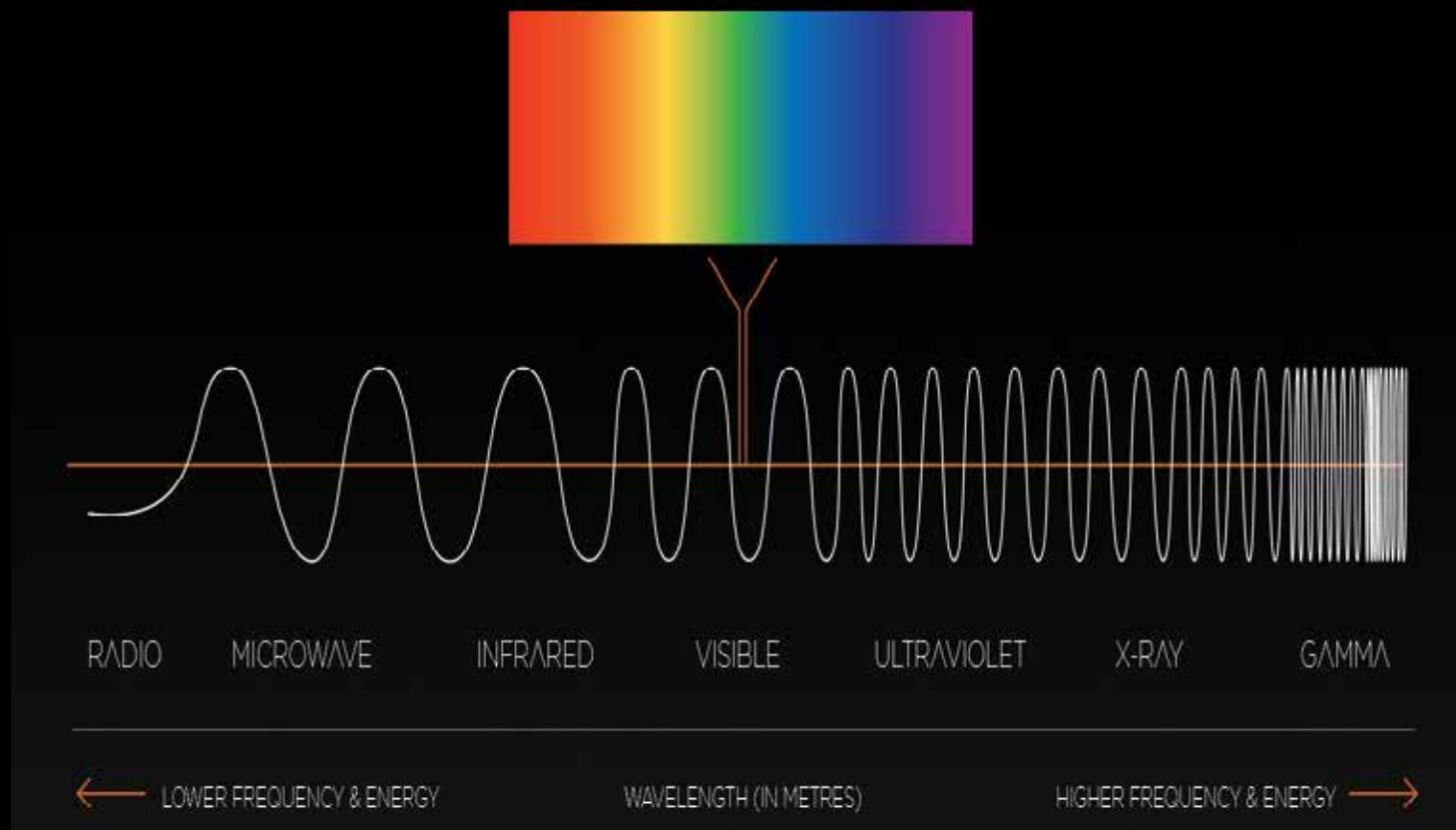


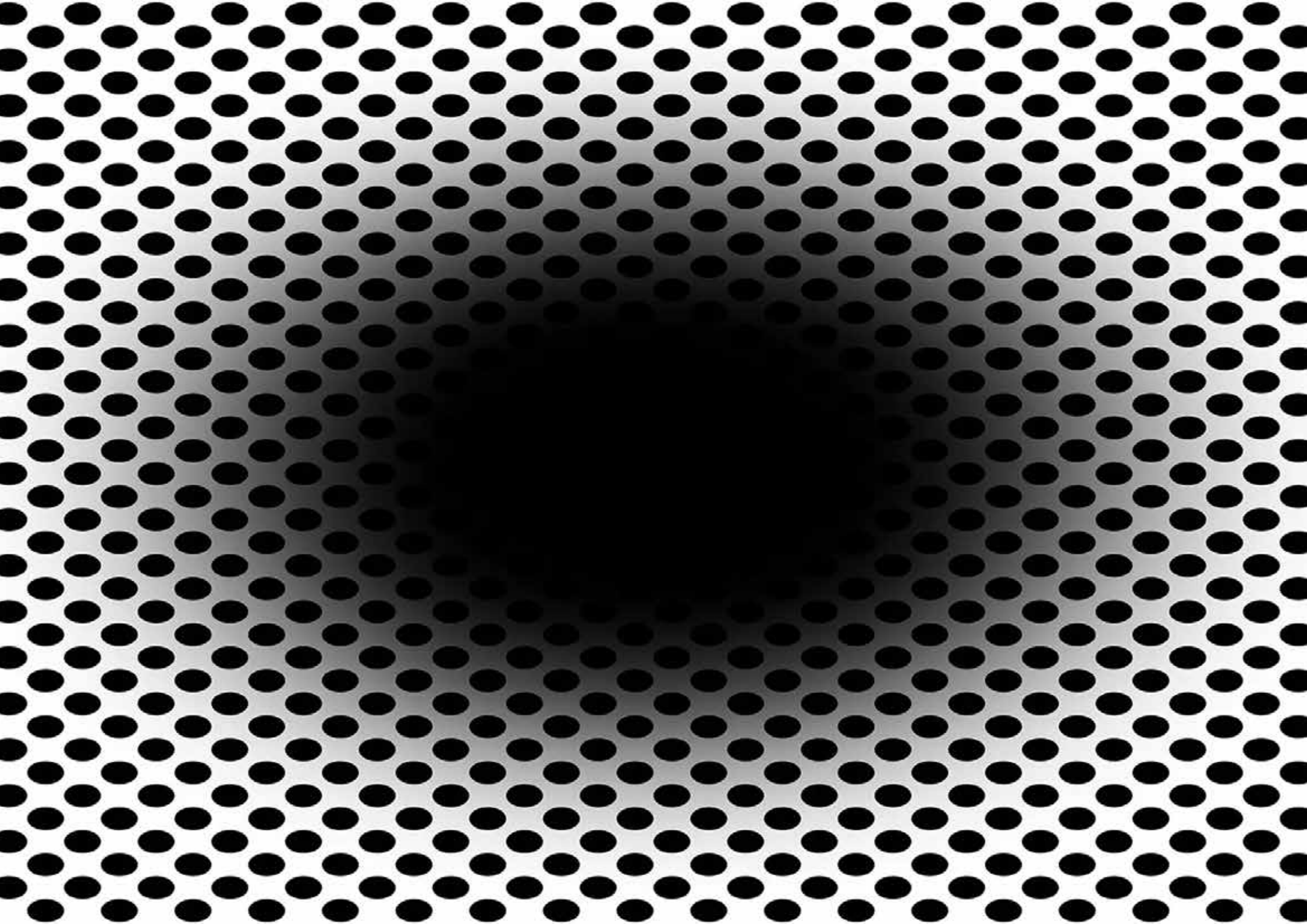


**In search of the language
of light and shadows**

Johanna Enger

Senior Lecturer in Lighting Design
The Perception Studio
Konstfack



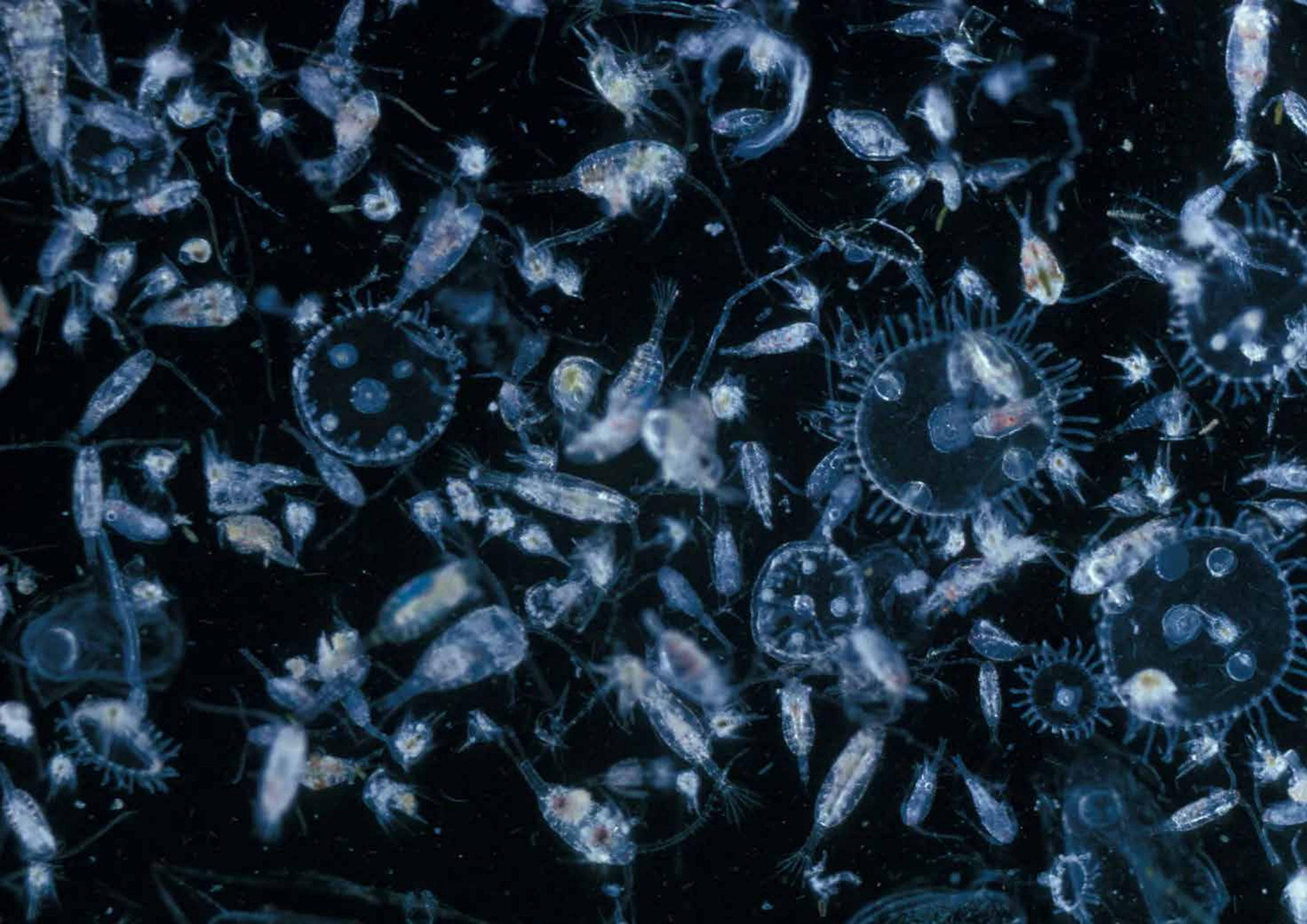


“Everything we perceive is inconsistent with the physical reality of the world,” Dr. Purves said. “Everything we