

PHILIPS

sense **and** simplicity

Philips Lumiblade

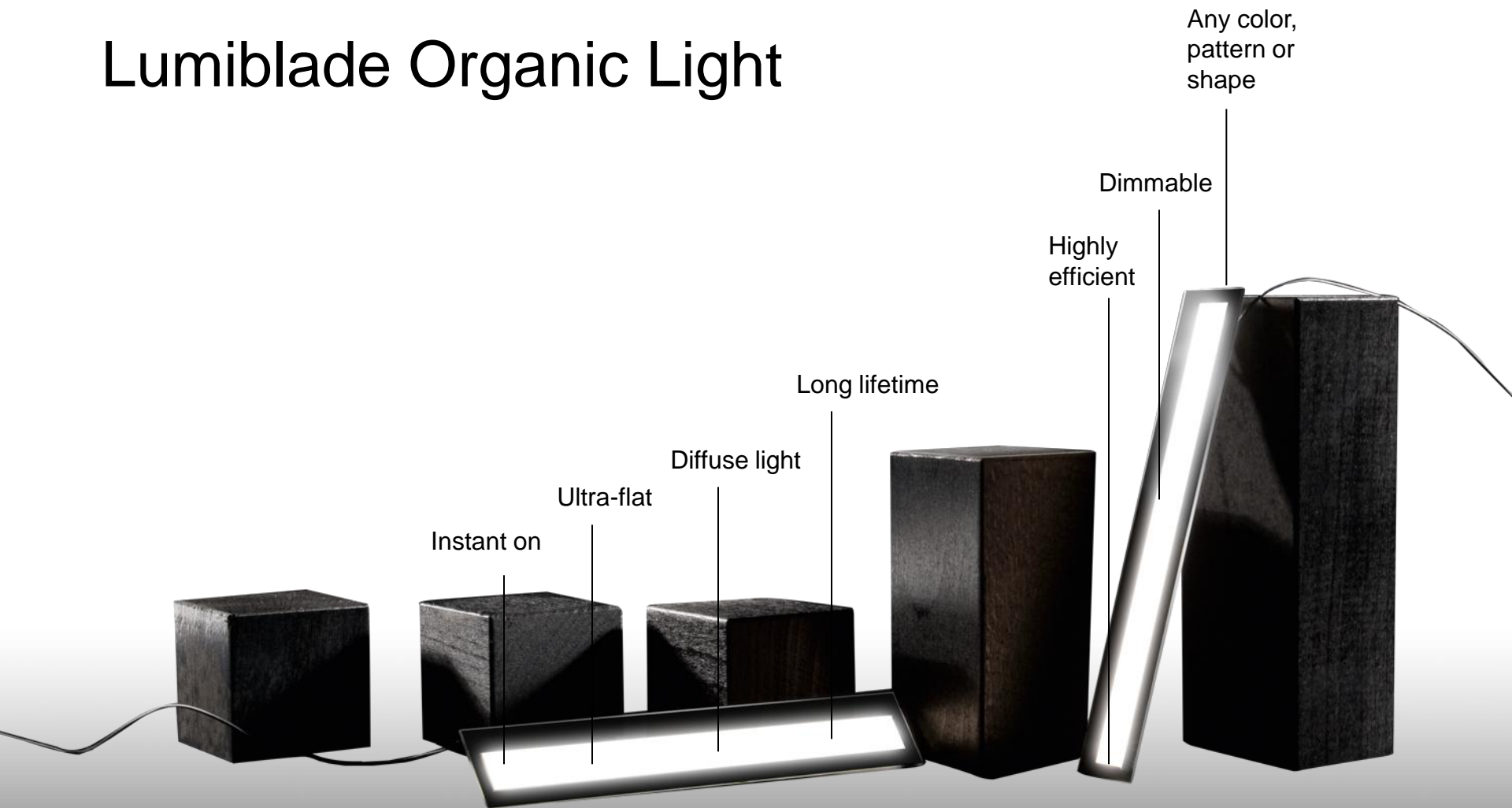
Creating the future with OLED Lighting

www.lumiblade.com

History of OLEDs within Philips

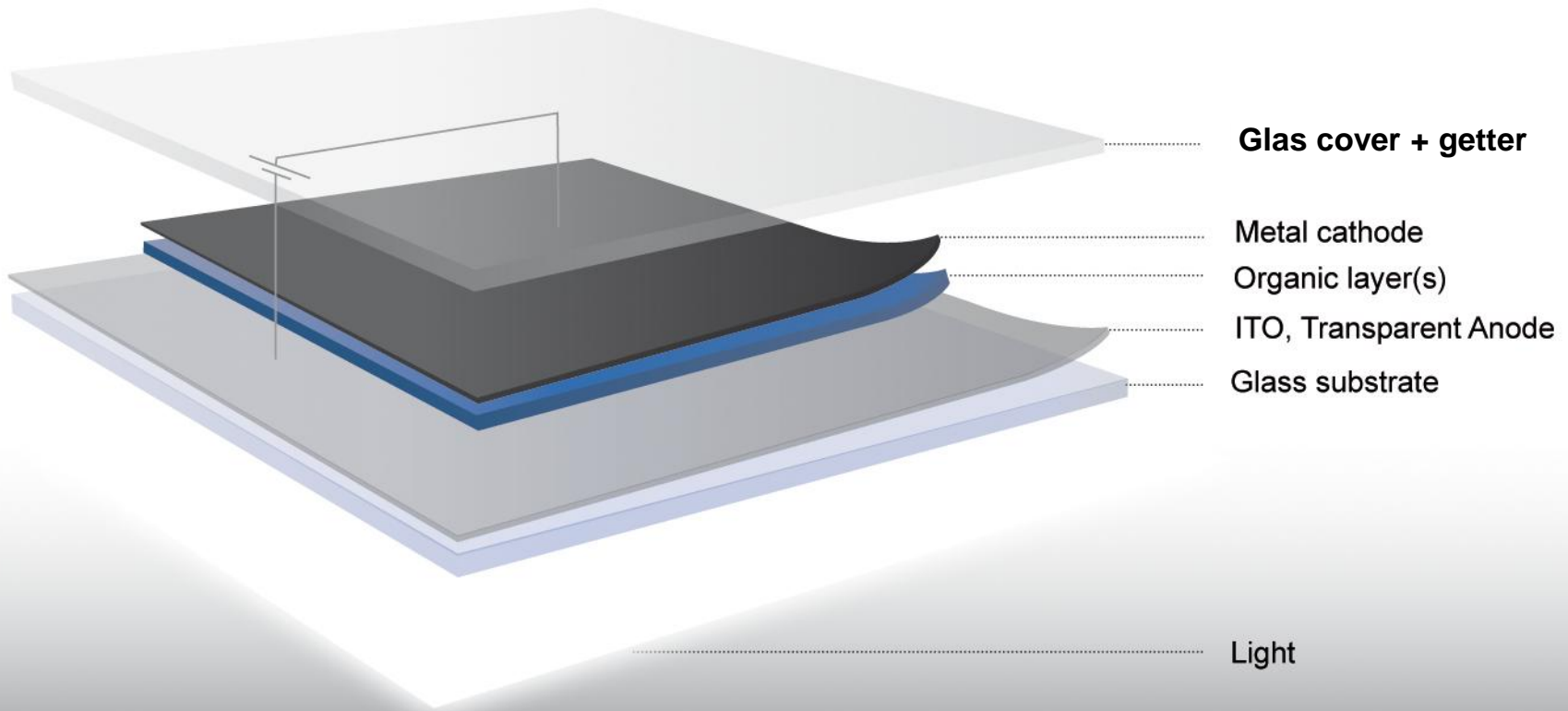
1991	Research project polymers
1997	Development for displays: polymer-based passive-matrix displays
2000	Start Research for Lighting
2004	Philips stopped display panel production (strategy)
2004	Foundation of development activity for OLED Lighting applications
2007	Pilot Production Line installed at Philips site Aachen
2008	Business Center Organic Lighting founded
2009	First design cooperations presented
2010	First OLED products presented
Today	<p>Global Business Unit OLED reporting to BG Lamps of Philips Lighting</p> <p>Mission: Industrialization of OLED technology</p> <p>>100 people in Development/Production/Marketing (based in Aachen/Germany)</p> <p>>25 people in Research (based in Aachen/Germany and Eindhoven/Netherlands)</p>

Lumiblade Organic Light



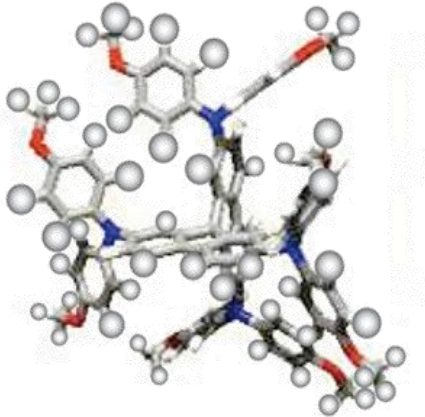
Unlike all other light sources, OLEDs are flat and directly emit homogenous light over the complete surface

