

# Biophilia meets Immersive Interior Lighting: How light art transforms cars into emotional spaces.

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*Keywords: Automotive Interior Lighting, Immersive User Experience, Biophilic Lighting, Lighting Identity, Wellbeing in Automotive Interior, Natural color associations, Immersive Services, Organically shaped PMMA flat light guides*



## 1 Abstract

### **New Currency: Experience per mile**

The effect of light on people is a completely untapped medium for differentiating automotive brands (Lighting Identity) and bringing the user experience in cars to a new level. Light offers a strong answer, especially now in the changing market and users' evolving awareness of their needs. Manufacturers, researchers, and users

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have long recognized the new significance of the car as a living space and the central role of light in this context.

The Fraunhofer IAO writes: "The researchers' vision is to transform the vehicle interior into a mental refueling station through digital and immersive services." Automobilwoche puts it succinctly: "An immersive user experience should inspire drivers and passengers and make the car an experience destination. Experience per mile is considered the new currency that should win and retain car buyers."

## 2 Introduction

### 2.1 Light supports people's moods

In recent years, numerous research series have been conducted on the potential of light in automotive interiors – including the study "Enhancing Driver's Experience Through Emotion Sensitive Lighting Interaction"<sup>1</sup>. Here, the Institute of Human Factors and Technology Management (IAT) and the Fraunhofer Institute for Industrial Engineering IAO tested the effect of light on drivers in three different stress scenarios: "Dense Urban Traffic", "Rainy Evening Ride", and "Coast Ride".

The results show the influence of light and colors on drivers' moods based on their emotional changes. All participants stated that light intensity and color influenced their emotions during the lighting scenarios. In the "Dense Urban Traffic" and "Rainy Evening Ride" scenarios, most people experienced an emotional change from negative to positive. The "Coast Ride" scenario showed that the choice of light and color can elevate the emotional state to an even higher level, even though the initial emotional situation was already positive.

## 3 Light Art

### 3.1 Rethink Light. Create Wellbeing.

Those who are ready to learn from light artists and use the right technologies can completely redefine light and use it as a new medium. One that supports the wellbeing of the people within it. "What interests me is the materiality of light", says James Turrell, the most famous and influential light artist in the world. Turrell speaks of the materiality of light. He uses light as material. For example, in his globally distributed Skyspaces: illuminated rooms with openings to the open sky, where the sky virtually comes toward visitors and appears in ever-new color nuances through the gentle color changes of the room lighting.



Figure 1: Self-experiment: Light artist Yves Peitzner tests which emotional stimuli light triggers using a brain sensor.

Munich light artist Yves Peitzner conducted a fascinating experiment at feno in Munich-Oberhaching last year: Using a brainwave sensor on himself, he measured what emotional stimuli viewing Turrell's work "Elliptical Glass" triggered in him. Peitzner directly converted these emotions into new light, visualized them in the installation "Tunnel of Sentient Light", and thereby proved what feelings light triggers in people.

## 4 Biophilia

### 4.1 Color associations from nature translated into the car

If light triggers feelings, which ones could be created in automotive interiors? Suitable examples are provided by biophilia, among others. The term biophilia describes humans' need to connect with other life forms (animals and plants) as well as with landscapes. Biophilia is nothing other than humans' connection with nature.

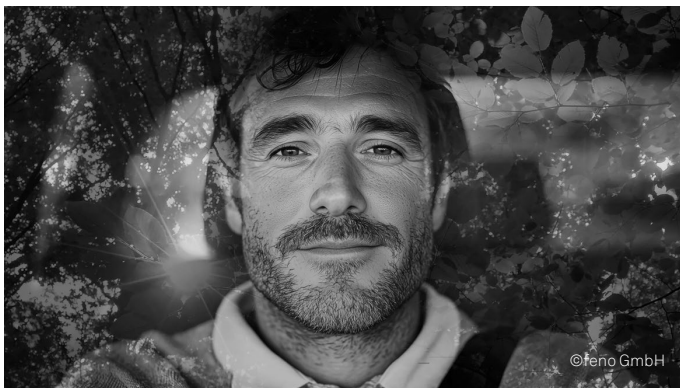


Figure 2: Recharging in nature – and in the car. With light effects and color associations from nature.