see, whether it’s line length, color, brightness, you name it.”

So, you are not really being tricked; instead, visual illusions help reveal what our mind’s eye is up to by showcasing mismatches between what we see and what is really out there.”



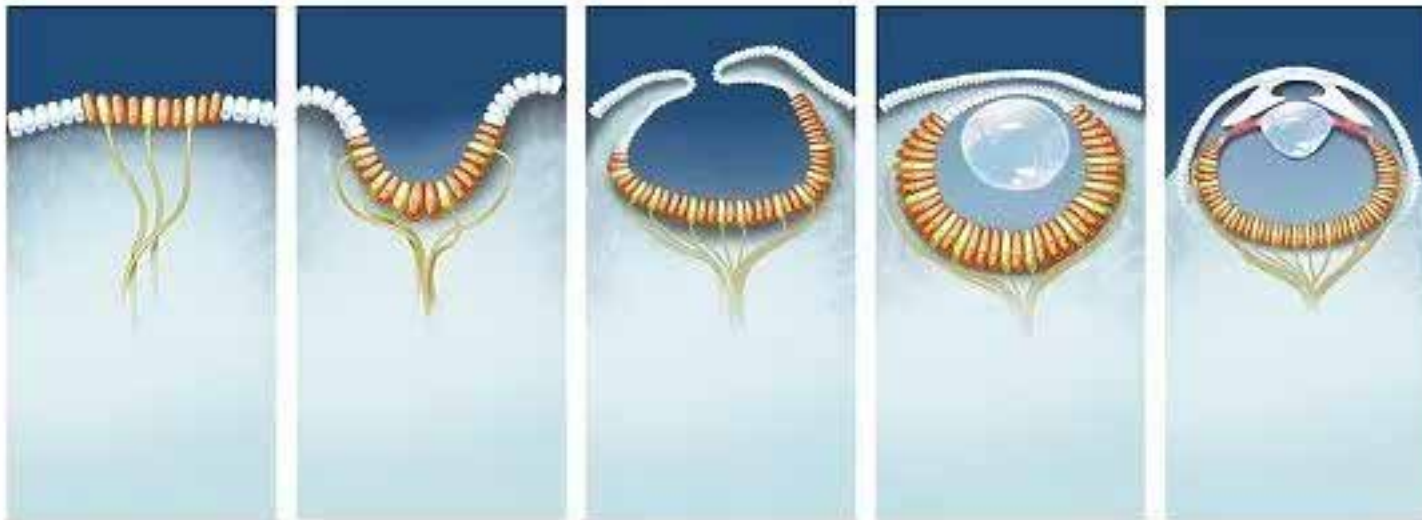
“If a tree falls in a forest and no one is around to hear it, does it make a sound?”



