indication of the progressive civilisation of human beings, but also a marker of the significance of lighting in interior design.

Lighting design comprises of two parts: lamp design and light and shadow design. We have to take into account the relationships between lighting and space, between lighting and decoration, and between lighting and taste, in order to achieve a satisfying overall effect. Lighting design is a marriage between art and technology. Apart from its basic function, interior lighting should be helpful in beautifying a space, decorating an interior, producing an atmosphere and creating a taste. Interior lighting is no longer merely a simple interior design element. It requires a perfect combination of the latest technologies and cultural identities. How to perfectly integrate art and technology into lighting is the primary difficulty a lighting designer or an interior designer encounters.

So, what kind of a lighting design could be called a good one? What should we pay attention to in the process of interior lighting design? How to make lighting maximally contribute to a marvelous interior? In finding answers to these questions, first, let's come to designers' understanding and experience of lighting design.

从1879年爱迪生发明电灯到2000年LED被尝试应用于室内照明设计，人类对于室内灯光的设计在100多年间不断地取得进步和革新。灯光在室内设计中的应用和发展，不仅是人类文明进步的缩影，更表现了灯光在室内设计存在的意义和重要作用。

灯光的设计包括灯具设计和光影设计两个方面的内容，需要考虑到灯光与空间、灯光与装饰、灯光与格调等几个方面的综合效果。单纯就灯光的设计而言，它追求的是艺术性和科学性的结合。除了功能合理之外，更要具备空间装饰、美化环境、营造气氛、提升格调的作用。室内灯光设计再也不是是一种简单的设计形式，它要求在设计过程中既要结合现代科技发展的成果，又要突显文化特色。如何将科学性和艺术性完美地结合到灯光设计中是每一个灯光设计师或是室内设计师所要面对的重大难题。

那么，怎样的灯光设计是好的设计，在灯光设计过程中应该注意到哪些事情，灯光设计又如何能够创造一个奇妙的室内空间呢？让我们先来聆听大师们对灯光设计的理解和感悟吧！







**Francesca Storaro**

Lighting Designer  
AILD, AIDI, PLDA, IALD

弗朗塞斯卡·斯托拉罗

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Francesca Storaro graduated from the Faculty of Architecture in Rome, Italy on October 30, 1996, with full marks.

Registered in the Society of Architects of the City and Province of Rome on January 12, 1998.

Advanced master in Illumination Science at the University of Florence's Faculty of Mathematical, Physical and Natural Sciences. Completed on May 9, 2000.

Since 2007, she has been a lecturer at the Academy of Light (Accademia della Luce) and a member of AILD (the Italian Association of Lighting Designers).

Since November 2007, she has been a professional member of PLDA (Professional Lighting Designer Association) and an associate member of IALD (International Association of Lighting Designers).

In March 2009, she was awarded a teaching post for the FSE second level masters course for architectural and artistic lighting engineers at the Faculty of Architecture, Venice.

In 2009, the international architectural lighting magazine "Mondo Arc", on the occasion of its 50<sup>th</sup> issue, put Francesca Storaro's firm among the top 50 Lighting Design studios in the world.

弗朗塞斯卡·斯托拉罗1996年10月30日以满分的成绩毕业于意大利罗马建筑学院。

1998年1月12日注册为罗马建筑师协会会员。

佛罗伦萨数理与自然科学大学“照明科学”专业高级硕士。结业时间：2000年5月9日。

自2007年以来，在灯光设计学院举办讲座，并成为意大利灯光设计师协会 (AILD) 会员。

自2007年11月以来，成为职业灯光设计师协会 (PLDA) 正式会员、国际灯光设计师协会 (IALD) 准会员。

2009年3月，获得威尼斯建筑学院二级工程师硕士课程的授课岗位，为建筑与艺术灯光工程师授课。

2009年，国际建筑照明杂志《艺术世界》(Mondo Arc) 第50期将弗朗塞斯卡·斯托拉罗的公司列入世界50强灯光设计工作室。



- Notable projects:
- Piazza del Campidoglio, Rome, Italy
  - Palazzo D'Arnolfo, San Giovanni Valdarno, Italy
  - I Villini delle Fate, Rome, Italy
  - Castello Visconteo, Locarno, Switzerland
  - Correggio's domes, Parma, Italy
  - Augustus Room, National Museum, Rome, Italy
  - Four C Building, Beijing, China
  - Pavilion B2, 2010 Shanghai Expo, Shanghai, China
- 知名项目:
- 意大利罗马国会广场 (Piazza del Campidoglio)
- 意大利圣乔瓦尼-瓦尔达诺阿努尔夫宫殿 (Palazzo D' Arnolfo)
- 意大利罗马精灵小屋 (I Villini delle Fate)
- 瑞士洛迦诺维斯康提城堡 (Castello Visconteo)
- 意大利帕尔马柯勒乔圆顶教堂 (Correggio' s domes)
- 意大利罗马国家博物馆奥古斯塔斯房间 (Augustus Room)
- 中国北京4C大厦 (Four C Building)
- 中国上海2010年世博会B2展馆(Pavilion B2)







# Light and Architecture

## 灯光与建筑

There is a magical relationship between architecture and light. Light and architecture are intimately related, like the sun and the moon, each helping the other to be revealed. The beauty of light is that it doesn't destroy material, but reveals it. The original work remains in its place, visible during the day. At night, however, an interpretation of the work is seen. All too often, light is relegated to the role of simply showing rather than actually telling.

