

INQUINAMENTO LUMINOSO, ILLUMINAZIONE ARTIFICIALE E LE PATOLOGIE CRONICHE

Scuola di Specializzazione in Medicina dello Sport e dell'Esercizio Fisico
DIPARTIMENTO DI FISIOLOGIA E FARMACOLOGIA «VITTORIO ERSPAMER»



SAPIENZA
UNIVERSITÀ DI ROMA



SISTEMA SANITARIO REGIONALE

ASL
VITERBO



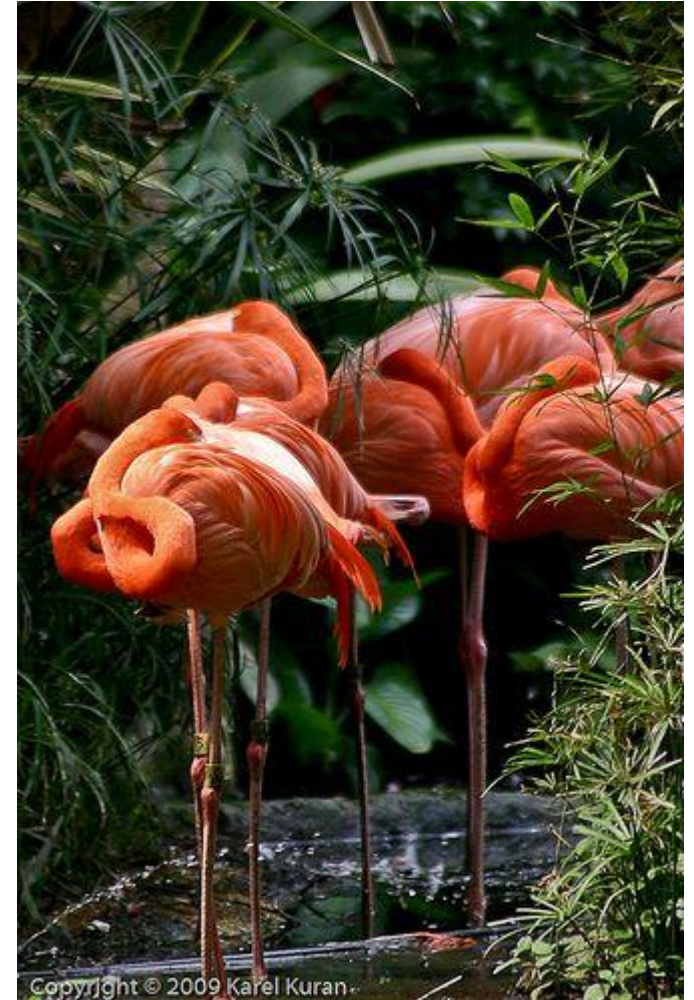
Assirem Ets
Associazione Italiana
per la Ricerca e l'Educazione
nella Medicina del Sonno

Dott Rocco Santarone
Medicina generale

Aboca, 2023

“...dalla loro osservazione, pressoché **tutti gli animali prendono parte al sonno**, sia che essi siano del mondo marino, volatili o terrestri”

De Somno et Vigilia, Aristotele (384-322 a.C.)