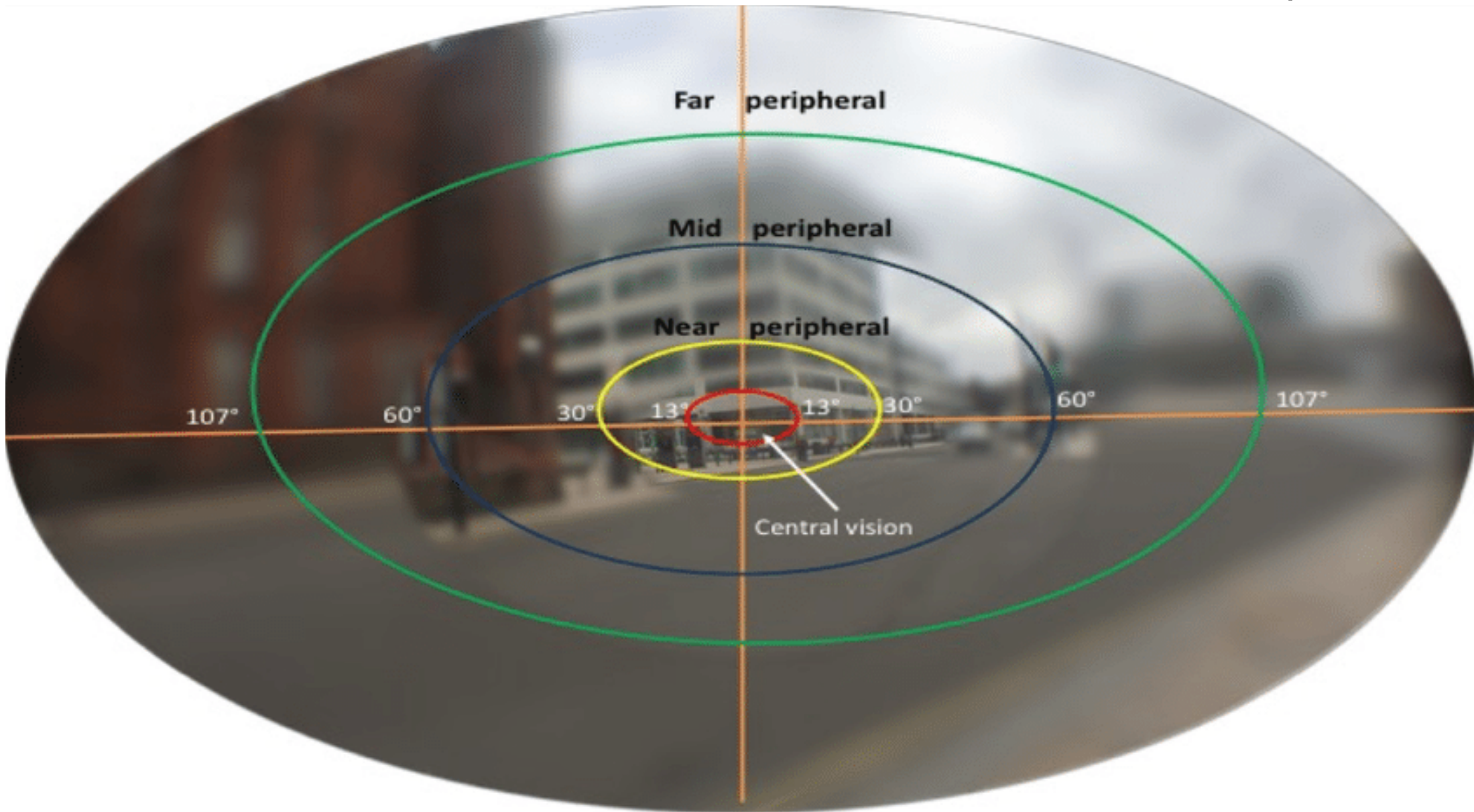
The cambrian explosion



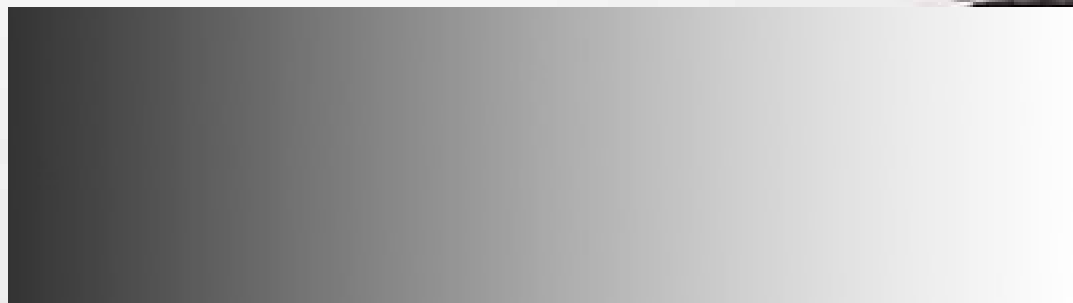
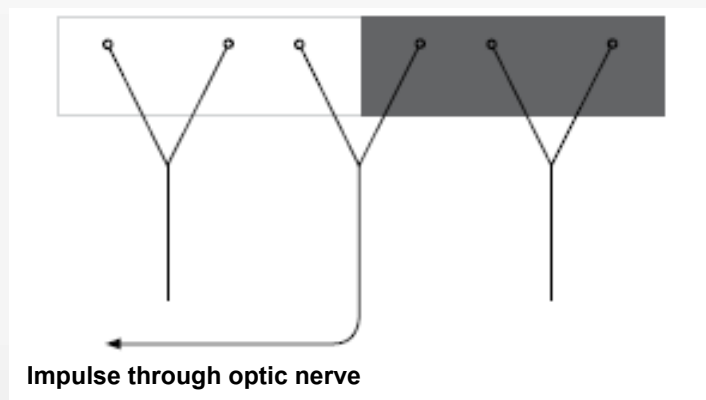
Evolution of the eye



Focus vision & Peripheral vision



Contrast Ratio Gradient





All the light we percieve is reflected

**Contrasts can be created through
the colour scheme...**



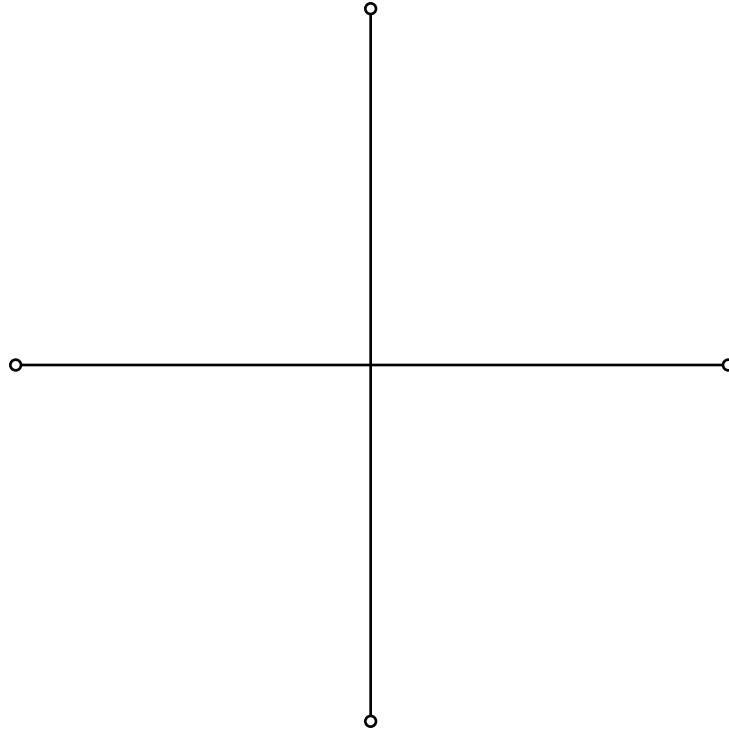
... or by using directed light





Light level

Contast



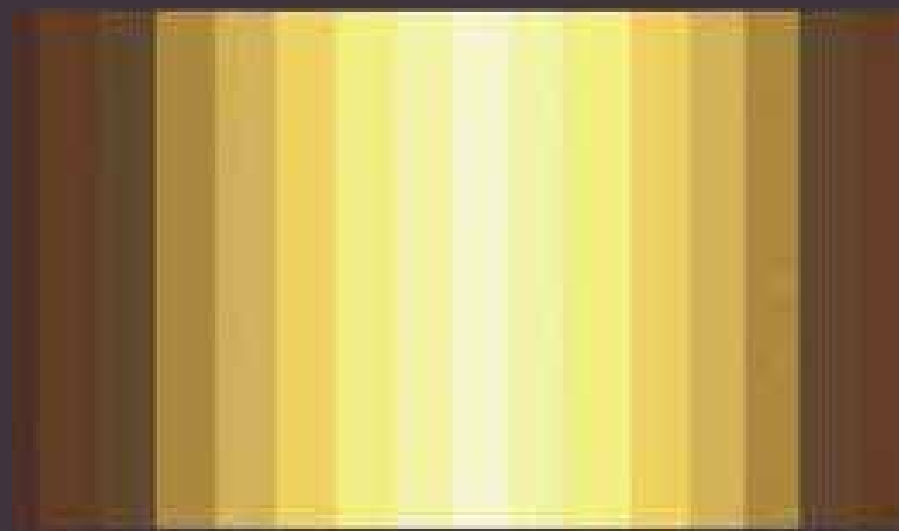


Perception of brightness & contrast



Pictures by Ulf Klarén



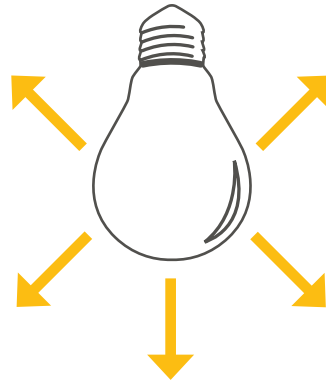


Pictures by Ulf Klarén

The Photometric system

Lumen, lm

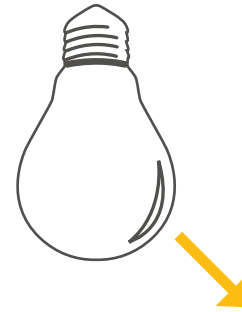
Total light flow in any direction from the light source



Lumen, lm

Candela, cd

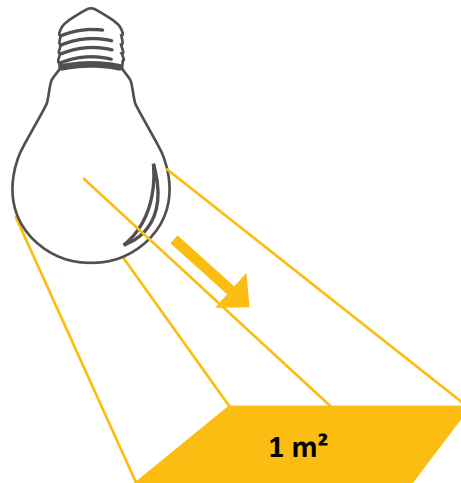
The intensity of light in a given direction