OLED technology: a layer of light



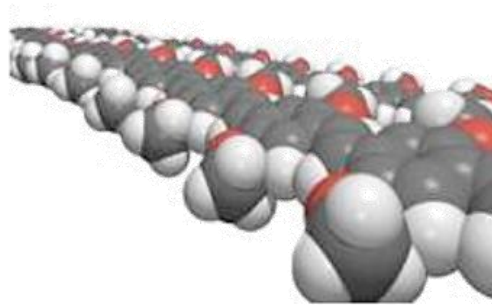
OLED material systems

Molecules



Now available
Easier to make material
Difficult to process
Vacuum processing

Polymers



Future product
Very difficult to make
Easier to process
Wet processing

OLED features and benefits



Thin = Less space needed in application: design freedom

Low weight = Ideal source in weight sensitive application

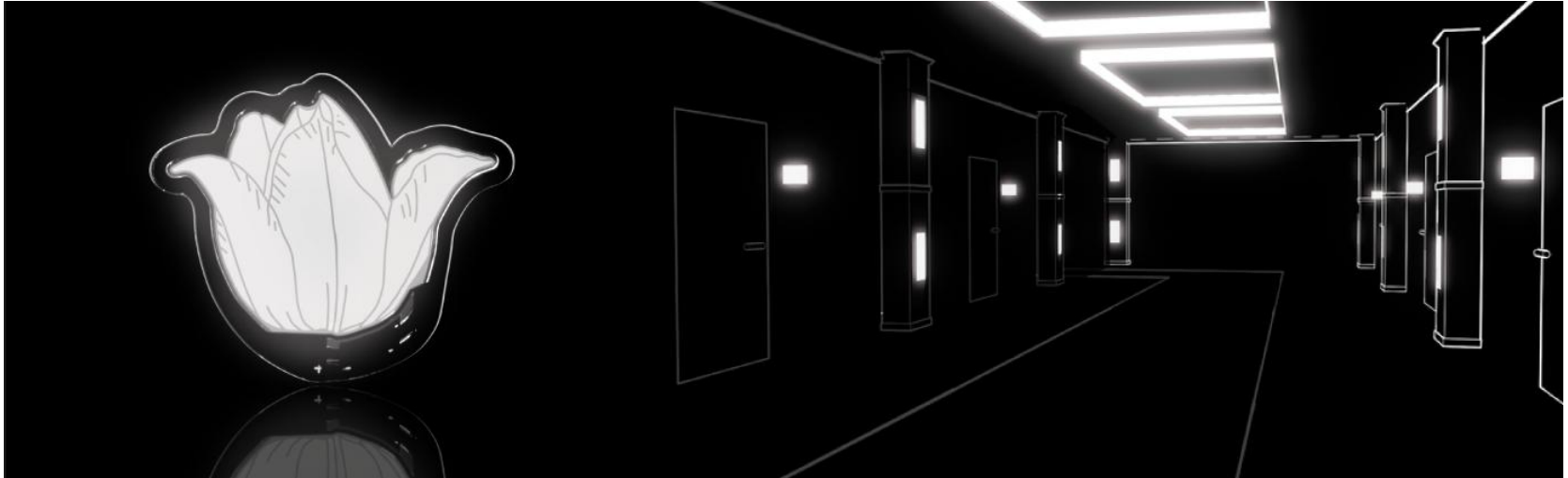
Diffuse low brightness source = Today at par with halogen – future 140 - 150 lm/W and no losses due to secondary optics

Energy efficient = Environmental friendly

No harmful substances = Easy to recycle

Low voltage = in use e.g. in combination with children

Feature: energy efficiency



- 2011: 25 lum/W at 3000cd/m² in white
- Efficiency is expected to double every 2-3 years
- Practical efficiency limit at 140 lum/W
- In combination with like thin/little properties heat dissipation/good color rendering, OLEDs will become an attractive alternative to fluorescent lighting

OLED is a potentially very energy efficient light source

Feature: energy efficiency



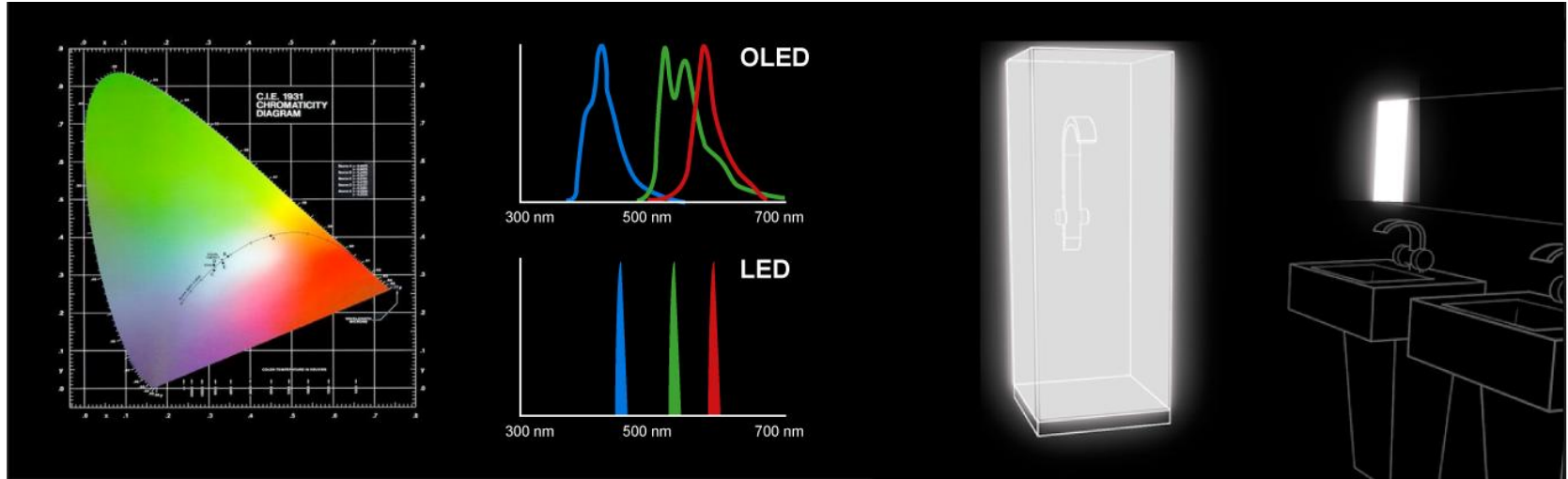
This OLED panel is developed by Konica Minolta and produced by Philips.

It features high efficiency with full phosphorescent organic materials supplied by Konica Minolta.

Technical data:

- Luminous efficacy: 45 lm/W
- Thickness: 1.8 mm
- Area: $\approx 55 \text{ cm}^2$
- Lifetime (T50): 10,000 hours
- Luminance: $1,000 \text{ cd/m}^2$
- Current/voltage: 71.5 mA / 3.6 V
- Color coordinates (x; y): 0.45 ; 0.41
- Color temperature: 2,800 K

Feature: color tunability



- Target 2010: monochromes & different shades of white
- Material spectra generally wider and more flat than inorganic LEDs
- Generally all colors doable
- First color tunable samples shown in lab
- Stepwise approach: duo chrome variable

OLEDs will stepwise become color tunable (2-3 years from now)

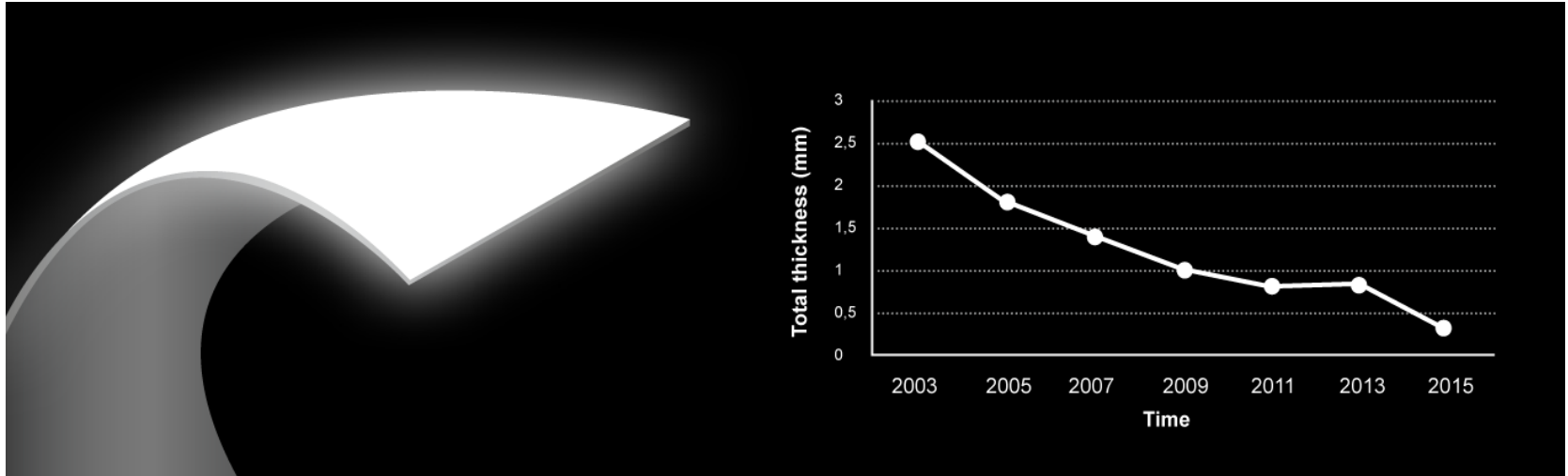
Feature: transparency



- OLEDs look like a mirror in the off state (Aluminium cathode) today
- In the future, OLEDs will become transparent in the off-state
- With that OLEDs can be integrated in glass (e.g. as large area light source or partial illumination/information)