My research is based on a new interpretation of this concept: light as a new language. Light not only ensures the perception of objects, but also conveys emotions, history, and culture. We need to go beyond the distinction between the aesthetic and functional values of light, to make its language one and whole. It is not uncommon to see architectural styles of different eras or designed by different architects illuminated in an identical manner—but every architecture requires its own specific lighting, obviously made up of lights, but also of shade. Indeed tales can sometimes be told by shadows.

Light demands fully-fledged planning. Three levels of lighting language can be distinguished:

- 1. Lighting to show a monument;
- 2. Architectural lighting of a monument;
- 3. Communicative lighting of a monument (added value); a refined use of light.

In the case of the first type, which is unfortunately the most frequent, there is in general no actual planning involved.

The second type involves considerable preliminary work, philosophical and artistic interpretation, a thorough analysis to reveal how the monument can be portrayed. Historic and architectural research is fundamental if space is to be interpreted correctly. It is vital to be acquainted with the intentions of the contractor and the designer, to identify the historic context of the work if it is to be properly depicted through the language of light.

This is none other than the interpretation of the architectural language conveyed by the building designer into the language of light, through the exaltation and definition of architectural elements. Once the context and the raison d'être of the monument or building have been identified, the idea begins to take shape, with the translation of a vision into a lighting project; firstly through a rendering of a nocturnal simulation, then the selection of appliances, their positioning, the sources, the directing, to translate the project into reality. With its interplay of chiaroscuro, the monument tells its tale as an architectural being. This type of lighting—on a purely historic-architectural level—affords a "scientific" reading of the monument, rendered by the colour white and its tones of varying warmth.

建筑与灯光之间存在一种神奇的关系。灯光与建筑紧密相连，如同太阳和月亮的关系，彼此衬托出对方的美。灯光的美在于它不是去毁坏建筑材料，而是去衬托材料之美。建筑的位置是不能移动的，白天可见，但是到了晚上，就需要用灯光来阐释。然而，人们常常把灯光的作用降低为仅仅去展示，而不是真正去述说。

我所做的研究正是要去全新阐释这样一种理念——灯光是一种新的语言。灯光不仅确保了我们对物体的感知，同时也能够传递情感、历史和文化信息。我们要超越对灯光的美学价值和功能价值的区分，将灯光的语言视作一个不可分割的整体。不同时代的建筑风格或者不同建筑师的设计风格采用相似的照明方式，这种现象并不鲜见，但同时，每一座建筑又要有自己独特的照明，而其构成，既包括光，也包括影。光影有时确实有一种娓娓道来的感觉。

灯光需要全面、细致的设计。灯光的语言可以分为三个层次：

- 1.建筑的外部照明；
- 2.建筑的内部照明
- 3.建筑的“交流照明”（附加价值），对灯光的一种考究的运用。

第一种照明是最常见的，但是不幸的是，一般来说我们无法对其进行设计。

第二种照明涉及相当多的前期设计工作，包括从哲学、艺术层面上去进行解读，以及就怎样去表现一座建筑做全面的分析。要想正确地解读空间，历史研究和建筑研究都是必须要做的基本功课。如果你想通过灯光的语言来恰当地表现这座建筑的话，很关键的一点就是了解建筑承包商和设计师的意图、明确该建筑所处的历史环境。

这跟建筑设计师通过建筑语言来阐释建筑一样，只不过他们运用的是建筑元素。一旦一座建筑的环境和这座建筑存在的理由确定了，那么设计理念也就开始成形了，我们需要做的就是将头脑中的概念转变为现实中的灯光；首先通过模拟夜间效果图，然后选择照明设备及其位置、光源、方向，把这个设计项目变为现实。通过明暗对比，建筑将自己的故事娓娓道来。这种照明——从纯粹的历史建筑的层面上来说——能让我们对历史建筑有一种“科学”的解读，通过白色及其不同的色温色调来实现。





The third type expresses ideas that go beyond architectural design to venture into the realm of communication. The distinction between natural light and artificial light here becomes vital; it gives buildings a double life, the possibility of a dual interpretation. The use of colours entails an added value. During the day, the site lives and exists with its natural colours; artificial light and colours belong to the night, another dimension of space, open to dreams and imagination. All too often, however, colour is used inappropriately, for the sake of mere spectacle, to the detriment of the proper use of colour, its real language. Light is not only composed of white; as in music where there are seven notes, or in literature where all letters of the alphabet are used, colours are the language of light.

Ultimately this is a matter of being unaware of the possibilities and reactions of chromatic vibration. The language of light has a value similar to that of literature or music. Just as words are articulated to create increasingly complex formulas, or as musical notes guarantee an enormous heritage of expression, colours are the building blocks of the language of light. A kind of alphabet, or expressive scale.