Candela, cd

Belysningsstyrka-Lux, lx

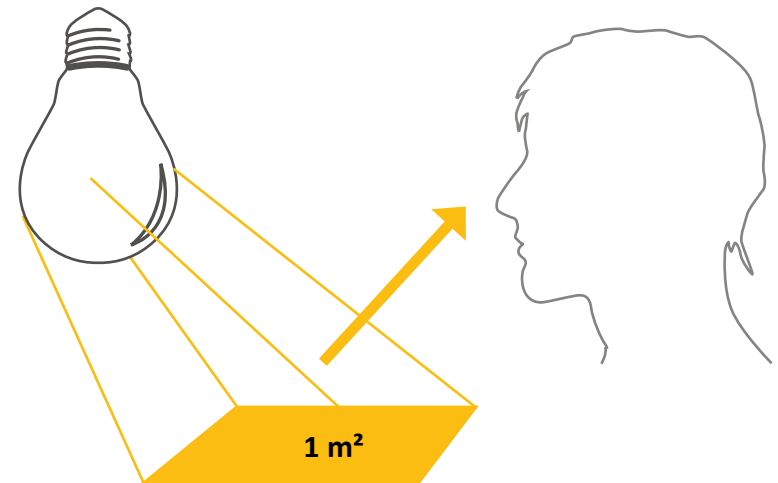
The incident light per square meter



Lux, lx

Luminans-cd/m²

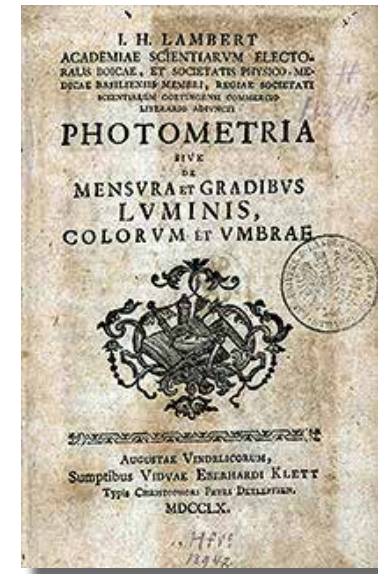
The reflected light from a surface



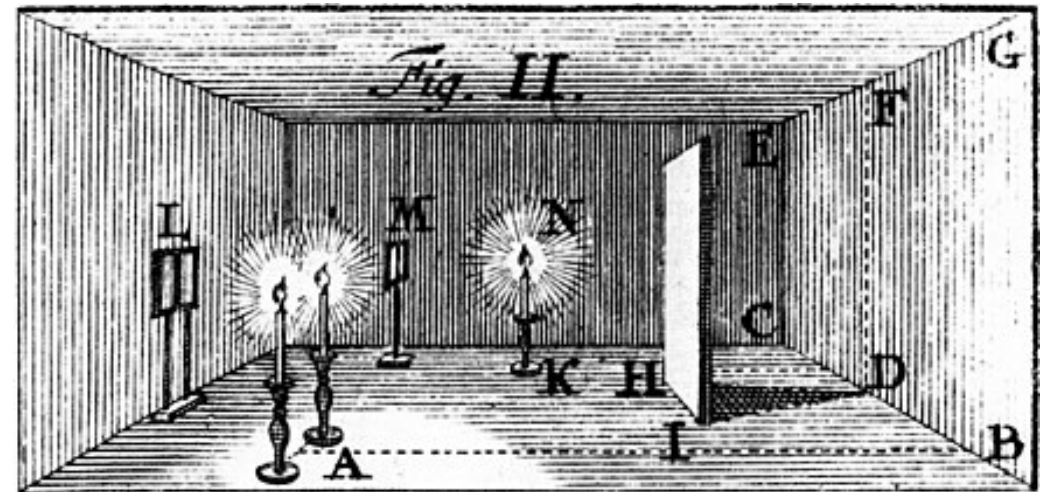
Luminans, cd/m²

Photometria - 1760

The first complete system of photometric principles and units



Johann Heinrich Lambert
Mathematician, philosopher
1728 - 1777



Edison
and
Shelby
Incandescent
Lamps
Electrical
Supply
Houses Wired for Electric
Lights
Burglar Alarms
Fire Alarms
Annunciators
Bells
ELECTRIC ENGINEERING & CONSTRUCTION
407 Pacific Ave., TACOMA

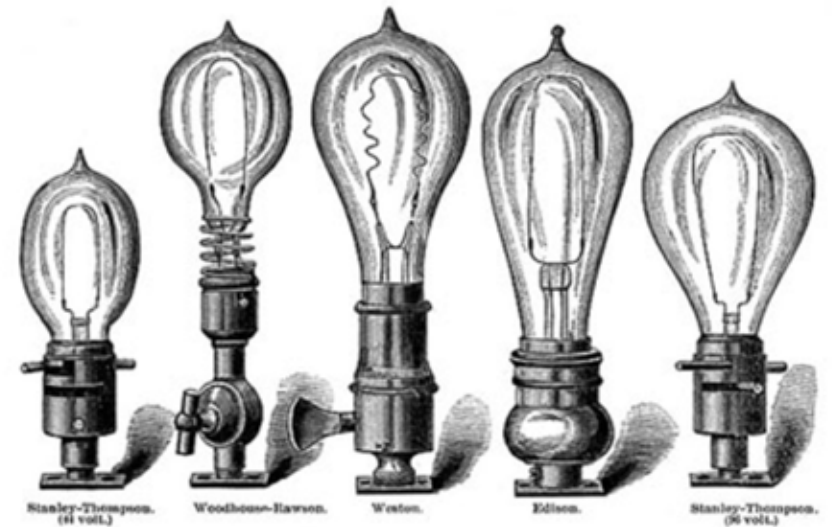
PHILIPS
"ARGA"
LAMPEN
JAARBEURS

His Only Rival

<https://d3b6k4k48m9p0.cloudfront.net/uploads/2015/07/his-only-rival1909.jpg>

MAZDA
Electric
LAMPS
ensure good
lighting in
the home -
and on the car
Mazda Lamps can be bought
wherever electric lamps are sold

Industrialism turned light into a commodity.
Photometry offered a measure
of light source performance





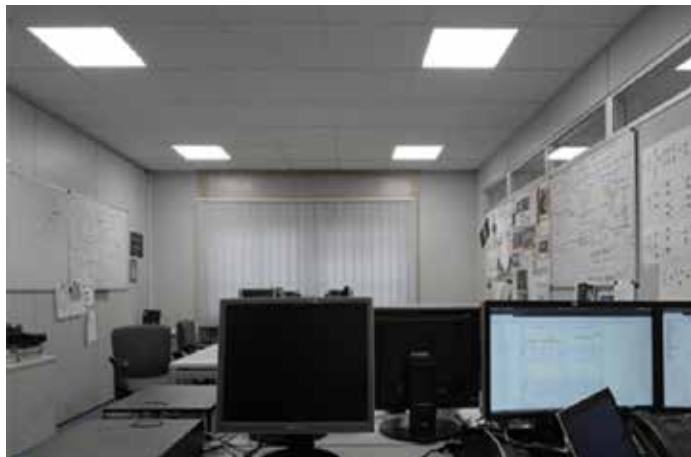
1959

The lighting standard for indoor lighting must guarantee visual comfort through minimum requirements.



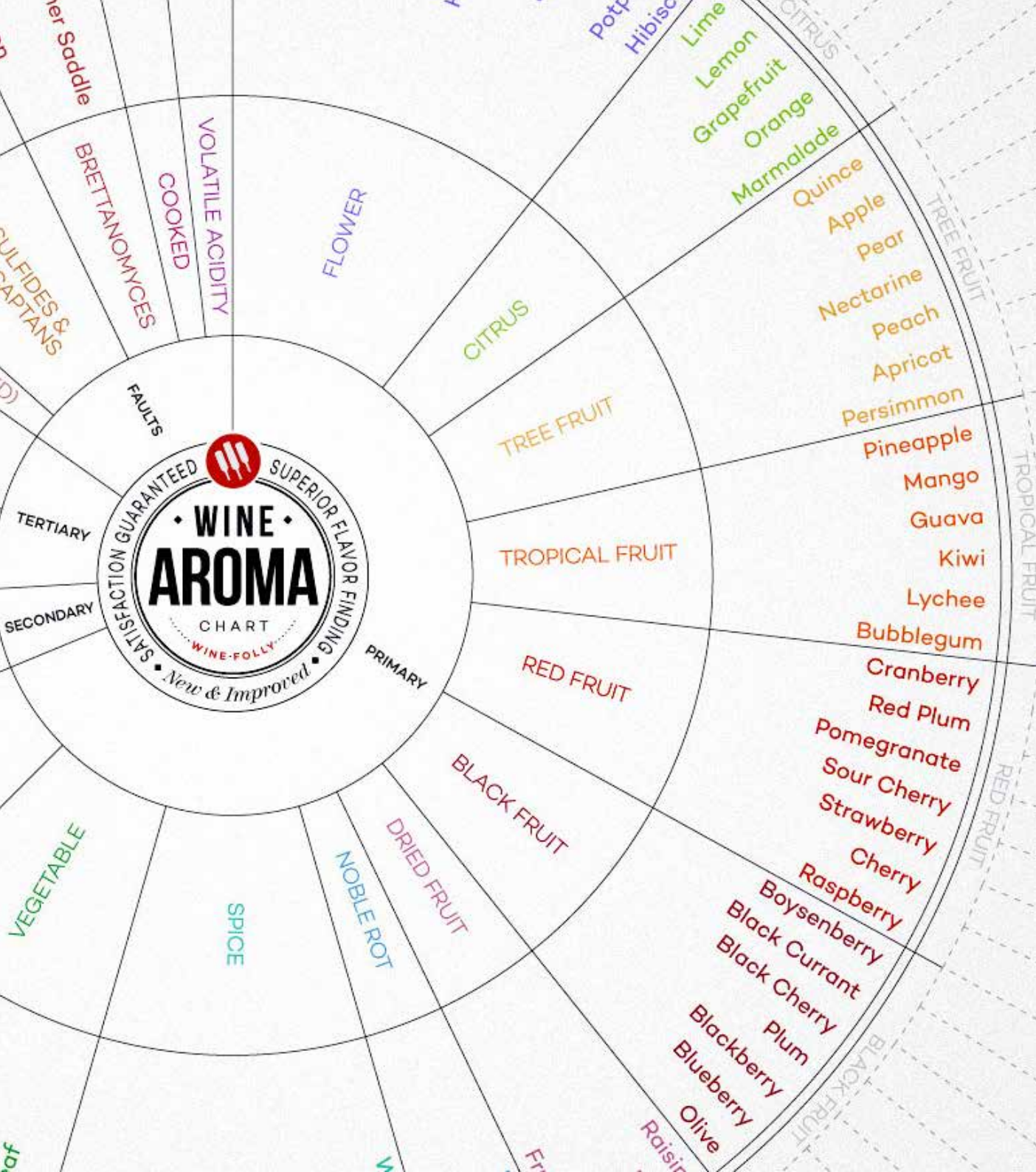
1968

But the standards are a blunt tool for creating appealing lighting environments.