Un bisogno primario



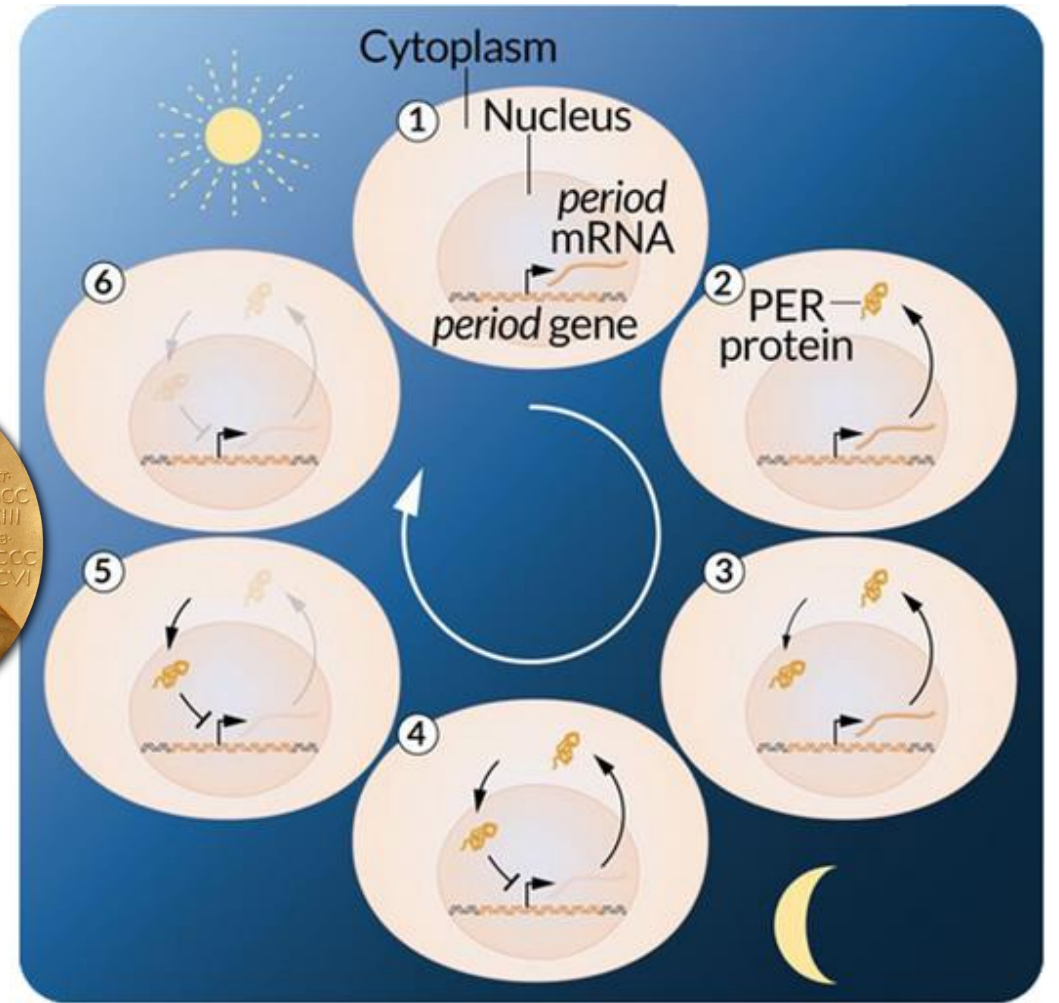
La piramide dei bisogni Maslow (1954)

COS'È IL SONNO?