Today we bear witness to the birth of a new discipline that allows us to read architecture and urban planning with a new degree of awareness. An effort is required, however, to grasp the significance of this new vision entrusted to artificial light and colour, going beyond first impressions to appreciate the motives of the interpreter. The use of colour with classic architecture is still met with widespread apprehension; but if chromatic symbolism is correctly applied, a monument can be reread at night.

The importance of the lighting designer is often undervalued. There is a misconception that anyone can do the job. However, it is important to recognise the lighting designer's role and added value. The lighting designer, the "architect of light", is an individual who is able to interpret, narrate and reveal elements of sculpture, painting and architecture through a specific language, the language of light, and must be recognised as such.

The architecture of light is for me the future of architecture itself. Through artificial light, it is possible to live again the architecture that man lives during the space of the sun, also during the space of the moon. Thus it becomes possible, through Light and its symbolic meaning, to tell the story of that architecture through the personal interpretation of the lighting designer. Nighttime becomes another spatial dimension, deputed to dreams, fantasy and creativity.

第三种照明表现的是超越建筑设计、大胆涉猎到沟通交流这个领域中。自然采光和人工照明的区别在这里就变得很关键了，照明赋予了建筑第二重生命和双重解读的可能。对色彩的运用需要一种附加价值。白天，建筑存在于自然光线的色彩中，人工照明及其色彩属于空间的另一个维度——夜晚，那是一个梦幻和想象的世界。然而如果色彩运用得不恰当，只为了创造壮观的景象，就乱用色彩，违背了真正的灯光的语言。灯光不仅仅由白色构成，如同音乐中有7个音符或者文学中我们要用到所有字母一样，灯光的语言由不同的色彩构成。

最后，还有一个问题，那就是人们会对色彩产生心理反应或者共鸣，很多人没有意识到这一点。灯光的语言跟文学或者音乐有相似性。如同文字组成复杂的话语，或者音符确保一段乐章的表现力一样，色彩就是构成灯光语言的砖石，一种字母，或者一种表现层次。

如今，我们见证了一个新学科的诞生，它让我们能够在一个全新的层次上解读建筑和城市规划。然而，我们仍需努力去掌握这种由人工照明和色彩构成的新领域，超越第一印象，去欣赏解读者的动机。色彩在古典建筑中的运用仍然广受推崇。但是，如果能够正确运用色彩象征的话，一座建筑在夜晚将有另一种解读。

灯光设计师的重要性常常被小视。人们有一种错误的观念，认为这是人人都能做的事。然而，重新去认识灯光设计师的作用和他带来的附加价值，是很重要的。灯光设计师是“光的建筑师”，他能够用一种特殊的语言——灯光语言——去解读、讲述、揭示雕塑、绘画和建筑元素，灯光设计师扮演的角色必须要这样理解。

对我来说，建筑照明是建筑自身的未来。通过人工照明，我们能够把我们白天所处的阳光下的建筑在月光下赋予另外一种生命。因此，运用灯光及其象征意义，我们能够通过灯光设计师个人的解读去讲述一座建筑的故事。夜晚成为空间的又一维度，充满梦幻、神奇和创造力。





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7



8



## Takeshi Sano

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[www.ssdesign.asia](http://www.ssdesign.asia)

1995-1998.12, Mr. Sano managed lots of projects as construction site supervisor  
1999.1-2003.5, For Global-Dining Inc. (<http://www.global-dining.com>) (one of the best Japanese restaurant management companies that provides high-quality service and creative interior), Mr. Sano was in charge of planning of restaurant and design and was one of the best designers of Global-Dining. It had a big influence on the restaurant design in Tokyo.  
2003.6, Mr. Sano established design company Sweet co., ltd. He worked centring on several big projects in a year.

1995年至1998年12月，佐野先生作为施工现场监理完成多个项目。

1999年1月至2003年5月，佐野先生为全球餐饮公司（Global-Dining Inc.）做了餐厅的室内设计。这是日本最好的餐饮公司之一，提供高品质的服务和创造性的室内装饰（网址<http://www.global-dining.com>），这个项目对东京的餐厅设计产生了重要影响。佐野先生也由此成为全球餐饮公司最佳设计师之一。

2003年6月，佐野先生建立了Sweet设计有限公司。一年之中完成了多个重大项目。



His important works are Rigoletto, Casita, Tanaka and Ten. His works are various styles of restaurant from Asian, Japanese to Western style. Mr. Sano is in harmony with engineers and constructing workers and is trusted. He has a strong sense of responsibility and is Japanese Samurai. He goes abroad for design inspection and never neglects study. His mind is always positive and is full of promise. He is the top designer of next Tokyo generation.

重要项目包括雷格拉多（Rigoletto）、卡西塔（Casita）、田中（Tanaka）以及坦恩（Ten）。他的作品中包含各种餐厅风格，从亚洲、日本风格到西式风格。佐野先生与工程师、建筑施工人员紧密合作并深受信赖。他有很强的责任感，是日本武士。他曾出国考察，但从未忘记学习。他的思想总是积极进步、充满希望。他是东京下一代设计师中的佼佼者。





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