2016





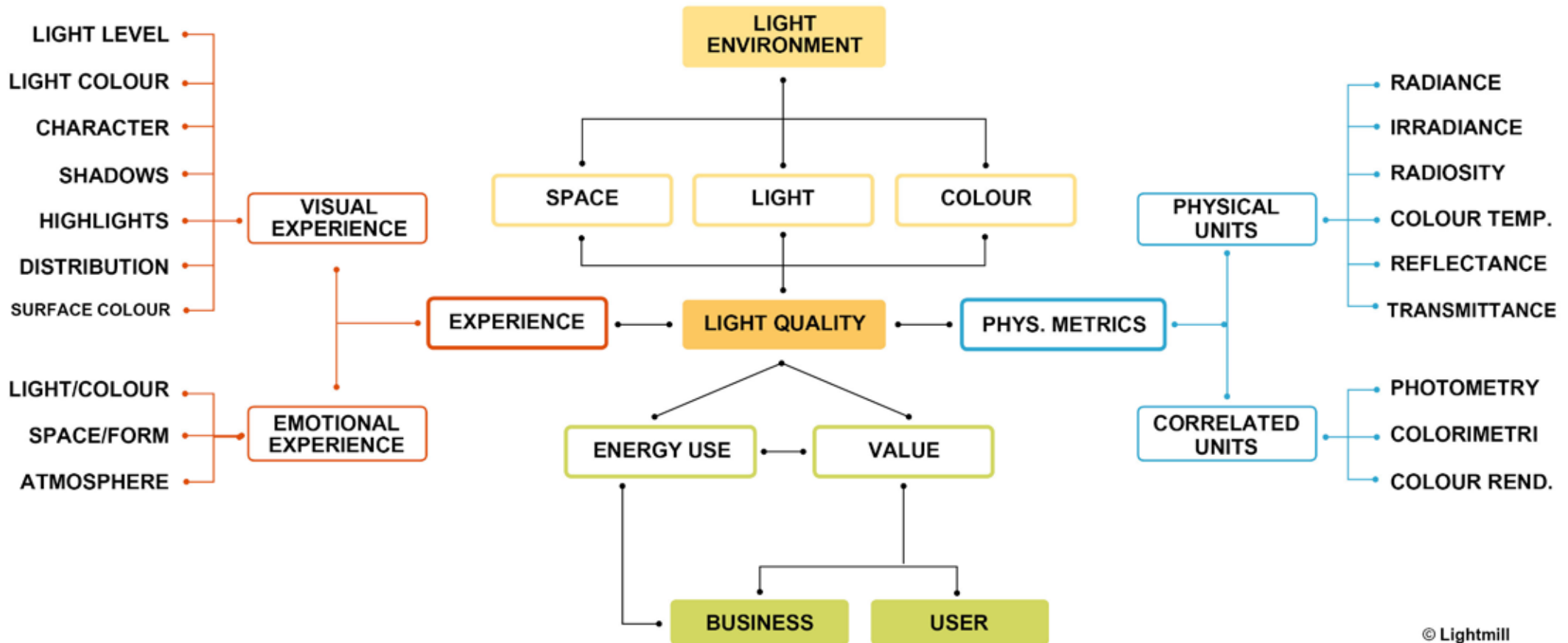
Perceptual Metrics for Lighting Design (2016-2023)

Konstfack - University of Arts, Crafts and Design

RISE - Research Institutes of Sweden

HKR - Kristianstad University

The Swedish Lighting Industry



© Lightmill

Study on perceived light character and light colour



Sensory analysis

Trained panel

Descriptive words

Perceived difference between
distinct and diffused light
(significant results)



The influence of light colour on
the experience of light character
(not tangible)



Study in an office environment

Different light distribution

Different light level and
electric power

Descriptive concepts + atmosphere



Workplace lighting conventions?

