

LD+A

LIGHTING DESIGN and APPLICATION

LightFair Preview
NHL Store Gears Up
Airport Safety



Branching Out

A campus addition with local roots

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Integrated lighting reinforces the curving form of a new arts building on the campus of Franklin & Marshall College in Lancaster, PA (p. 40). Photo: Paul Warchol Photography

THE EVOLUTION OF RESIDENTIAL LIGHTING

This book excerpt explores how the changing meaning of ‘home’ is reflected in how we ply our craft

By Clifton Stanley Lemon

The COVID pandemic forced us to spend more time in our homes than ever before. As a result, we’re taking a closer look at residential design and lighting, and none too soon. The general discourse on lighting today greatly favors non-residential applications. Remediating this situation was one of the reasons my co-author Randall Whitehead and I wrote *Beautiful Light: An Insider’s Guide to LED Lighting in Homes and Gardens* (Routledge 2022).

Residential designers are more often focused on what feels good and what makes a home beautiful and comfortable to occupants in off-work hours (although now work schedules and environments are becoming far more flexible). Also, they’re typically more inclined to think about lighting that not only makes the home and its appurtenances look their best, but lighting that makes *people* look good. In the following excerpt from the book, Chapter 1, we try to anchor the understanding of good residential lighting principles in history and evolutionary biology. We want warmer light at night in our dwellings because we evolved that way, basically. Also, even though we don’t discuss daylight at length in our book, almost all homes and interior spaces have a varied mix of many light sources including daylight. Learning to articulate these different sources in layers and balance them well is the essence of the art and science of lighting. And because beauty, not engineering, is the driving force in residential design practice, we called our book *Beautiful Light*.

In order to explore the evolution of residential lighting we start with a brief examination of our modern Western concept of the home, the archetypal structures that embody it and how they evolved. The ideas of family and, indeed, “home,” are fluid social and cultural constructs, constantly shaped by the combined forces of technology, economics and urbanization. But for our purposes

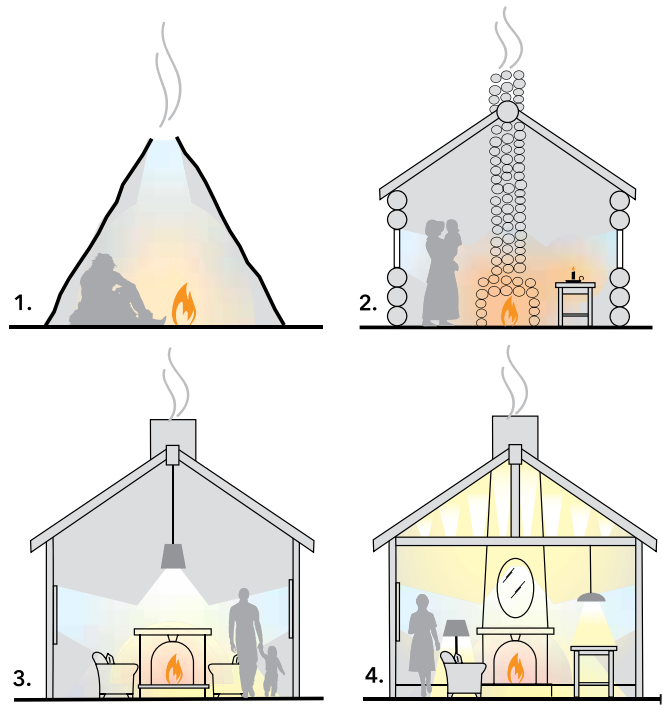


Illustration: Clifton Stanley Lemon

The evolution of interior lighting: 1. Sky light and fire light in a primitive hut. 2. Sky light and fire light in a log cabin with small windows. 3. Single-source ceiling lighting in a modern home. 4. Daylight with balanced layers of electric light: ambient, task, accent and decorative.

here we’ll talk about the single-family home, the most commonly understood model in the U.S. today. Whether single or multi-story with detached walls on a separate plot of land or as part of a larger multi-family building, its layout is typically comprised of a collection of single-purpose rooms: living room, dining room, kitchen, bedrooms, bathrooms, multipurpose open-plan rooms, miscellaneous utility rooms and outdoor spaces. This particular arrangement has not been the norm for the majority of human history, but evolved with the advent of modern industrialized society.

The most primeval dwellings were meant to mitigate—and use—the attributes of environment: precipitation, temperature, wind and light. Our basic physiological needs demand a roof and walls to create an envelope for protection from the elements, predators and enemies, and a place for



Photo: Dennis Anderson, Lighting Design: Flandall Whitehead

fire, gathering, and preparing and consuming food, but a completely dark enclosure is not useful. One of the earliest innovations was an opening in the top of a hut, teepee or other enclosure that not only let in daylight or even moonlight, but allowed for the exhaust of smoke and fumes from fire and oil lamps necessary to dispel darkness and cook food.