OLEDs will be transparent in the off-state (3-5 years from now)

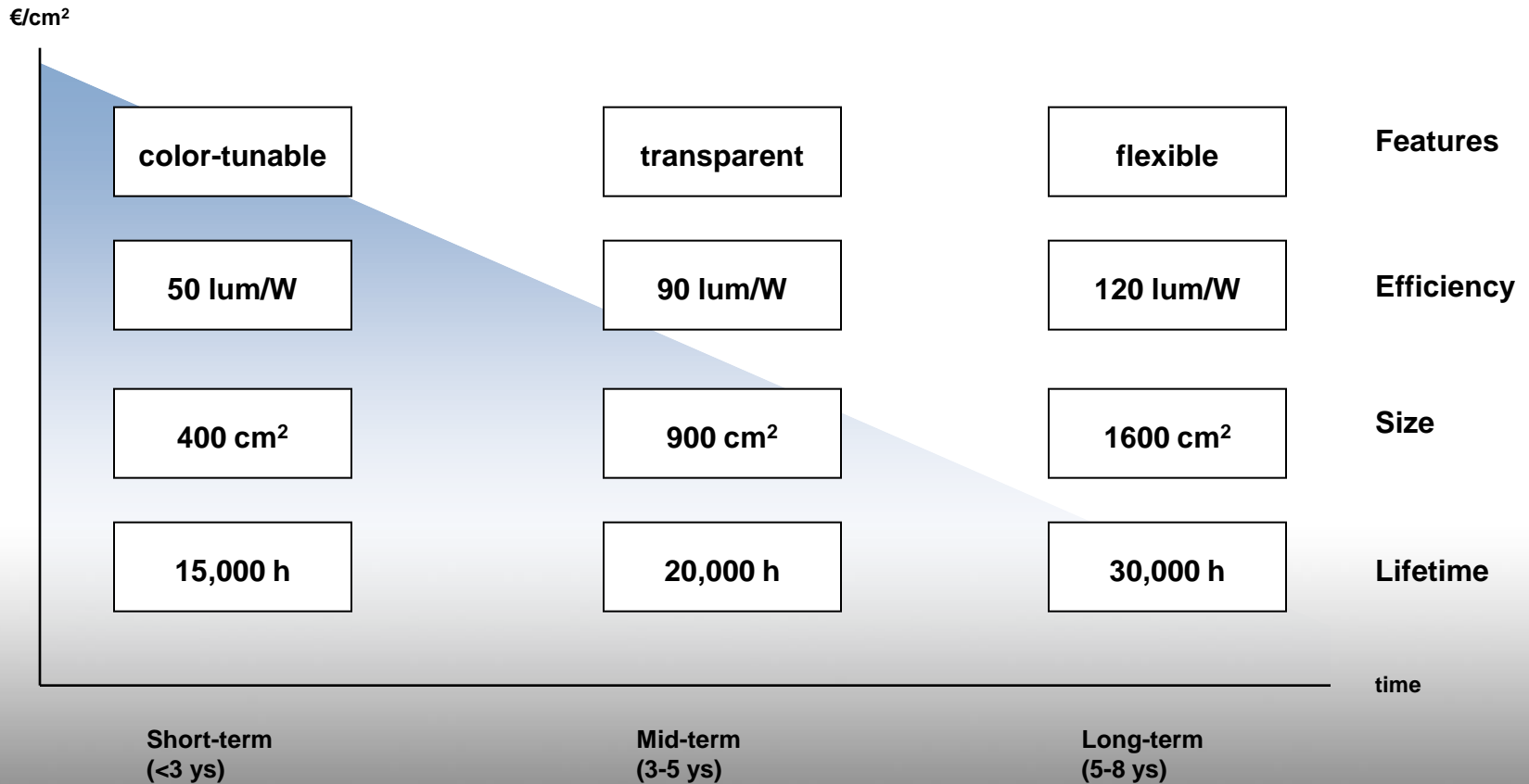
Feature: flexibility



- Today, we process on rigid glass
- Glass is necessary due to its tightness (organic materials are very sensitive to oxygen/water)
- Next step is thin film encapsulation, will decrease device thickness by 50%
- In the future, OLEDs will be manufactured on bendable plastic substrates
- First samples shown in the lab, but sound R&D needed to industrialize the process

OLEDs will be flexible (3D) (5-8 years from now)

Product feature roadmap



USPs

Easy to integrate

Unmet wish to integrate lighting into interior design; dissatisfiers today: heat dissipation, height, quality of light

Aesthetics

„first light source with an aesthetic value“; flatness of device in combination with depth of focus; directly emitting
Associations: elegant, pure, subtle

SSL but nice colors

Oversaturation with RGB applications; wish for subtle, „beautiful colors“ in combination with SSL advantages

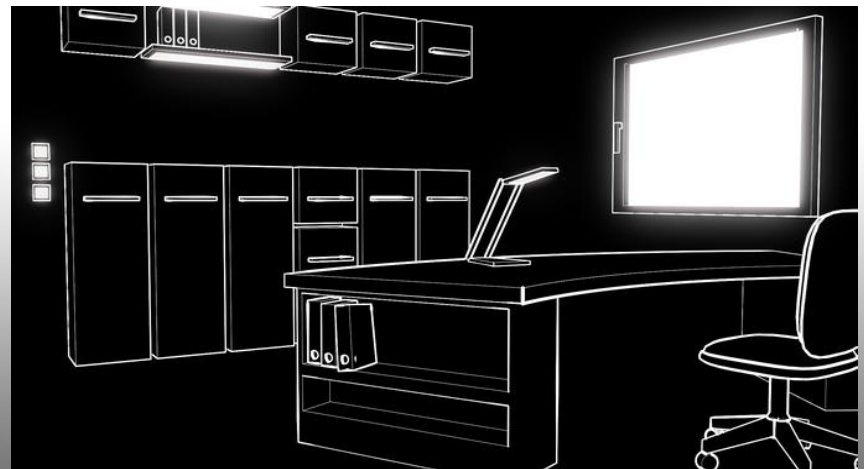
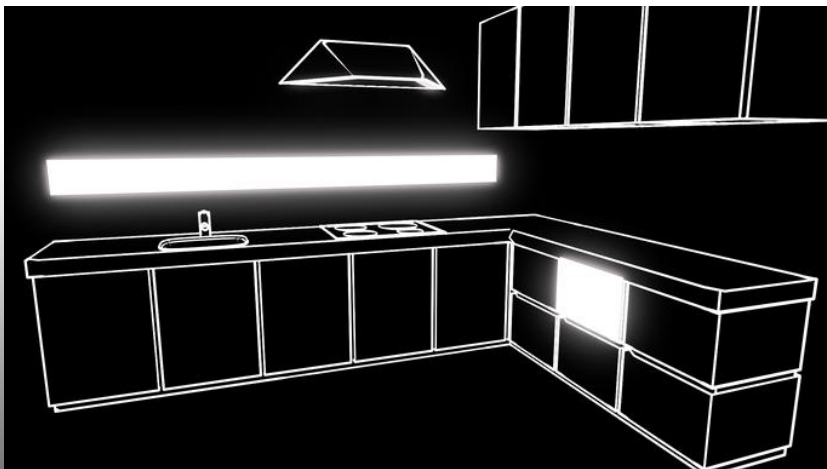
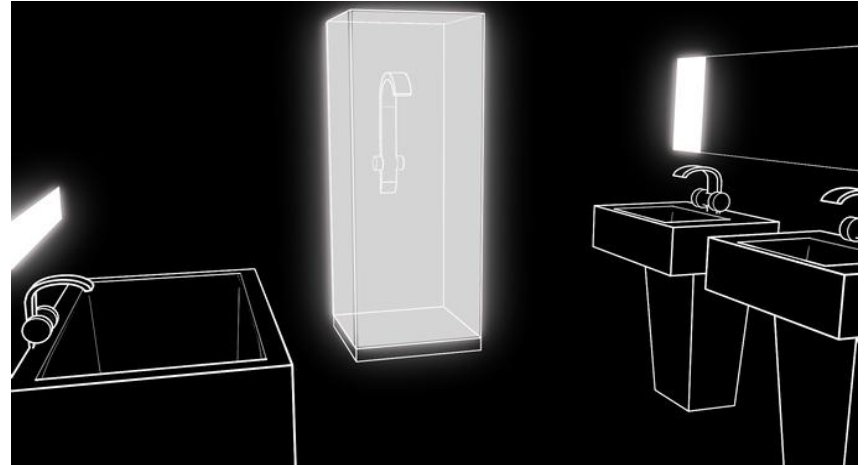
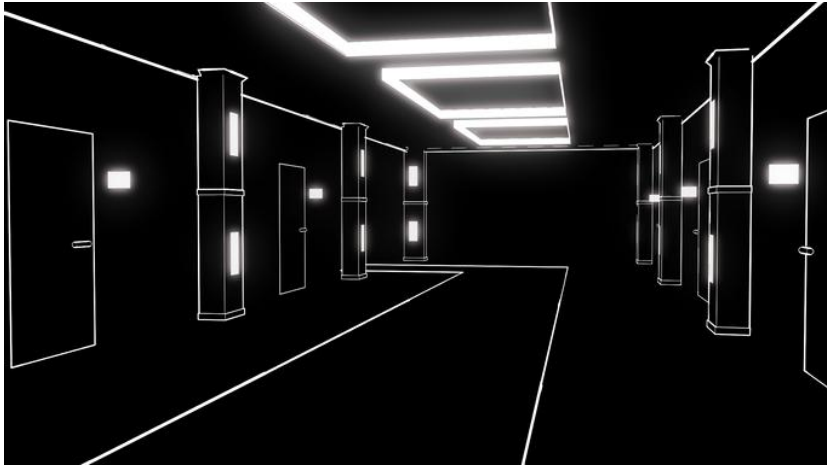
Total customisation