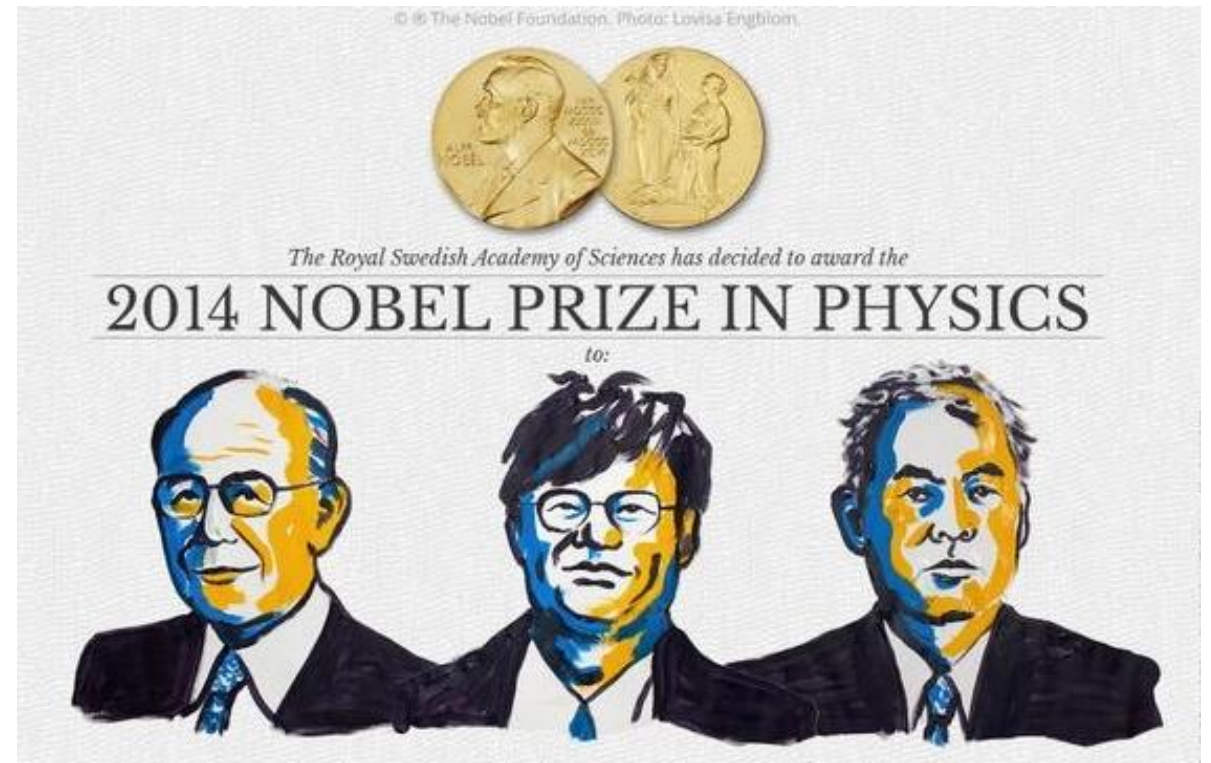


Is sleep essential? G Tononi, C Cireli - PLoS Biology 2008

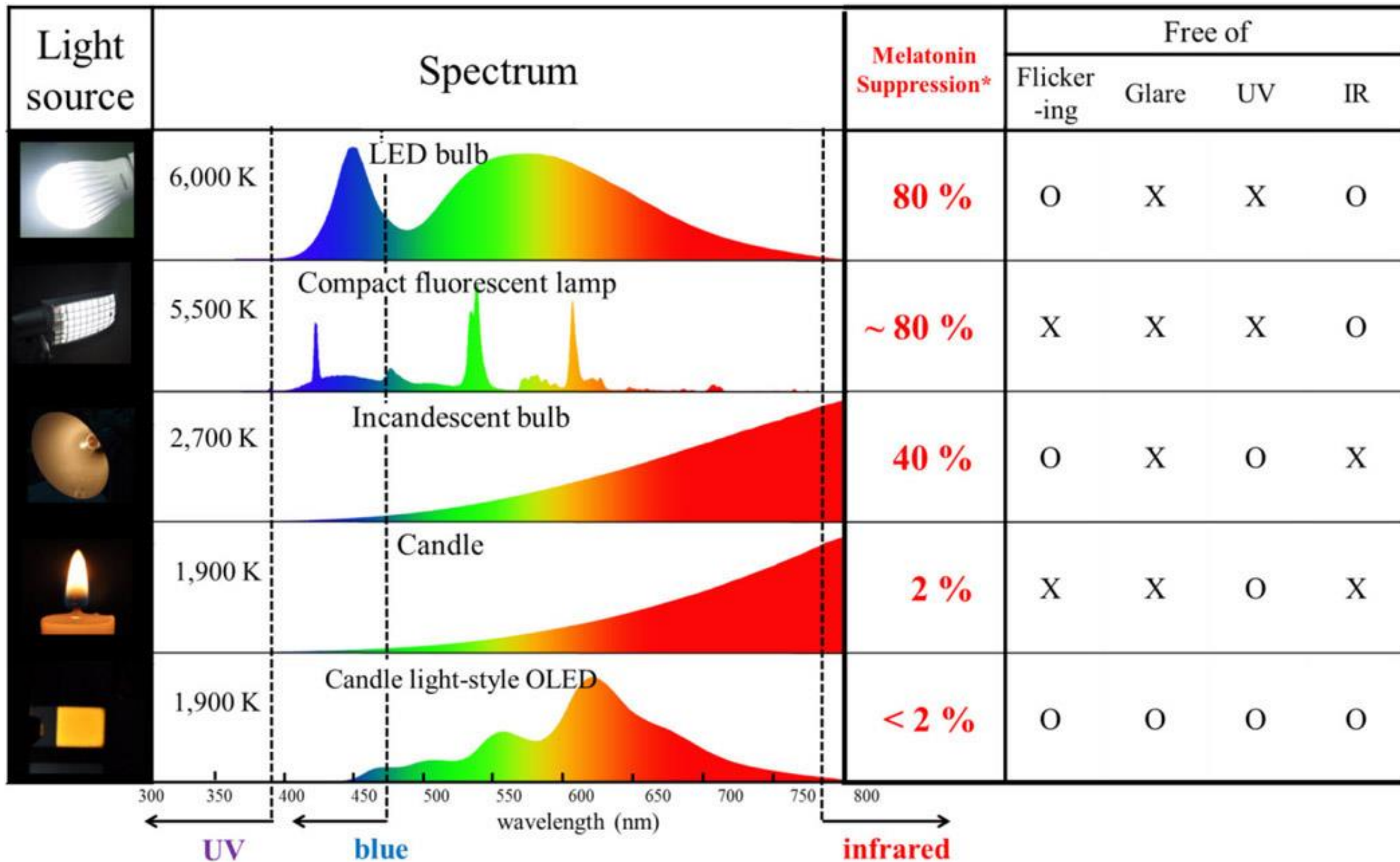
2017 NOBEL PRIZE IN PHYSIOLOGY OR MEDICINE