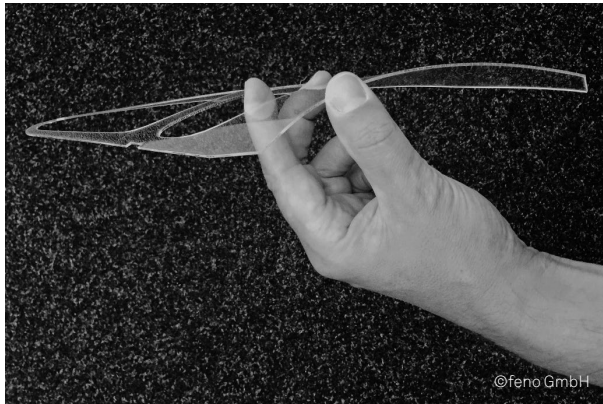
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Example: the four seasons. Each season is associated with typical color associations for us humans. With pink spring blossoms, for instance, we associate vitality and new energy. Deep yellow tones of summer give confidence, warmth, and comfort. Autumn colors have a refreshing, motivating effect, and the strong white and blue of winter we associate with creativity and performance.

Light effects open emotional spaces. You can support people's moods with Immersive Interior Lighting. Even in cars.

## 5 Technologies

### 5.1 Organically shaped PMMA flat light guides. As thin as a ruler.



The necessary reliable technologies already exist. For example, feno works with laser-structured, thermoformable PMMA flat light guides to backlight surfaces and materials – for instance, in door modules. These flat light guides have decisive advantages that make the entire process from design to installation faster, more straightforward, and more cost-effective.

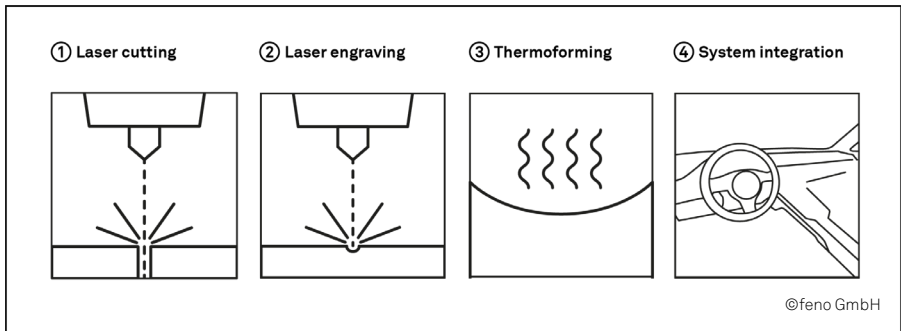
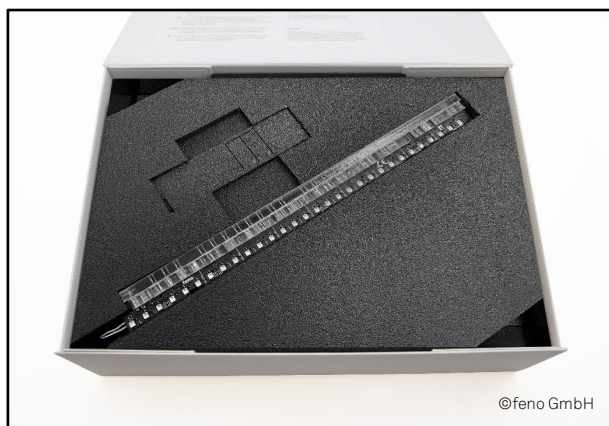


Figure 3: Production of integrated laser-structured flat light guides – no tools needed.

- As thin as a ruler and therefore space-saving
- Adapting to organic shapes in the interior
- Much more design freedom for designers
- Optimally short time to market
- Homogeneous light distribution even over large surfaces

## 5.2 Using iRGBW Light Designer as a creative tool for lighting creators



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With the iRGBW Light Designer by feno, designers and electronics developers can freely try out, coordinate, present, and implement their ideas – simply via plug & play. From the first creative phase to prototyping. With its intuitive control via OSP (Open System Protocol) for intelligent, individually addressable LEDs, complex color effects can be orchestrated quickly and easily in the finest color mixtures and dimming levels.



Figure 4: With application-specific optics, even water reflections, sunbeams, or surf can be staged as light play on surfaces and materials using the iRGBW Light Designer.

- Try out, coordinate, present, implement lighting ideas
- Highest light quality and homogeneous gradients
- Precisely prototype colors and effects on materials
- Simulate individual requirements early and inspire designers & customers
- More targeted interdisciplinary collaboration and faster development time

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## 6 Summary and Outlook

### Immersive User Experience: Feeling light with new eyes

Light in automotive interiors is a previously untapped solution for supporting people's wellbeing and creating emotional brand experiences. Both drivers and passengers can be balanced through targeted light effects and color associations in stressful situations or recharged in exhausted situations – and connect emotionally with the "emotional space car" through immersive, natural lighting moods. Individual solutions can help shape the new significance of the car as a living space as well as the lighting identity of brands.

In the future, the emotional effect of light will be an integral part of car functions. Just like cruise control or seat heating. As an immersive device.

## 7 References

[1] F. Braun, F. Edel, and A. Ardilio, "Enhancing Driver's Experience Through Emotion Sensitive Lighting Interaction", AHFE International, 2022.