Customizable in size, color, shape, brightness and lifetime – much easier than any other light source

Future

Green product: energy efficient, no hazardous substances, easy to recycle. Transparent = integration in glass = manifold applications

Various applications

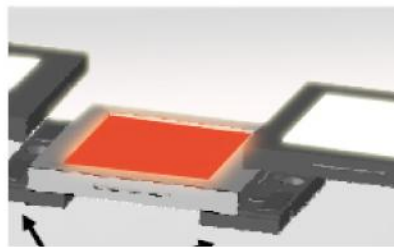


Integration levels

Bare level



OEM level



System level



content

Bare OLED
Customized OLED

OLED and connector
OLED as lamp
equivalent, with std.
socket/base

OLED solution
Plug & play
OLED & integration

customer

Lighting designer,
project owner

„traditional OEM“
Considers OLED
as lamp equivalent

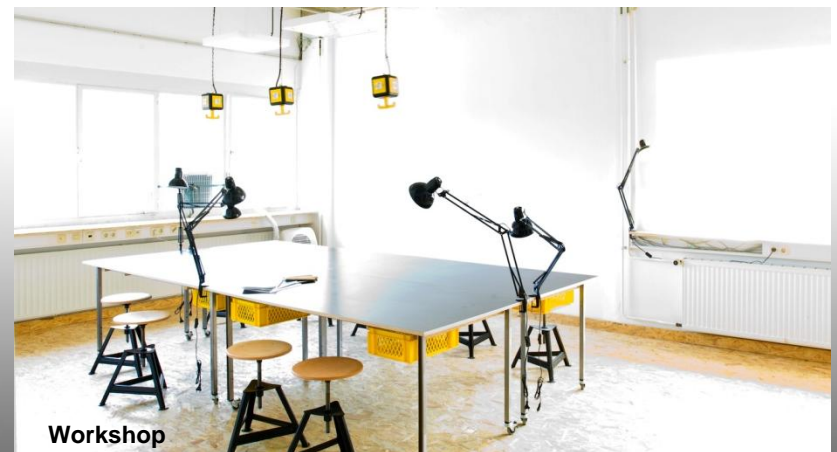
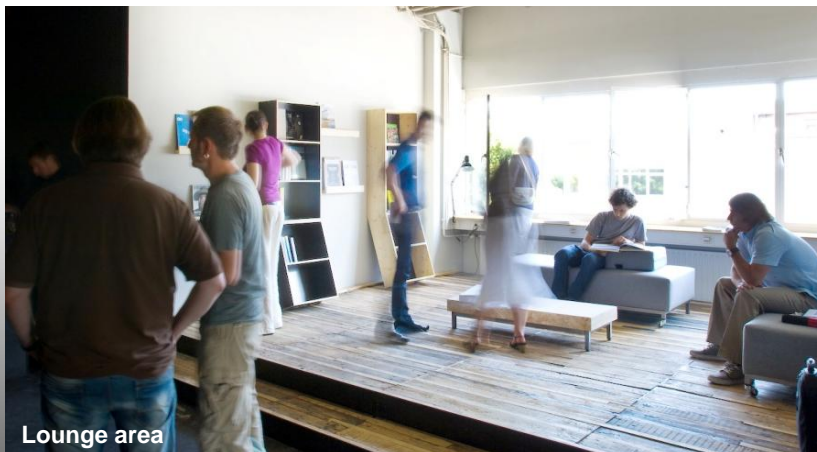
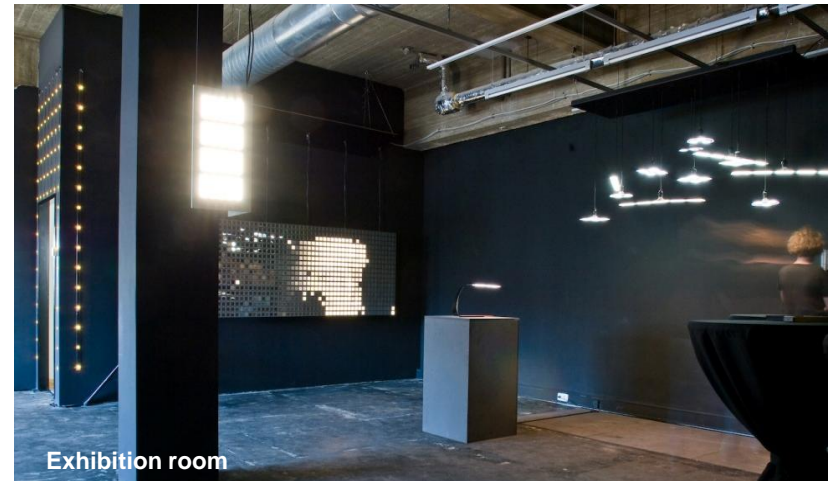
„integrators“
Wish to integrate light in
their products and have
not done so before

Philips Lumiblade Creative Lab

- Hands-on workshop for OLED experience
- Designed by creatives for creatives
- OLED training & design programs for architects, LDs, OEMs, creatives in general
- Showroom Lumiblade projects & products
- Curated design library
- Material's library supported by material connexion



Philips Lumiblade Creative Lab



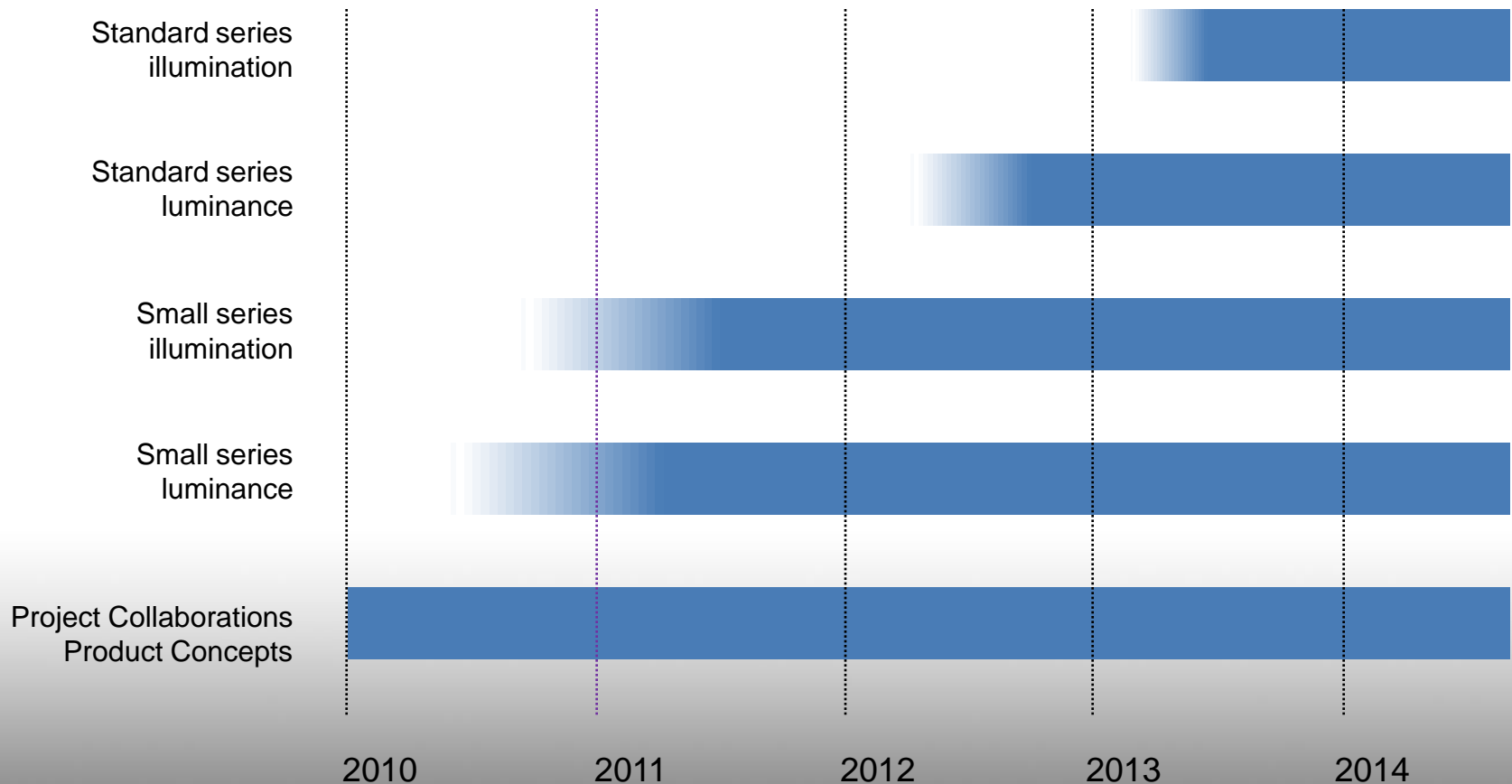
Production facilities

All subprocesses necessary for high volume production setup, integrated in one line.
Gen-2.5 (400mm x 500mm). 2.000 m² clean room. Further expansion planned.