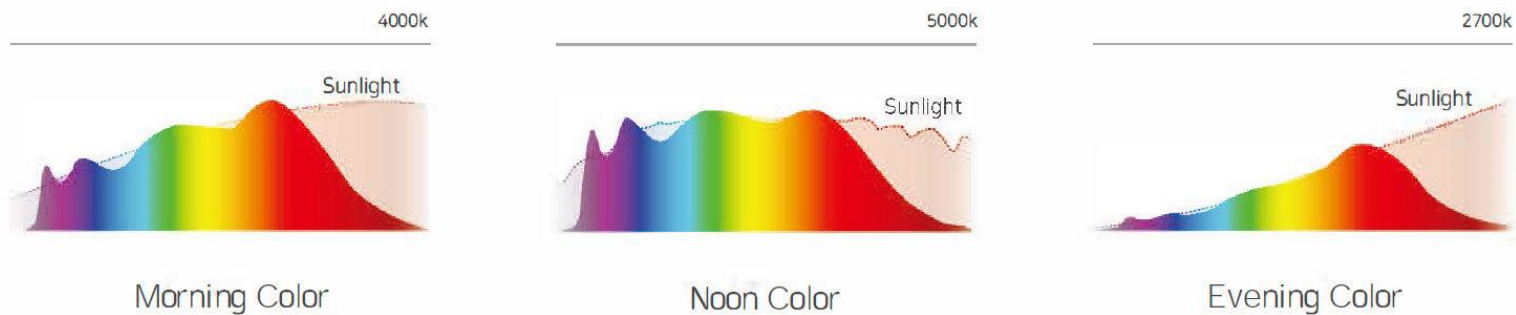
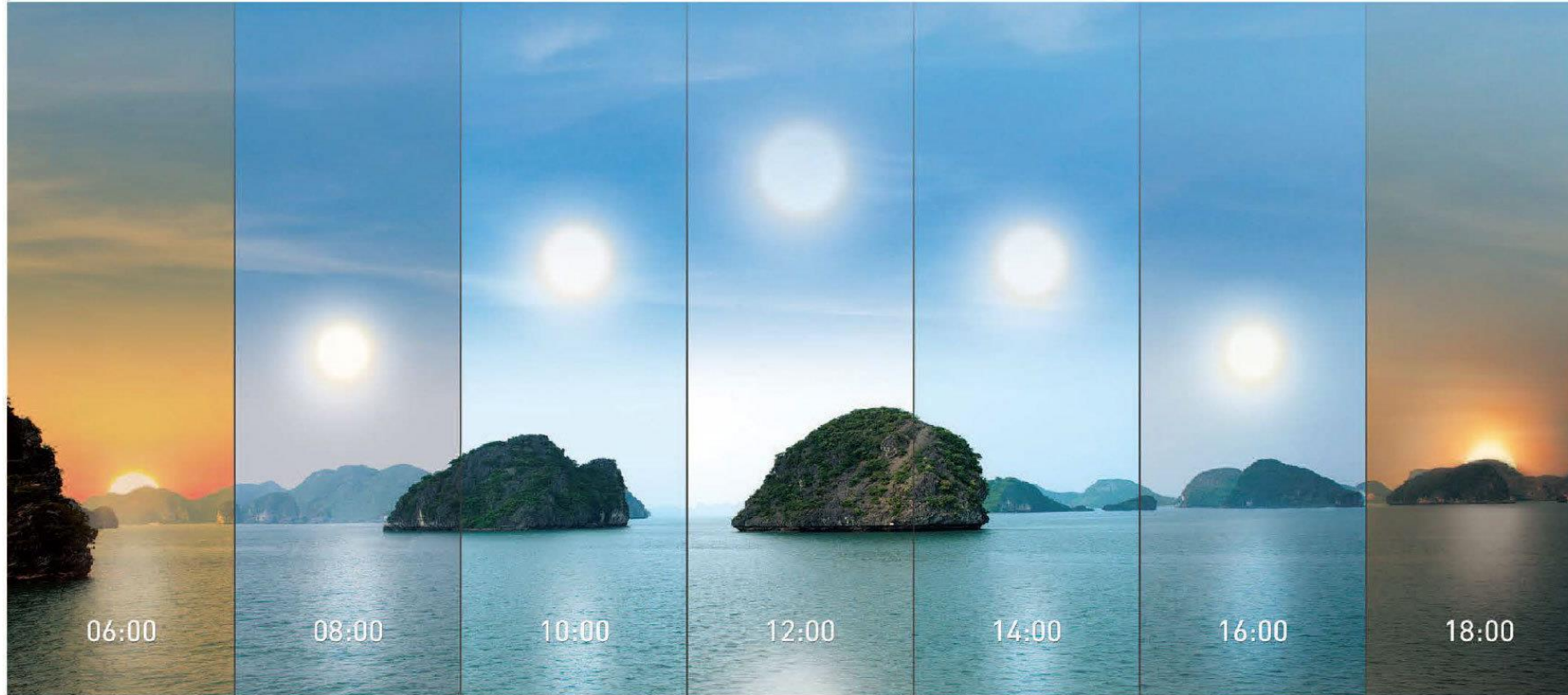
“...for their discoveries of **molecular mechanisms**
controlling the CIRCADIAN RHYTHM”