Before more advanced lighting technology (candles, gas lamps, then electric lights), humans evolved under conditions of light that centered around the daily rhythms of sunlight during the day and fire light at night. It's reasonable to assume that our visual equipment, our eyes and brain, are hardwired for these two conditions and the transitions between them. Indeed, vision science has identified parts of the eye—rods and cones—that process light at different levels. There are three kinds of vision: scotopic vision, or night vision, which uses only rods to see (objects are visible, but appear in black and white); photopic vision, or daytime vision, which uses cones and provides color; and mesopic vision, the in-between vision, which we use most of the time in mid-level light conditions.

In “prehistoric” times, approximately 10,000 years ago, as tribal groups grew in size and complexity, communal dwellings evolved that were organized around a central fire. People all slept in the same large lodge or room, along with the dogs. Light was provided by oil lamps, fire, and openings which were

This home shows a well calibrated balance between cooler daylight and warmer electric light in ambient, accent and decorative layers.

often no more than holes in walls or ceilings that let in light and air and allowed smoke to escape.

Our current arrangement of single-purpose rooms seems to have begun in 12th century Northern Europe with the innovation of the chimney. This was the era of a mini Ice Age, and temperatures were much colder than what we're experiencing today. Chimneys allowed multi-story buildings to share distributed heat from one shaft, and led to the development of smaller rooms which were more economical to heat. This contributed to the modern cultural idea of domestic privacy—a “room of one's own,” so to speak. Windows in these buildings were expensive and were sometimes glazed with thin sheets of animal horn, a material also used for lanterns.

The Romans had developed advanced glass manufacturing methods that made glass windowpanes affordable for many buildings by 200 C.E., but this technology was lost during the medieval period between 400 and 800 C.E. In the 14th century, however, French glassmakers perfected the technology of making flat panes of transparent glass, which were initially small and required assembly in lattices or window frames. Gradually window openings became larger and allowed buildings to use more daylight. Before gas and then electric light, an architectural tradition had developed that made skillful use of buildings'



Photos: Clifton Stanley Lemon

volume, surfaces and windows to modulate daylight for lighting the home. In fact, an archaic architectural term for windows is “lights.”

At night though, interior lighting for most homes consisted of fires, candles, and eventually more sophisticated lamps using oil and kerosene. The next lighting technology revolution was gas lamps, which produced a much brighter light and began to dispel darkness at sufficient levels to extend working hours. Along with many other rapidly evolving technologies, interior lighting significantly impacted forms of social organization and family structure. Ingenious devices were invented that multiplied the fragile, precious light as much as possible—chandeliers for instance were devised to amplify candlelight and were a great status symbol as only rich people could afford candles in medieval times. The forms of these luminaires persisted long after fossil fuel-based lighting gave way to electric lighting. Also, all fuel-based lighting produced noxious, unhealthy fumes and coated interior surfaces (and lungs) with soot and other chemical deposits.

When electricity as a distributed power source emerged in the 19th and early 20th centuries, electric lighting was the first application of this groundbreaking new technology. The cost and effort involved in running power lines from the local coal gas burning power plant to the home

What we call the “skyline/fire line hypothesis” says that human vision evolved to see brighter, cooler ambient light (sky light) from above and warmer light (fire light) from below.

meant that typically only one light per room was feasible, and it was placed in the center of the room in the ceiling. This remains a default lighting strategy in many homes today, even though it’s inadequate for providing well-balanced lighting.

As electric lighting expanded and became ubiquitous in residential use throughout the 20th century, the modern practice of lighting design was born, exemplified by designers like Richard Kelly, who articulated the theory of light layers. Even though electric incandescent light had technical limitations we no longer have today with LEDs, designers like Kelly established a solid methodology that involves identifying the various purposes for types of lighting and blending them carefully into an integrated whole.

Today solid-state lighting technology allows us to use the light layering approach to much greater advantage, with better light that is much more efficient, lasts longer and can be applied easily in more locations than ever before. It also allows us to improve lighting so that people look and feel better—the most important benefit of beautiful light with LEDs. In many ways we’re just beginning to fully exploit all the capabilities of this relatively new technology in residential design. ©

THE AUTHOR | A marketing consultant, researcher and educator, Clifton Lemon is CEO of Clifton Lemon Associates, program director for the LightSpec Conferences and a member of The Lighting Agora.