We continue investing in the technology and aim to be number one in manufacturing small molecule OLEDs for lighting applications

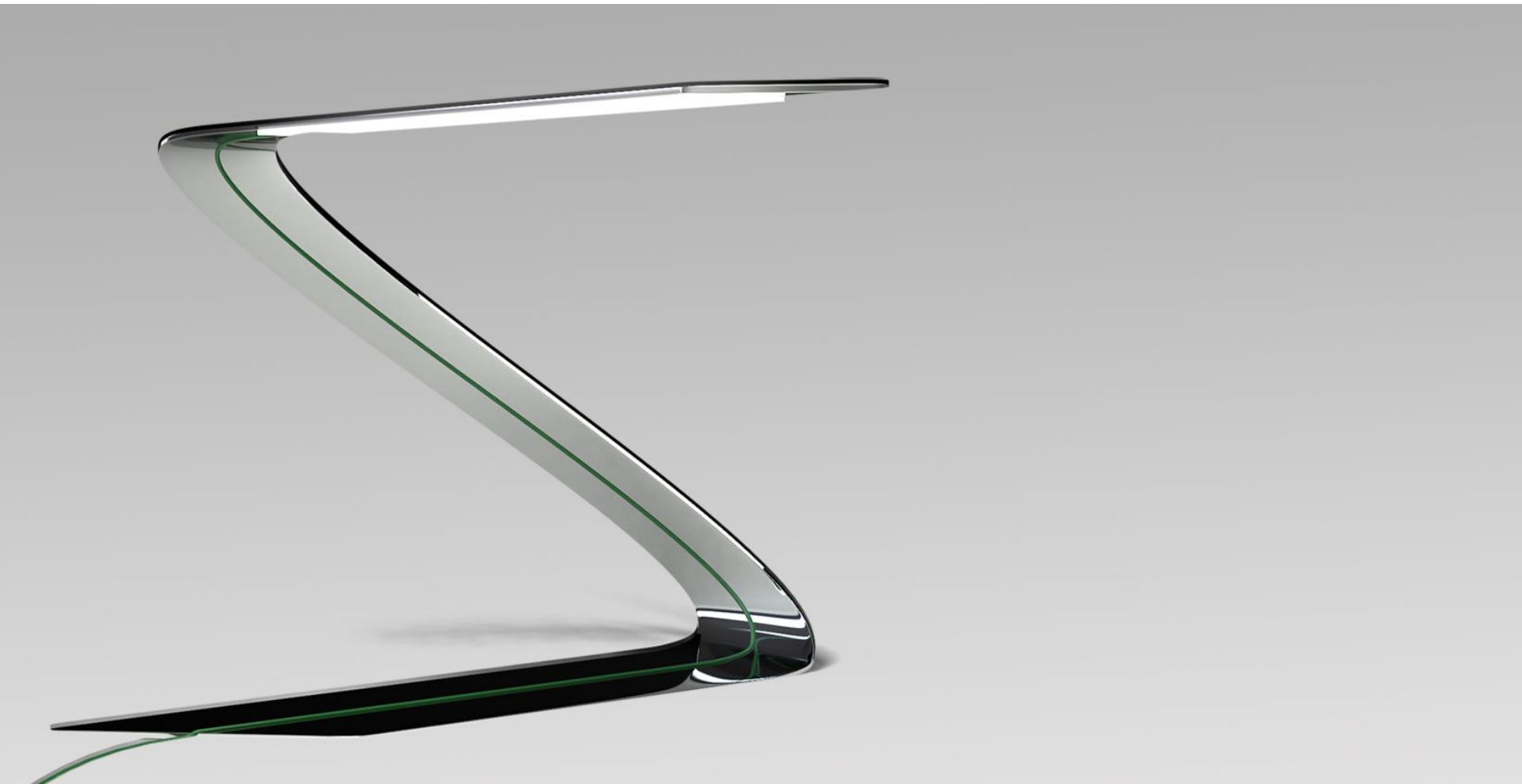
Roadmap delivery capability 2010-2014



O'Leaf: organic shapes for the world of design



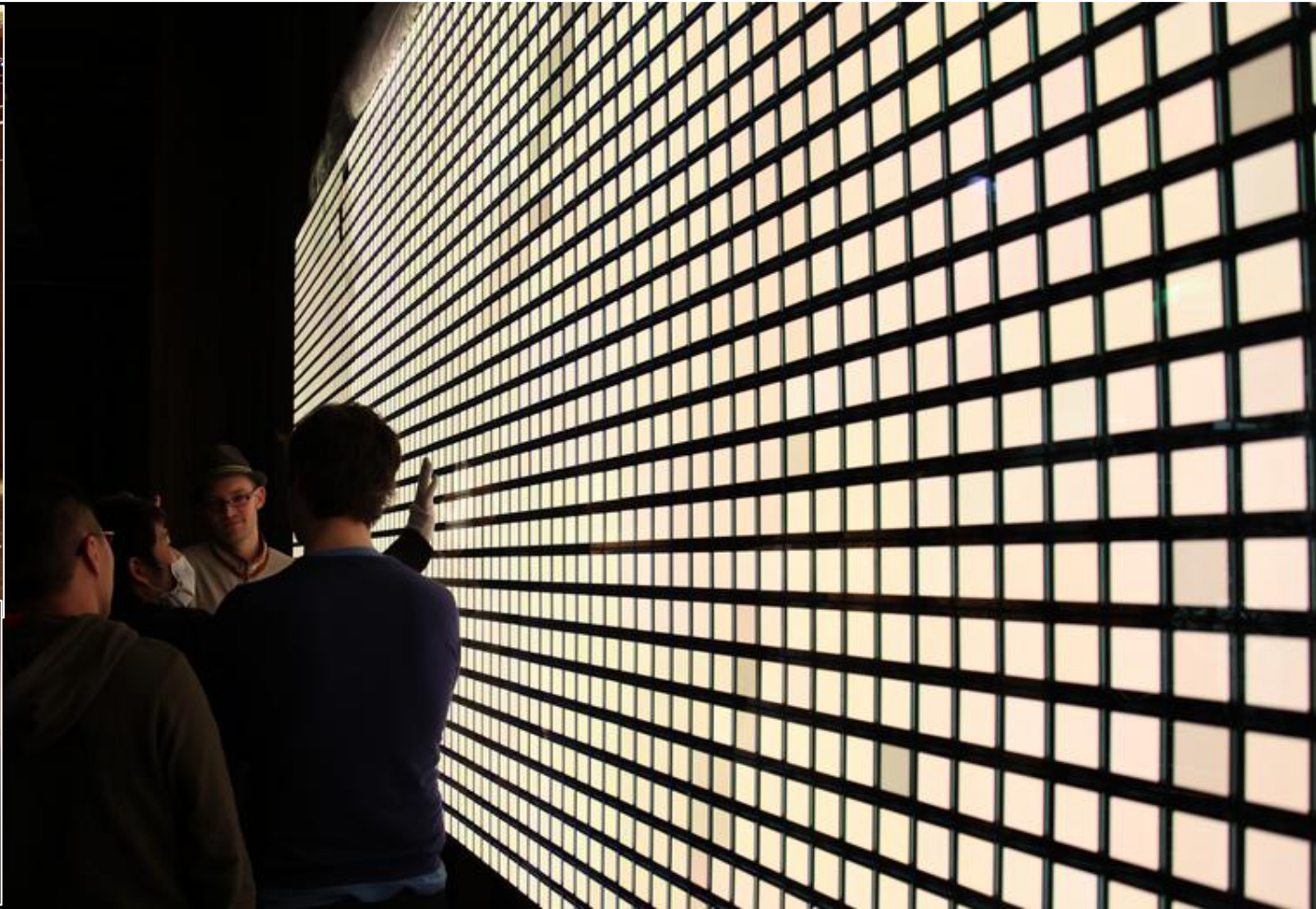
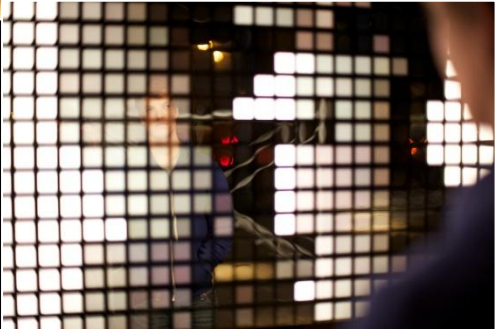
Edge: completely reductive in its simplicity