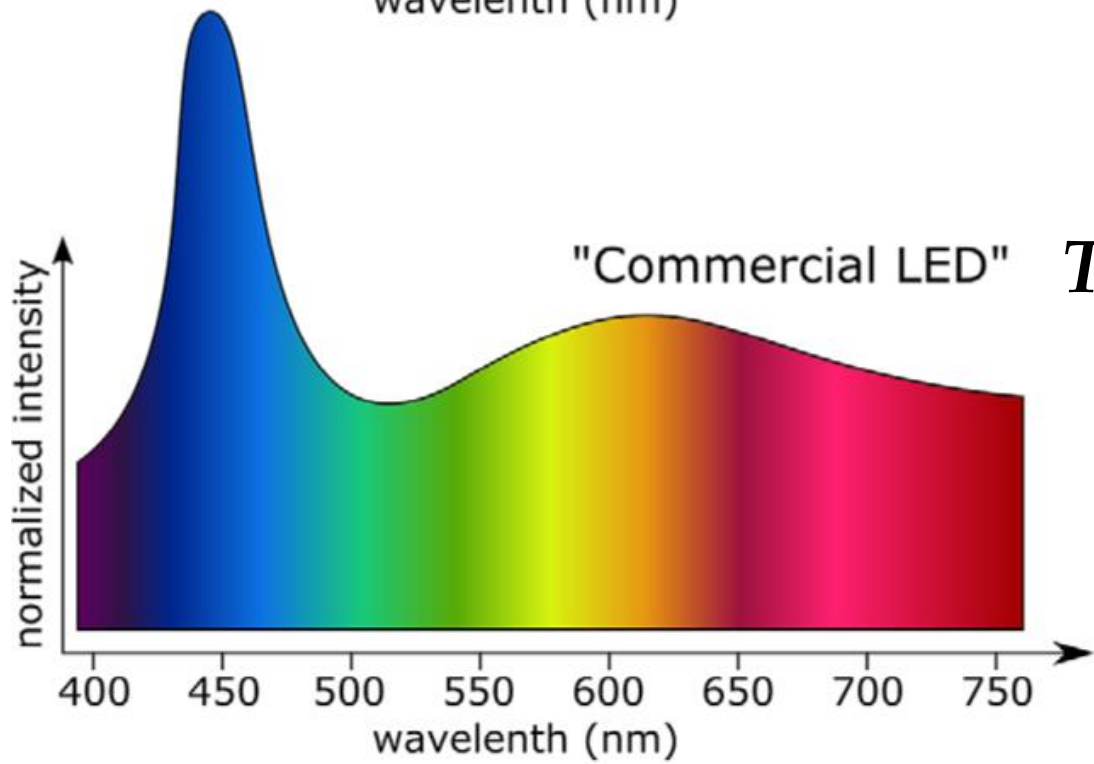
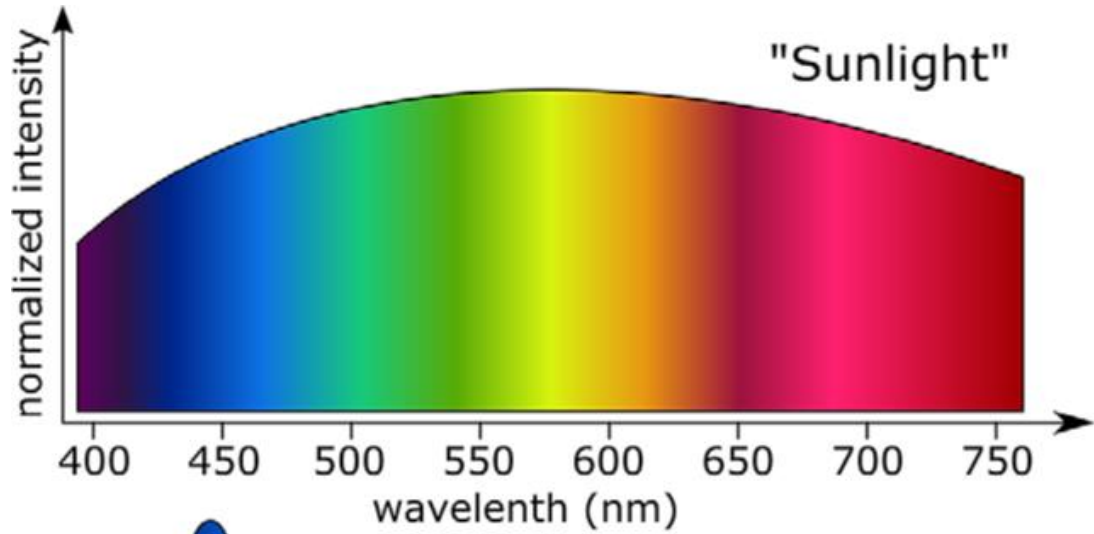