Up light not appreciated



Typology for colour schemes
(acromatic colours)
Reflection/contrast

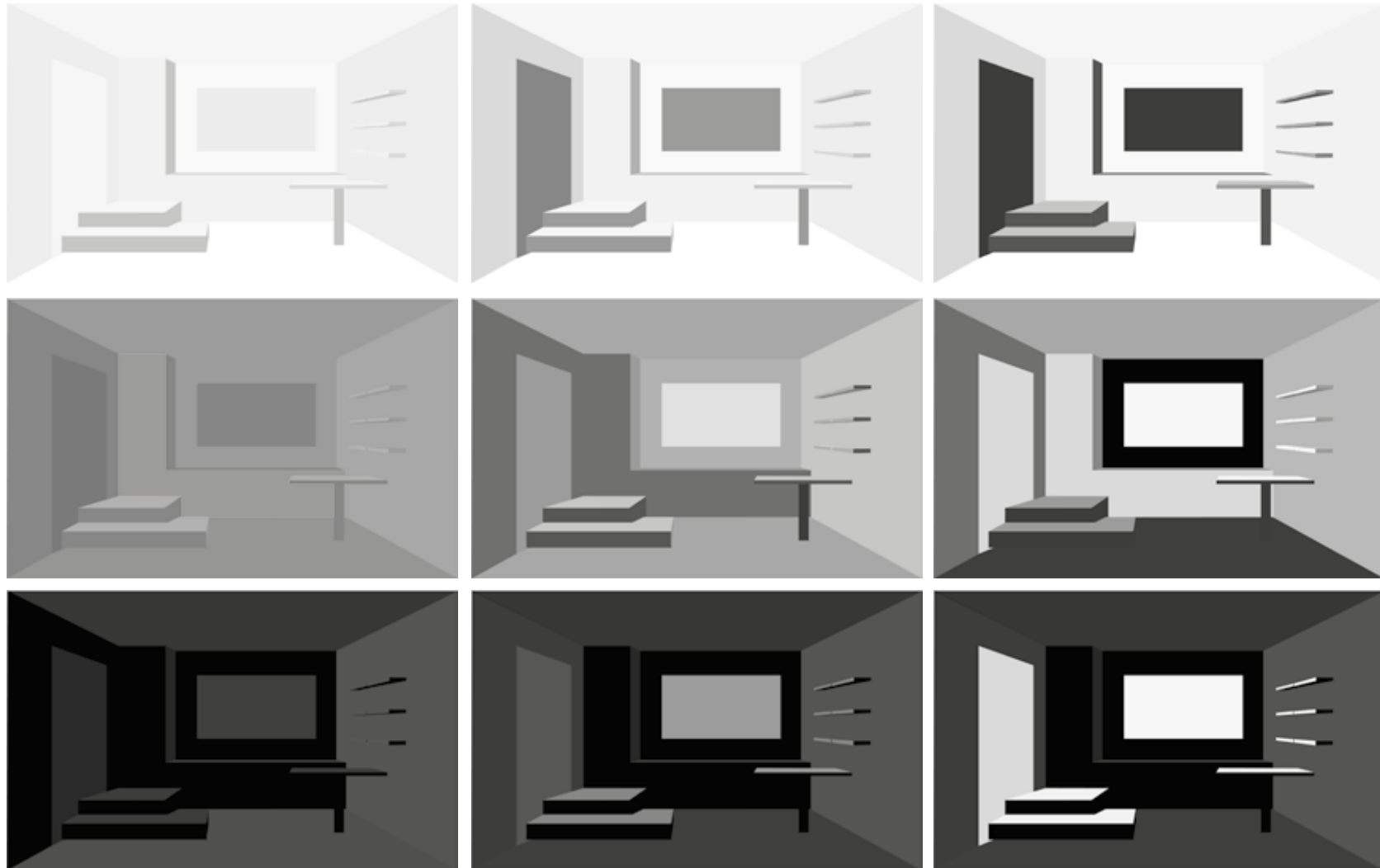
High

Reflectance

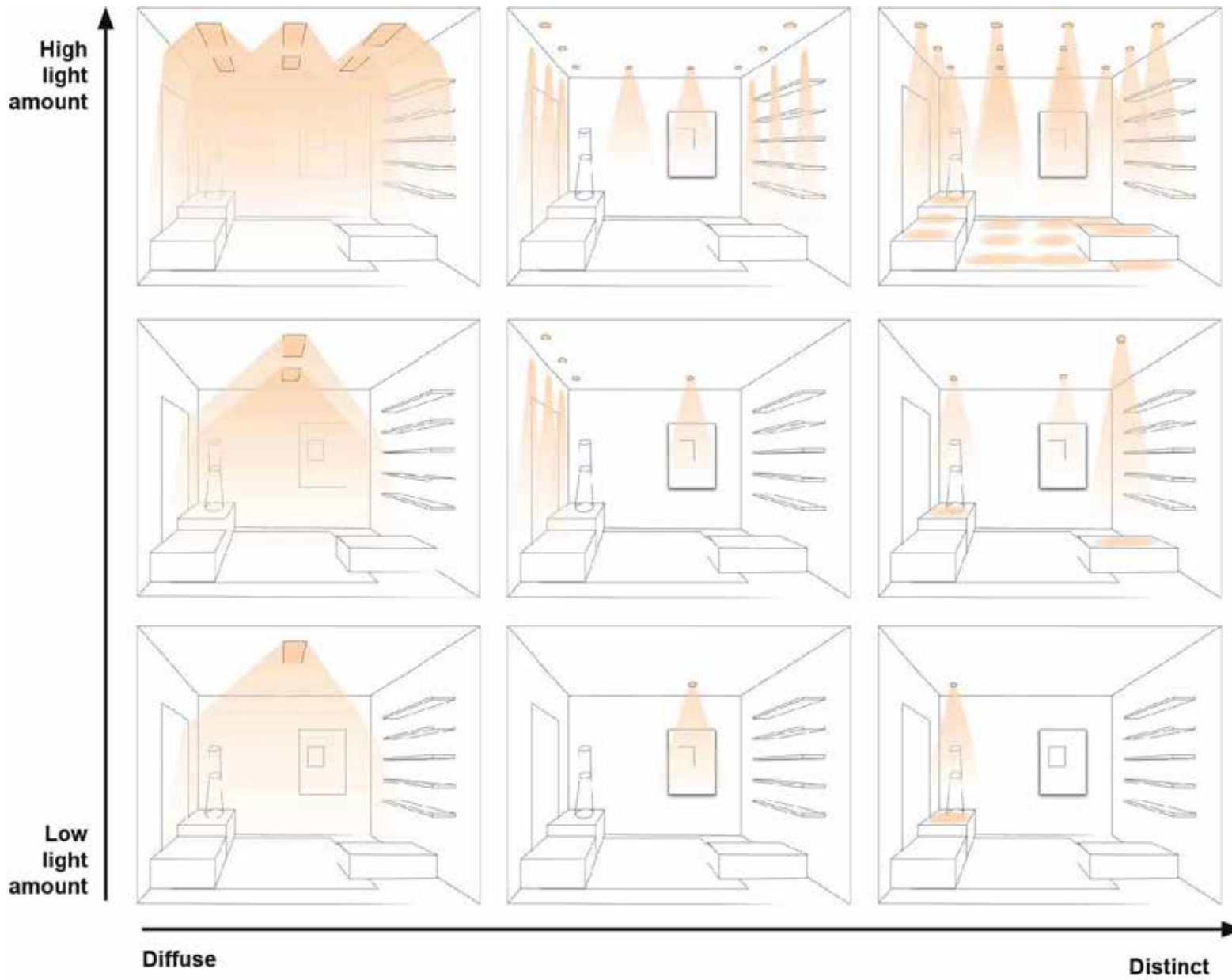
Low

Contrast

High



Typology for lighting principles



The room as a whole

- Uniform**
- Has depth**
- Formless**
- Incoherent**
- Varied**
- Flat**
- Spacious**
- Harmonious**
- Distinct**
- Monotonous**

Experience of the light

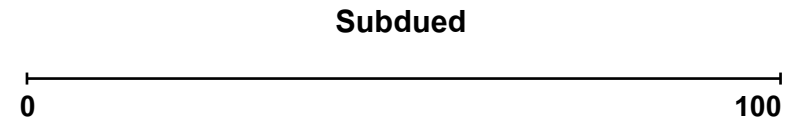
- Soft**
- Flat**
- Clear**
- Sharp**
- Dim**
- Luminous**
- Sparkling**
- Distinct**
- Monotonous**
- Mild**
- Varied**
- Intense**
- Even**
- Piercing**
- Diffuse**
- Decriptive**
- Crisp**

Experience of the shadows







- Clear**
- Light**
- Faint**
- Distinct**
- Soft**
- Decriptive**
- Hard**
- Diffuse**
- Dark**
- Blurred**

Experienced light level
(How do you experience the light level in the room? (Low/High))

Appreciation
(To what extent do you experience the room as appealing?)





Färgsättningen Ljuset	Horisontellt, jämnt ljus (Taklameller döljer ljuskällor) Låg kontrast (skuggor&högdagrar)	Vertikalt, jämnt ljus (Indirekt ljus) Låg kontrast (skuggor&högdagrar)	Horisontellt, jämnt ljus Låg kontrast (skuggor&högdagrar)	Vertikalt/horisontellt, varierat ljus (Riktat ljus, accentuerande ljussättning) Medelhög kontrast (skuggor&högdagrar)	Vertikalt/horisontellt, varierat ljus (Riktat ljus, slumpmässig ljussättning) Medelhög kontrast (skuggor&högdagrar)
Vit väggfärg och inredning Hög reflektans Låg kontrast	Modell G 	Modell D 	Modell P 	Modell M 	Modell R 
Gråskala väggfärg och inredning Medel reflektans Medel kontrast (Modell T är helt enfärgad=låg kontrast)	Modell T 	Modell H 	Modell N 	Modell B 	Modell V 
S/V+Gråskala väggfärg och inredning Medel reflektans Hög kontrast			Modell L 	Modell S 	
Svart väggfärg och inredning Låg reflektans Låg kontrast	Modell F 			Modell C 	