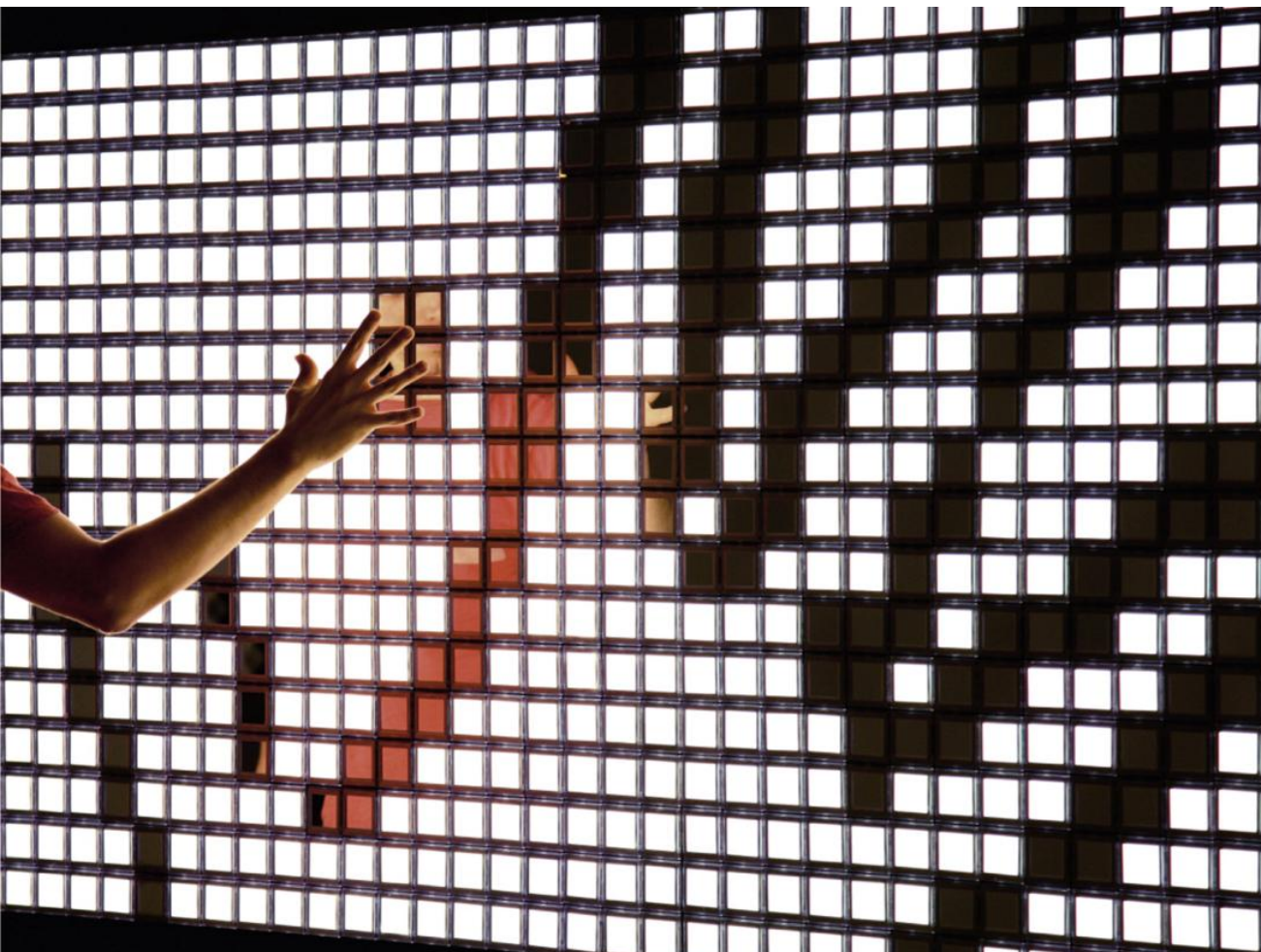
Light installation the easy way: LivingShapes



Installation: W Hotel Taipei



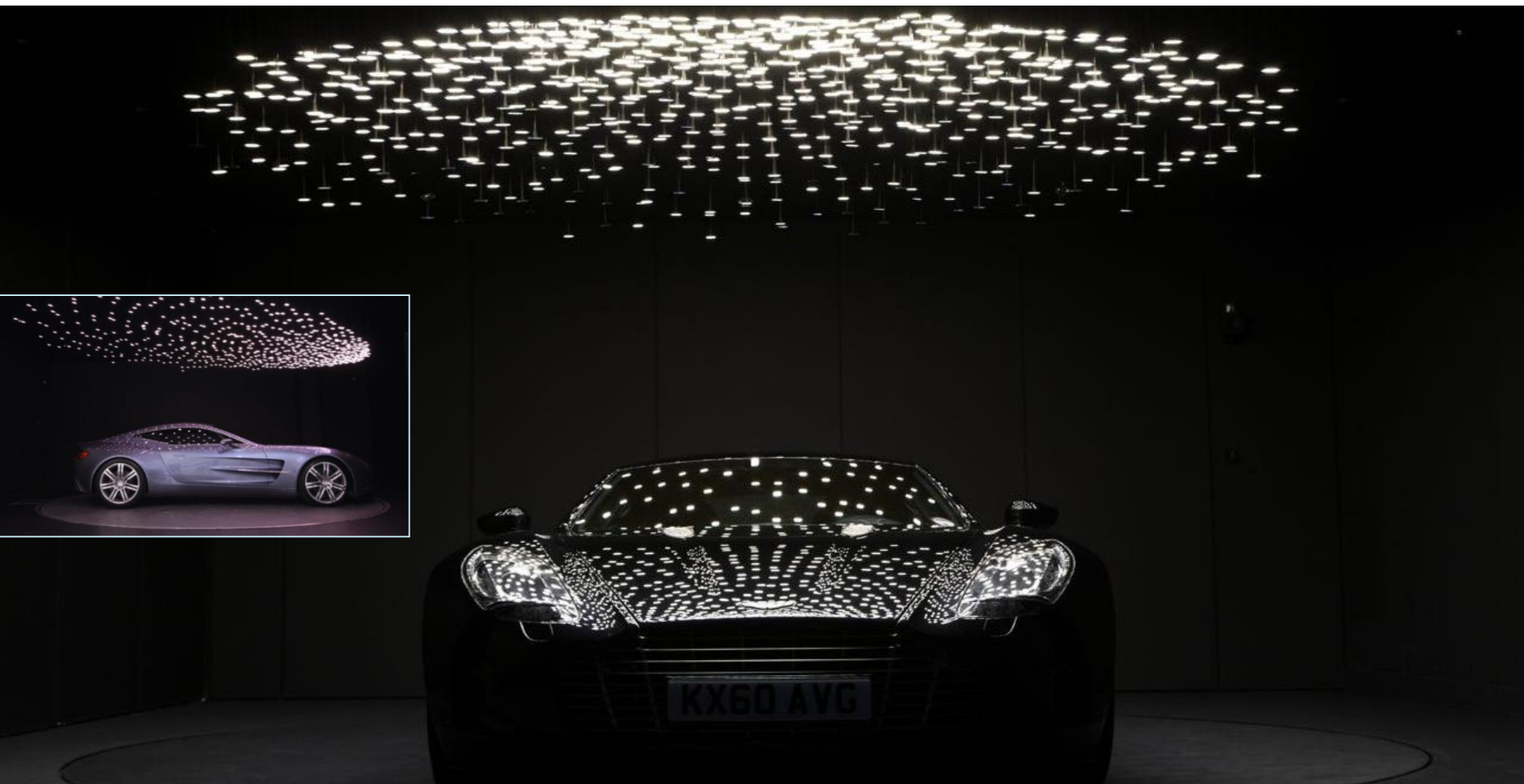
You fade to light: interactive mirror wall