2014 PHYSICS “for the invention of efficient **BLUE LIGHT-emitting diodes** which has enabled bright and energy-saving **white light sources**”



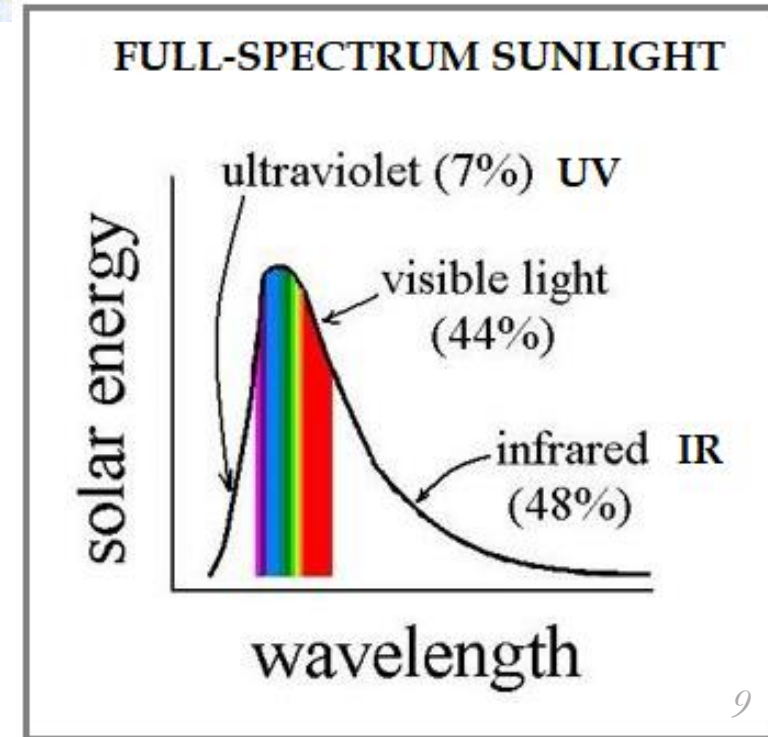
NATURAL SOURCE SUNLIGHT SPECTRUM... EVOLUTIONARY MISMATCH





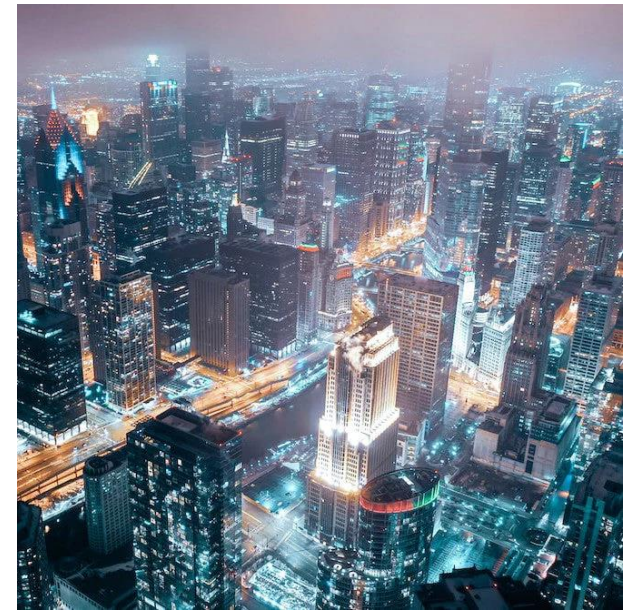
The dark side of artificial light

Biochem, 2020





ALAN ARTIFICIAL LIGHT AT NIGHT



"uso eccessivo della luce artificiale che altera i modelli naturali degli animali selvatici, contribuisce all'aumento delle emissioni di CO2, stravolge il sonno umano ed oscura la visibilità delle stelle"

68% of the world population projected to live in urban areas by 2050

16 May 2018

United Nations (UN)