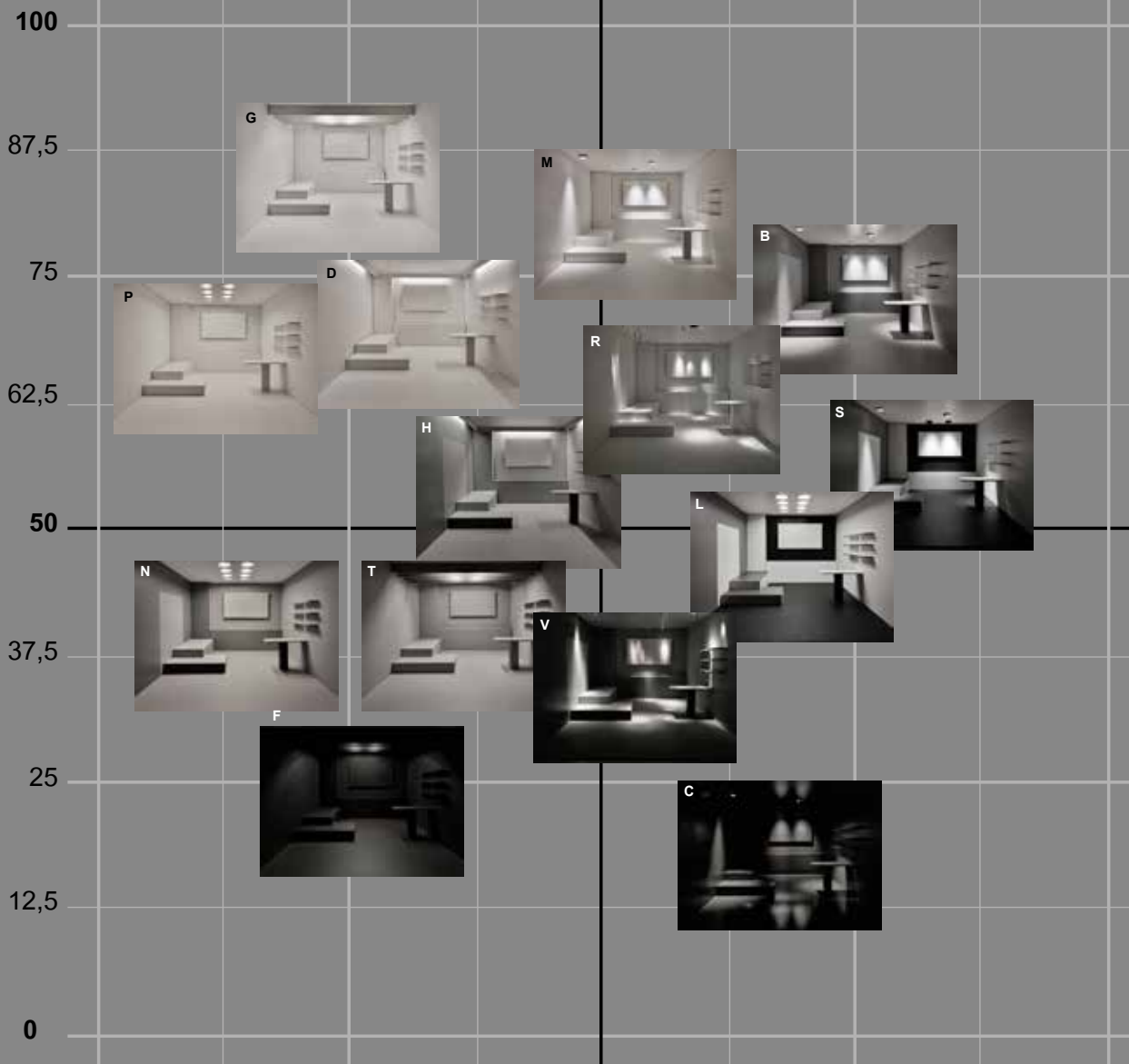
Perceived contrast

High

0 12,5 25 37,5 50 62,5 75 87,5 100

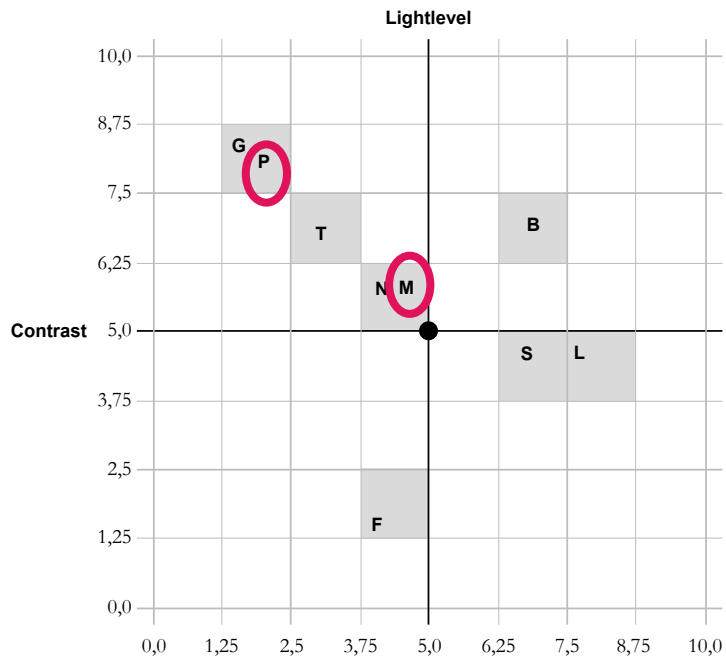
Perceived
light level and
contrast

Perceived light level



Low

High



Model P



Model M



Rummet

Coherent
Distinct
Spacious
Monotonous
Flat
Formless

Coherent
Distinct
Spacious
Has depth
Harmonious
Varied

The light

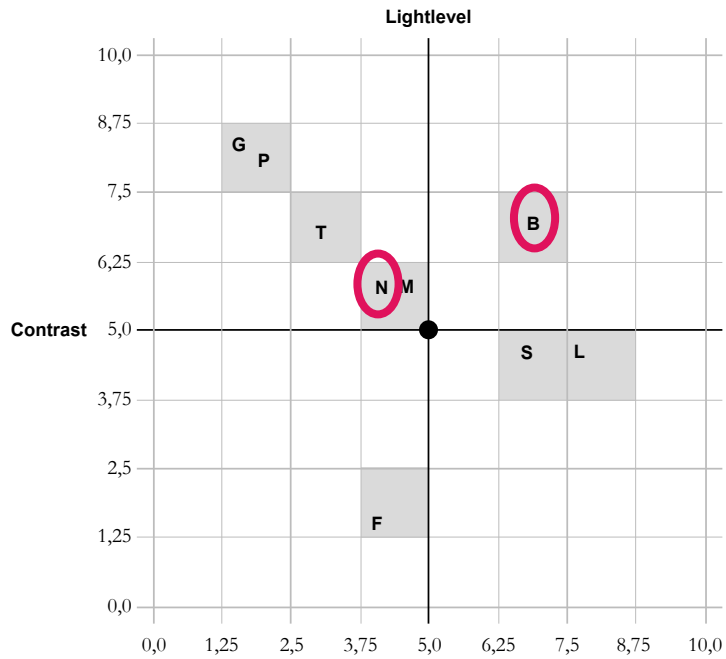
Monotonous
Homogenous
Even
Flat
Intense
Sharp

Varied
Soft
Descriptive
Distinct

The shadows

Faint
Blurred
Diffuse
Soft

Accentuating
Descriptive
Clear
Distinct
Soft



Percieved light level:

Model N: **6,1/10**

Model B: **6,8/10**

Model N



Model B



The room

Distinct
Has depth
Varied
Harmonious
Coherent

Distinct
Has depth
Varied
Incoherent

The light

Even
Monotonous
Homogenous
Flat
Soft

Even
Monotonous
Homogenous
Flat
Intense
Hard
Piercing

The shadows

Diffue
Blurred
Faint
Soft

Diffue
Blurred
Faint
Soft

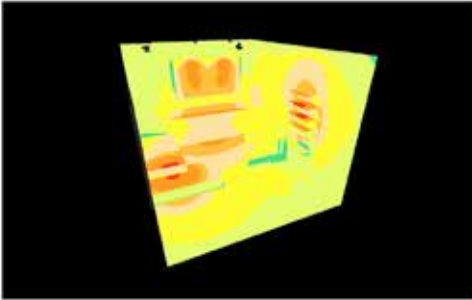
Modell M



Upplevd ljusnivå: 5,5/9
Tilltalande: 6,5/9

Upplevelse av rummet
Harmoniskt
Har rymd
Tydligt

Modell M transfererad till fullskala 14.29 m²



Armaturer:
Molto Luca, 15°, 20°, 35° 13W 3000K

Summa armaturer:
6490lm, 66W, 98.3 lm/W

Reflektionsfaktor:
Tak 74.5%. Väggar 73.3%. Golv 74.5%.

Belysningsstyrka, höjd 80 cm:
Medel: 324lx, Min: 104lx Max: 1866lx

Förbrukning: 170 kWh/a
LENI: 12 kWh/a/m²

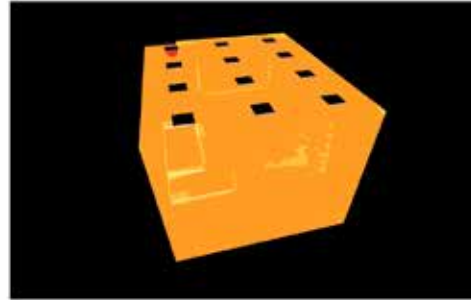
Modell P



Upplevd ljusnivå: 7,5/9
Tilltalande: 3,5/9

Upplevelse av rummet
Enhetligt
Har rymd

Modell P transfererad till fullskala 14.29 m²



Armaturer:
Elektroskandia OPAL MINI 3000K 12W

Summa armaturer:
11040lm, 144W, 76.7 lm/W

Reflektionsfaktor:
74.5%. Väggar 73.3%. Golv 74.5%.

Belysningsstyrka, höjd 80 cm:
Medel: 482lx, Min: 222lx Max: 566lx

Förbrukning: 360 kWh/a
LENI: 25 kWh/a/m²

Example:

2 white models with different lighting

Model M:

Perceived as appealing

Harmonious, Has space, Clear

Energy use: **170 kWh/a**

Model P:

Not perceived as appealing

Uniform, has space

Energy use: **360 kWh/a**

The reading room (Architect/Lighting designer: Jonas Kjellander)



The writing room



The reading room (Architect/Lighting designer: Jonas Kjellander)



The Room	The Light	The Shadows
Harmonious	Varied	Dark
Has depth	Soft	Descriptive
Varied	Descriptive	Soft
Spacious	Mild	Distinct
Distinct	Sprakling	Clear
Coherent	Distinct	
	Dim	