Mimosa: sensitive by nature



Aston Martin: engulfing the One-77



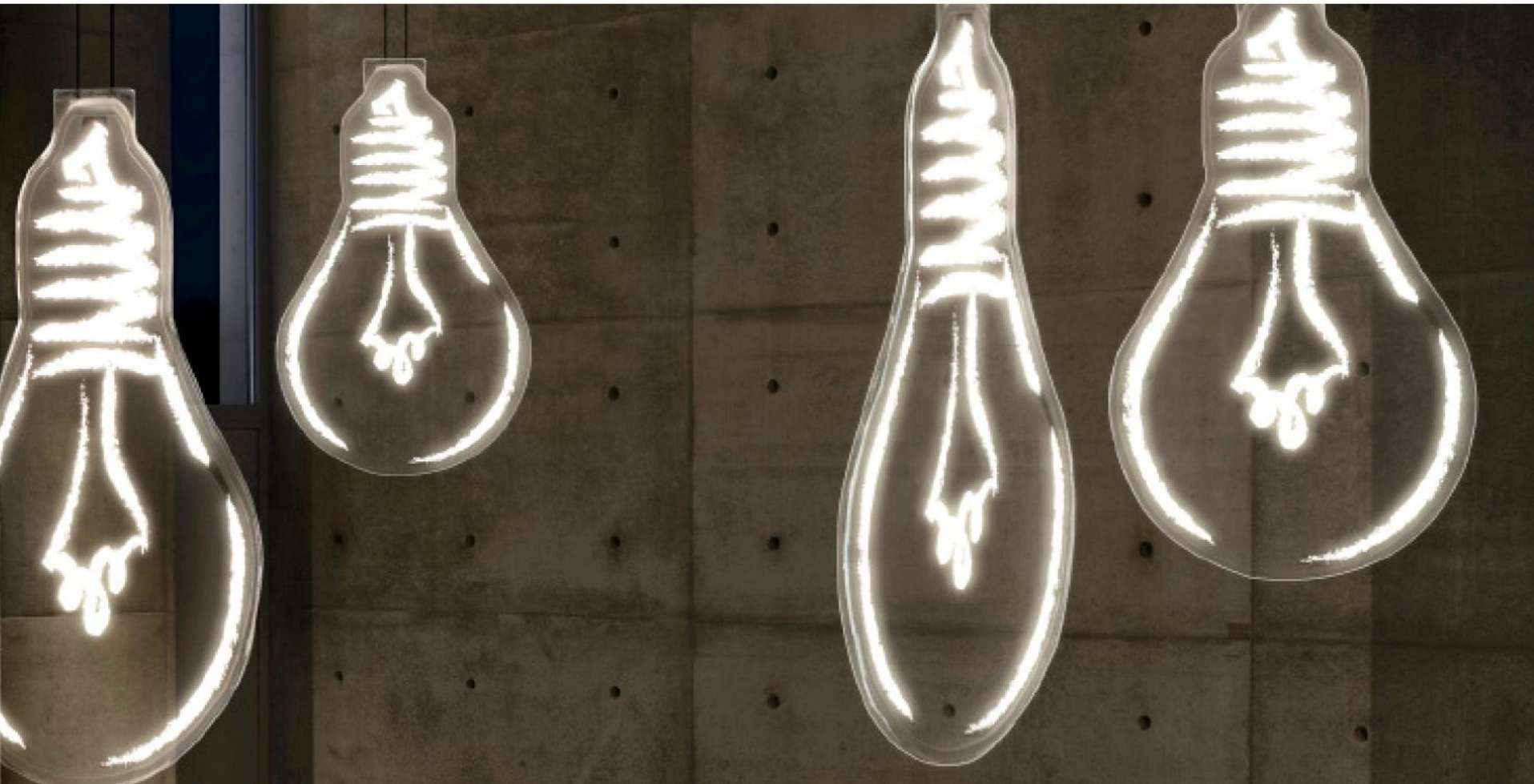
Black Eyed Peas: OLED Outfit



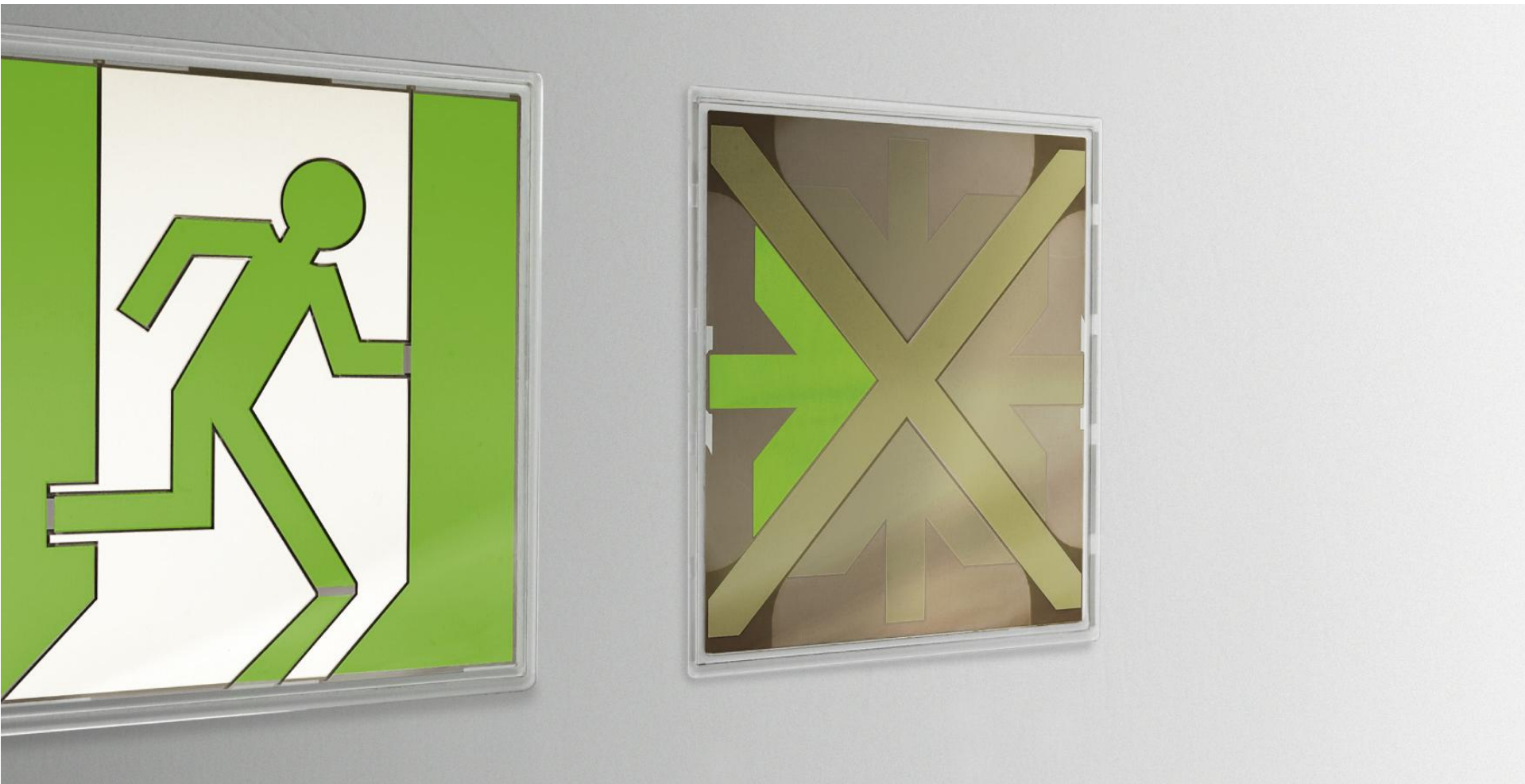
Reflections: you are my favorite mirror



Mr. Ed: a new generation of light



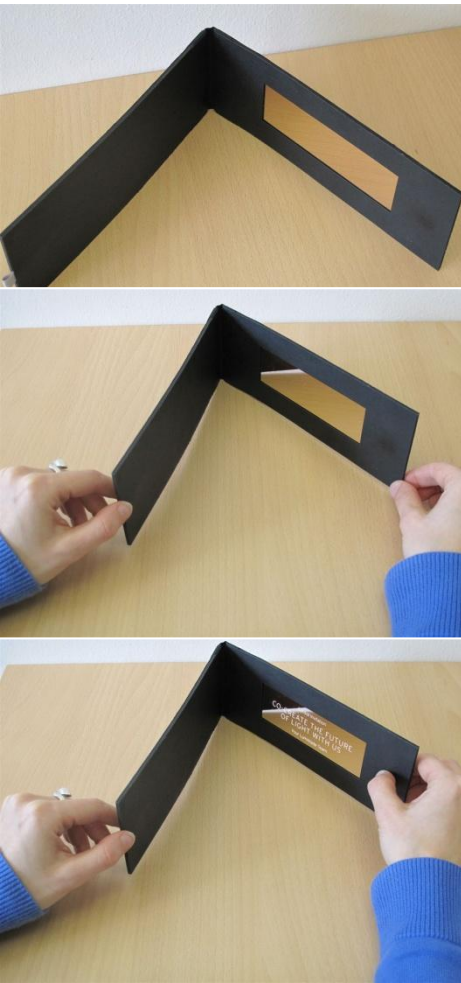
Dynamic guidance: highly visible & intelligent



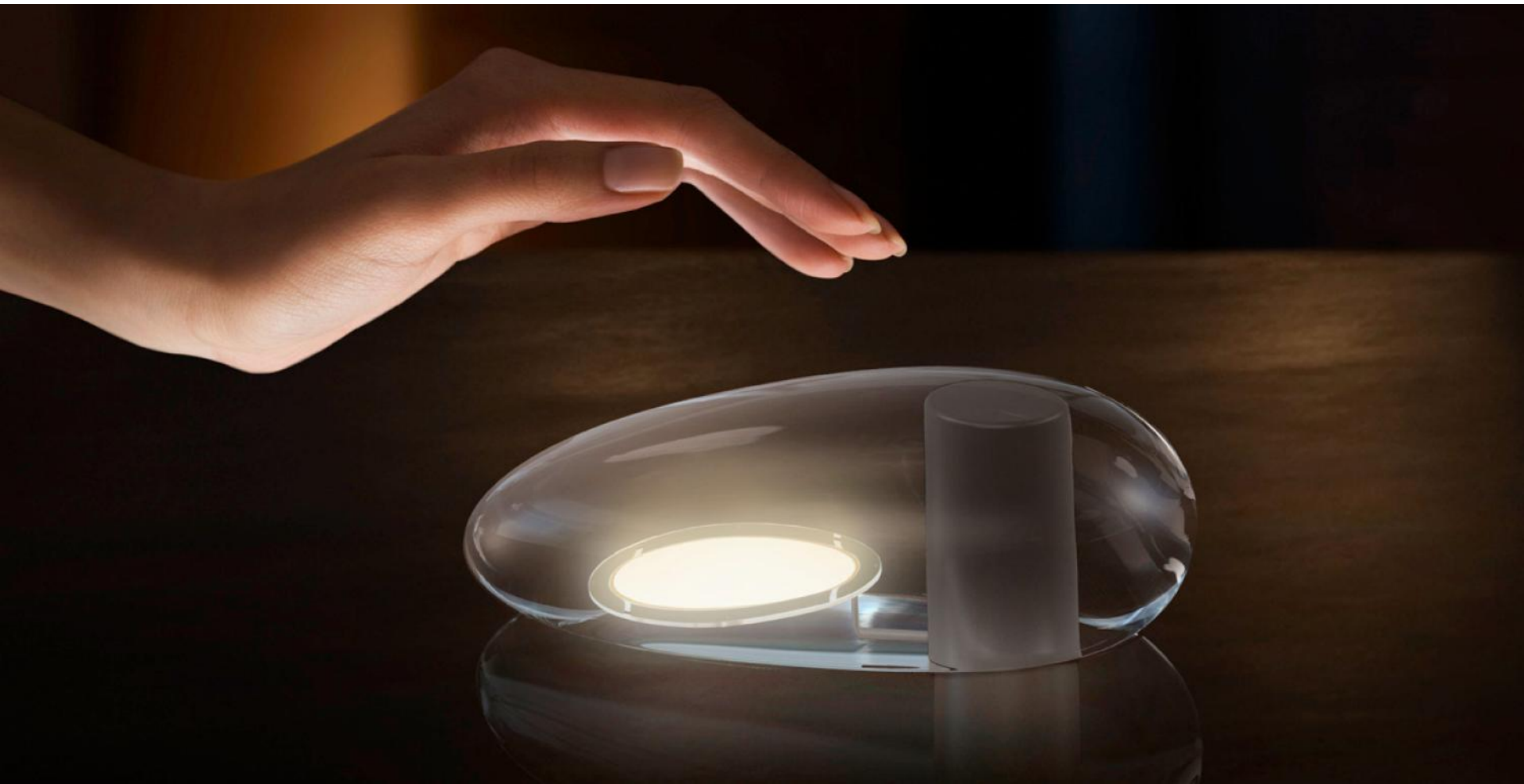
Philips Lumiblade OLEDs: easy to structure