NIGHT LIGHT POLLUTION



NASA Earth Observatory, 2016

DISPOSITIVI TECNOLOGICI ILLUMINAZIONE STRADALE



Computers



TVs



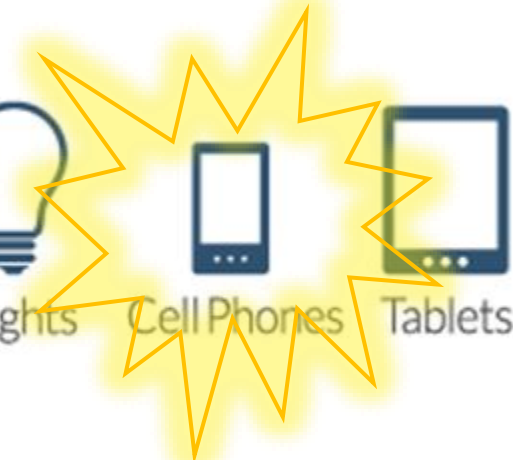
Lights



Cell Phones



Tablets



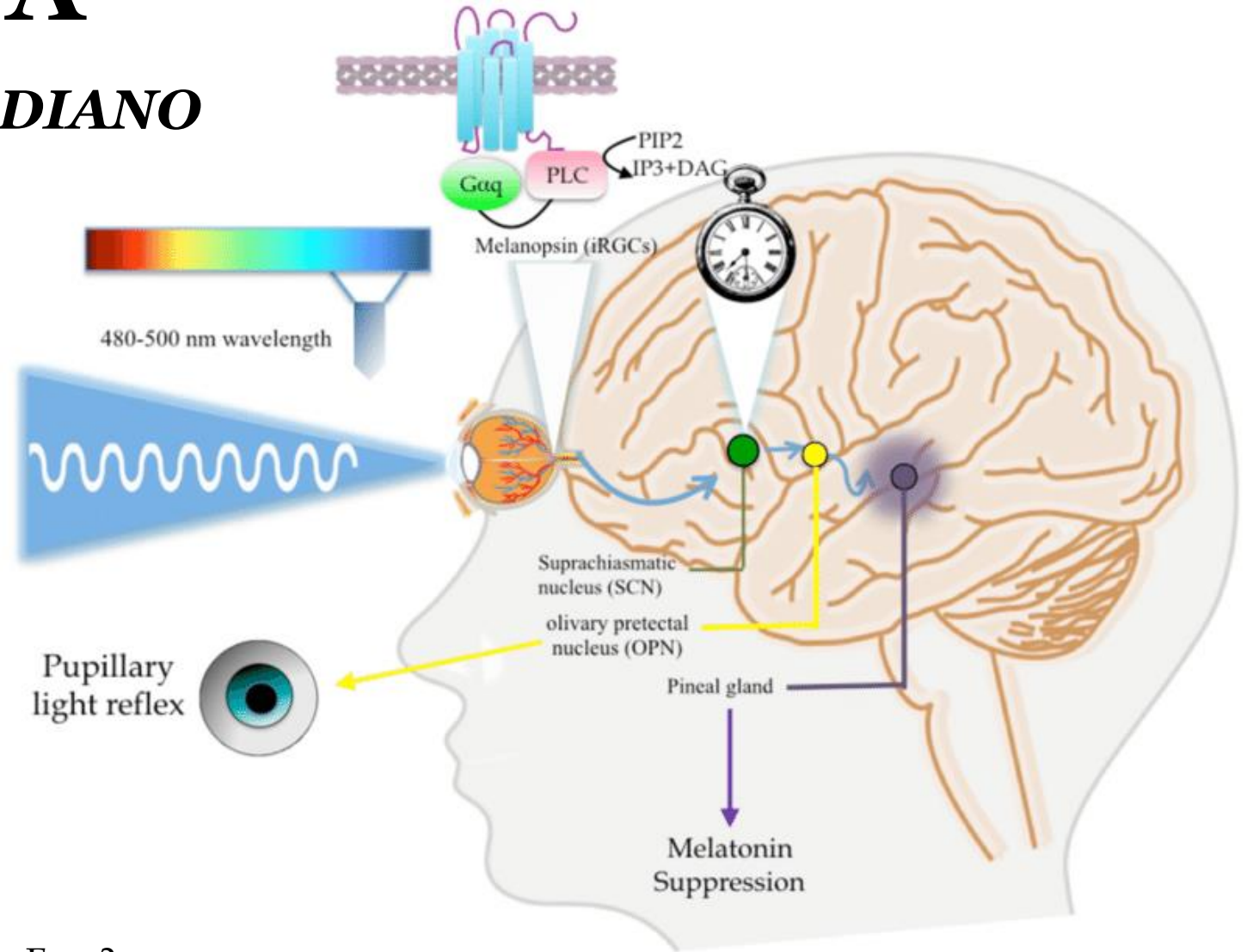
VS Lampade ai vapori di sodio ad alta pressione (2000-2500 K)

Lampade LED a 6000 K



MELANOPSINA

UN FOTORECETTORE CIRCADIANO



Melatonin and Melanopsin in the Eye: Friends or Foes?
Anales de la Real Academia Nacional de Farmacia, 2019

How exposure to **blue light** affects your brain and body

BY DISRUPTING MELATONIN, **SMARTPHONE LIGHT** RUINS SLEEP SCHEDULES. THIS LEADS TO ALL KINDS OF **HEALTH PROBLEMS**:

The disruption to your sleep schedule might leave you distracted and impair your **MEMORY** the next day.



A poor night's sleep caused by smartphone light can make it **HARDER TO LEARN**.