The writing room



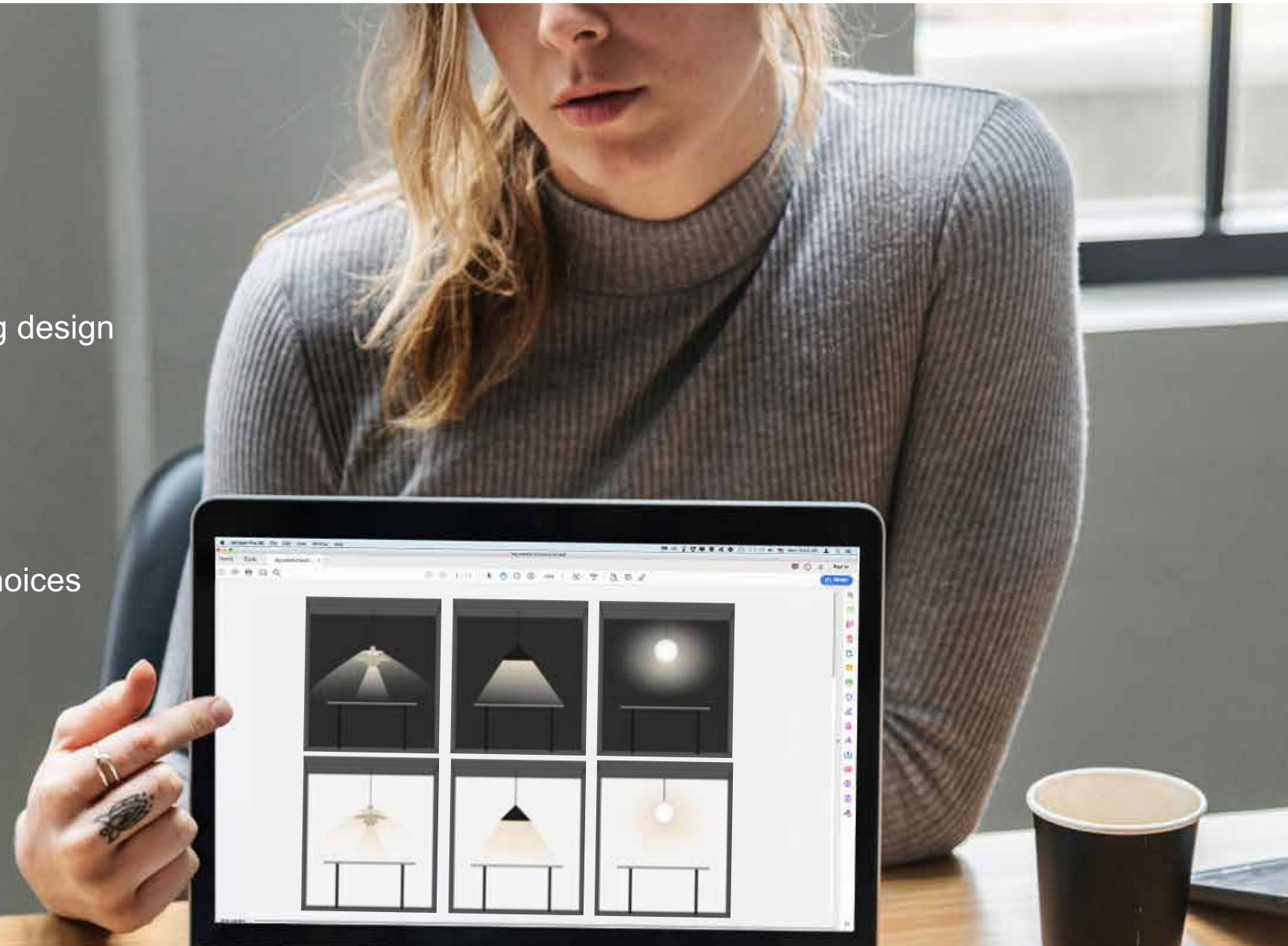
The Room	The Light	The Shadows
Formless	Monotonous	Diffuse
Monotonous	Even	Blurred
Flat	Flat	Soft
Coherent	Hard	Light
Distinct	Sharp	Faint
Spacious	Clear	

**Support for lighting designer / architect
in communication with client**

Guide for principals of lighting design
and colour schemes

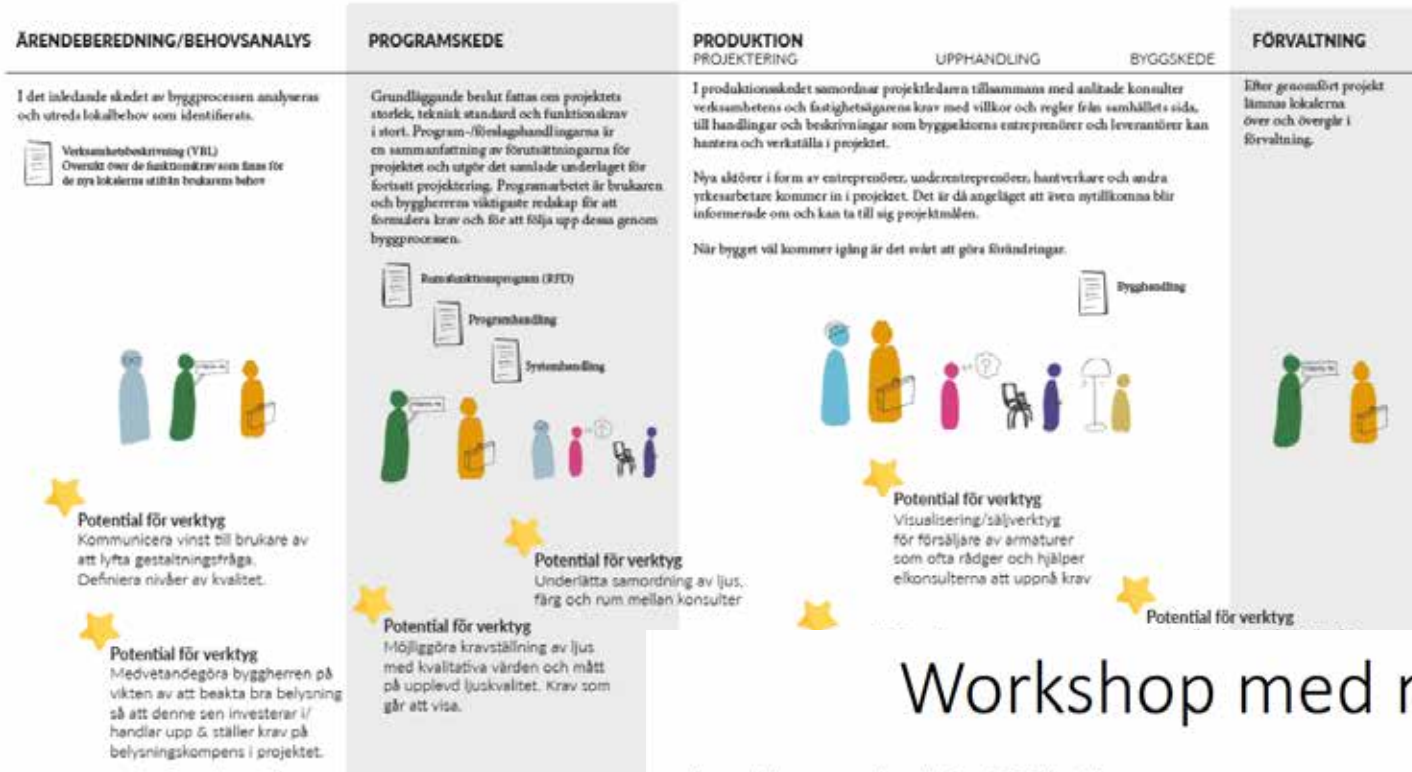
Effects on spatial experience
and energy use

Support making conscious choices



Byggprocessen med identifierade "potentialer för verktyg"

Till del baserat på Carolina Hillers sammanfattande analys av fastighetsägarens perspektiv



UX designers/developers:

Analysis

Target group and need

Workshops with reference group:
Scenarios/Personas

+ in depth interviews with lighting designers

Workshop med referensgrupp

<https://app.mural.co/t/rise9766/m/rise9766/1619027167398/d967e6f7d7d0aa3a1dc4767b22ba6fc5f4a717dc?sender=ue26a1871d148c8b6b08e1677>

GRUPP 1

1 Rollfigur
Sätt samman en kort beskrivning av en rollfigur som representerar en aktör i byggprocessen. Målet är att du ska kunna leva av din i sin rollfigur perspektiv och att du kan utgå från en rollfigur eller underlättas i en rollfigur.

2 Journey Map
1. **OMGIVNING**
Bakgrund om rollfiguren och byggprocessen med en kort och tydlig beskrivning av rollfigurens bakgrund.
2. **BEREDNING**
Vad gör du rollfigur? Beskriv dina första processer eller åtgärder.
3. **KOMMUNIKATION & VERKTYG**
Hur ser kommunikationen ut med andra aktörer? Vilka verktyg använder du?
4. **TANKAR OCH KÄNLOR**
Hur ser du på rollfiguren?
5. **FRUSTRERINGSPUNKTER / PAIN POINTS**
Identificera trender och utmaningar i rollfiguren.
6. **POTENTIAL FÖR VERKTYG**
Vad är de bästa verktygen för att digitala verktyg skulle kunna underlätta för en rollfigur?



2016-2023
7 workshops
7 reference group meetings



Thank you / Tack