Philips Lumiblade OLEDs: easy to structure II



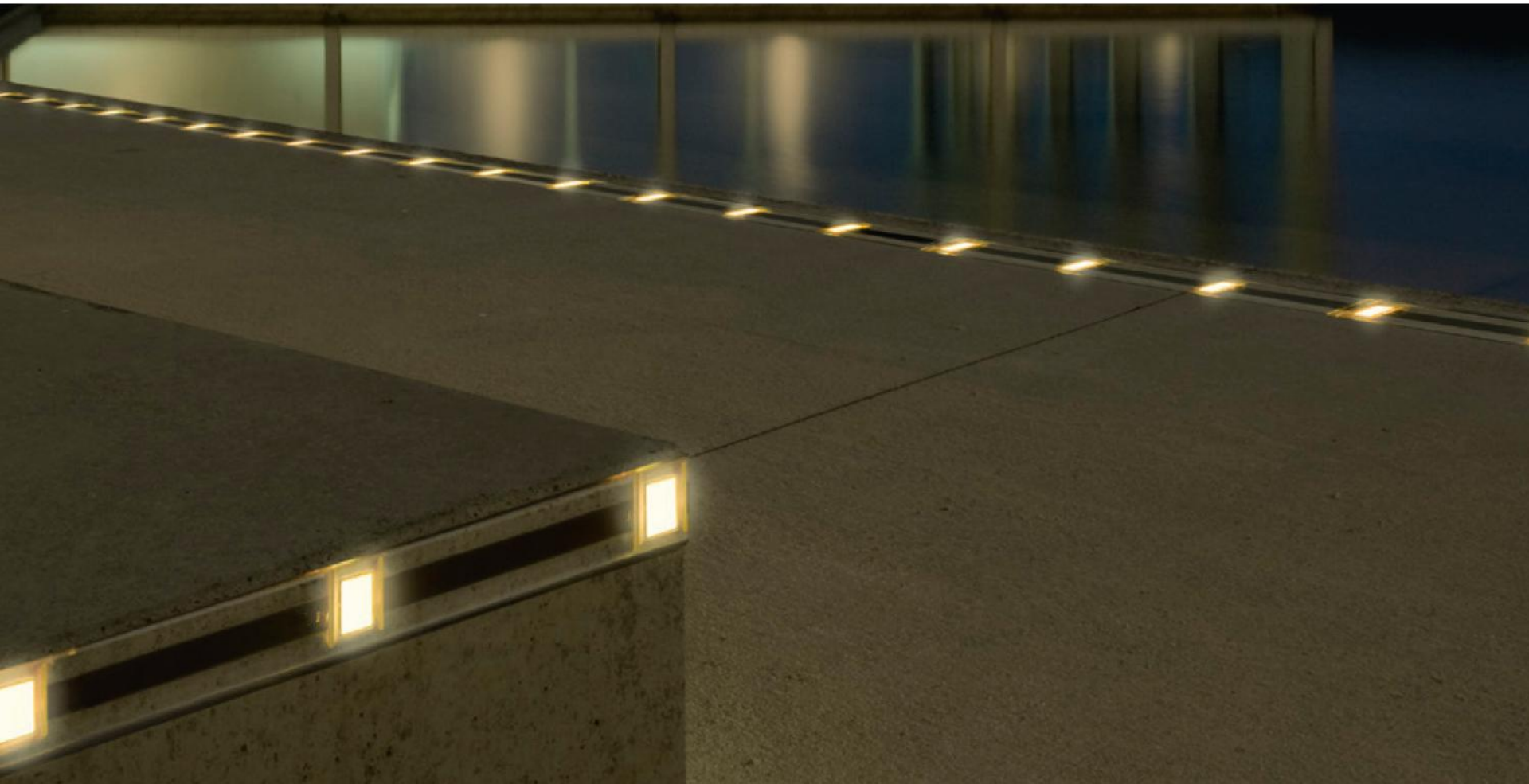
Glow: interactive and dimmable light source



GK: a farewell lamp for Gerard Kleisterlee



Markerlight: follow me



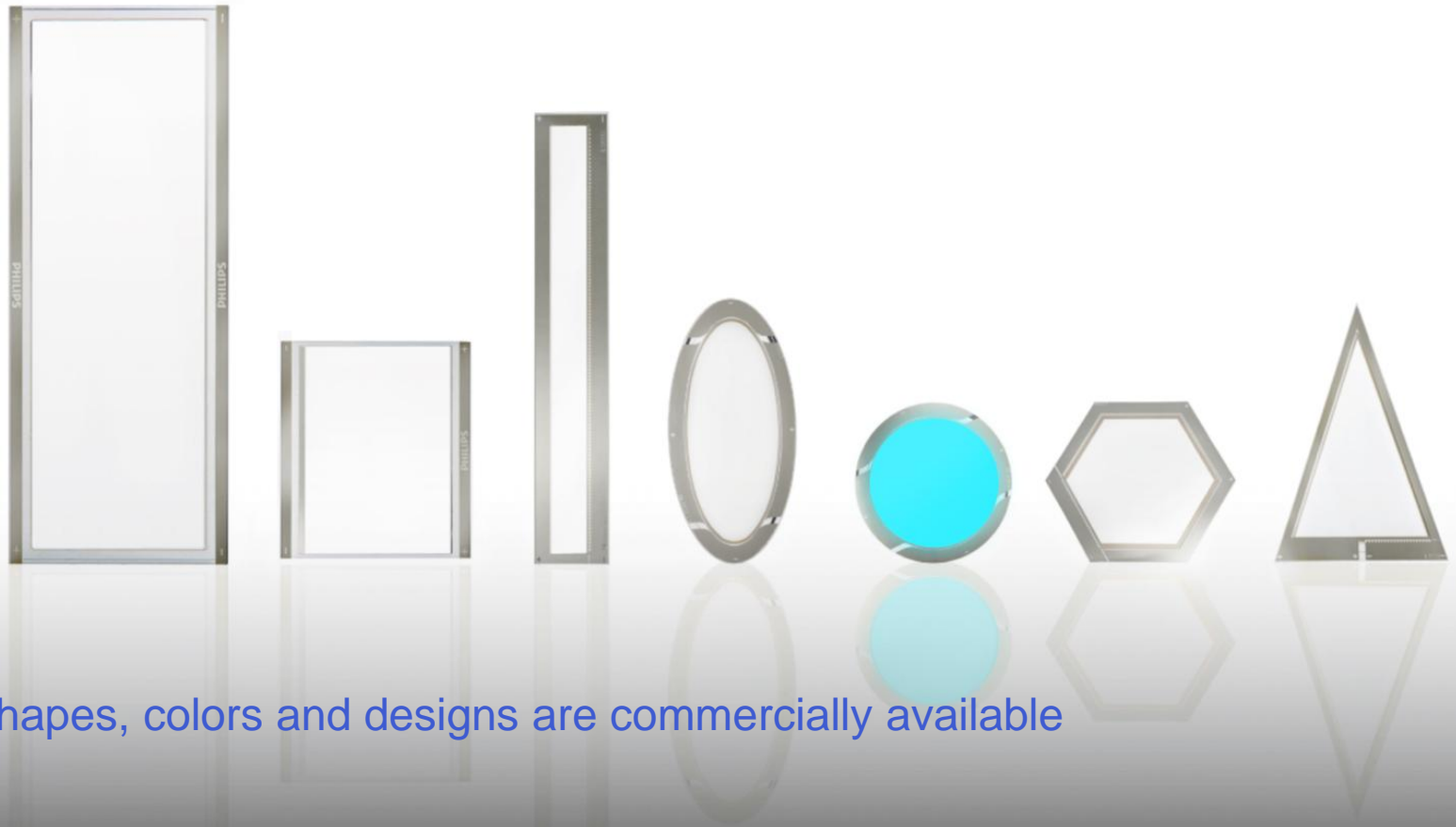
Flat lamp: a collection of OLED light bulbs



Philips Lumiblade module: easy to integrate



The Lumiblade collection



All shapes, colors and designs are commercially available

Thank you for your attention!

Visit us at www.lumiblade.com