Over the long term, not getting enough sleep can lead to **NEUROTOXIN** buildup that makes it even harder for you to get good sleep.

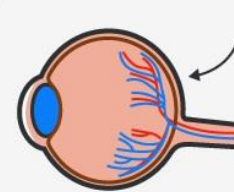


People whose melatonin levels are suppressed and whose body clocks are thrown off by light exposure are more prone to **DEPRESSION**.



By disrupting melatonin and sleep, smartphone light can also mess with the hormones that control hunger, potentially increasing **OBESITY RISK**.

There's some evidence that blue light could damage our vision by harming the **RETINA** over time – though more research is needed.



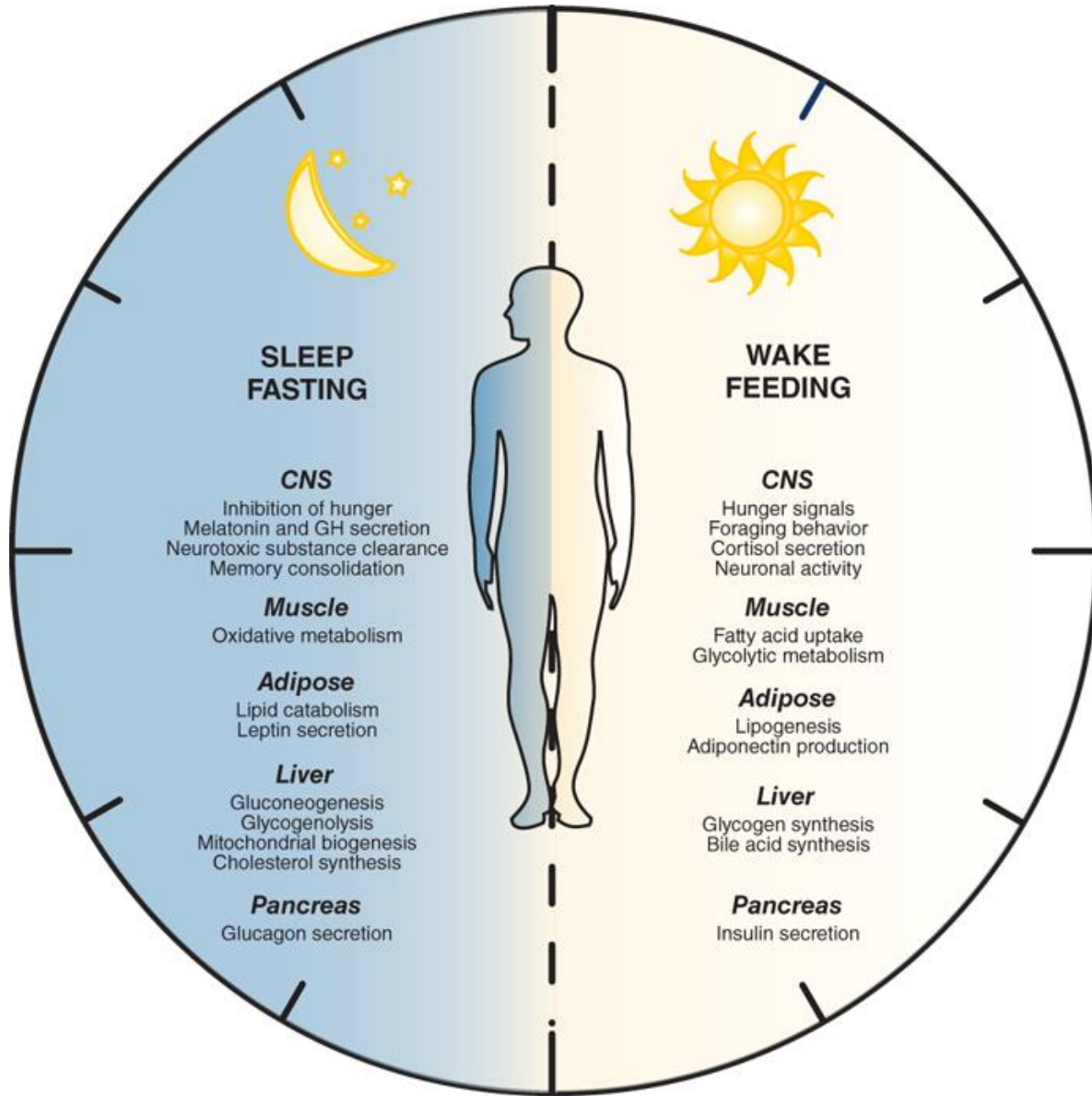
Researchers are investigating whether or not blue light could lead to **CATARACTS**.



There's a connection between light exposure at night and the disturbed sleep that come with it and an increased risk of breast and prostate **CANCERS**.



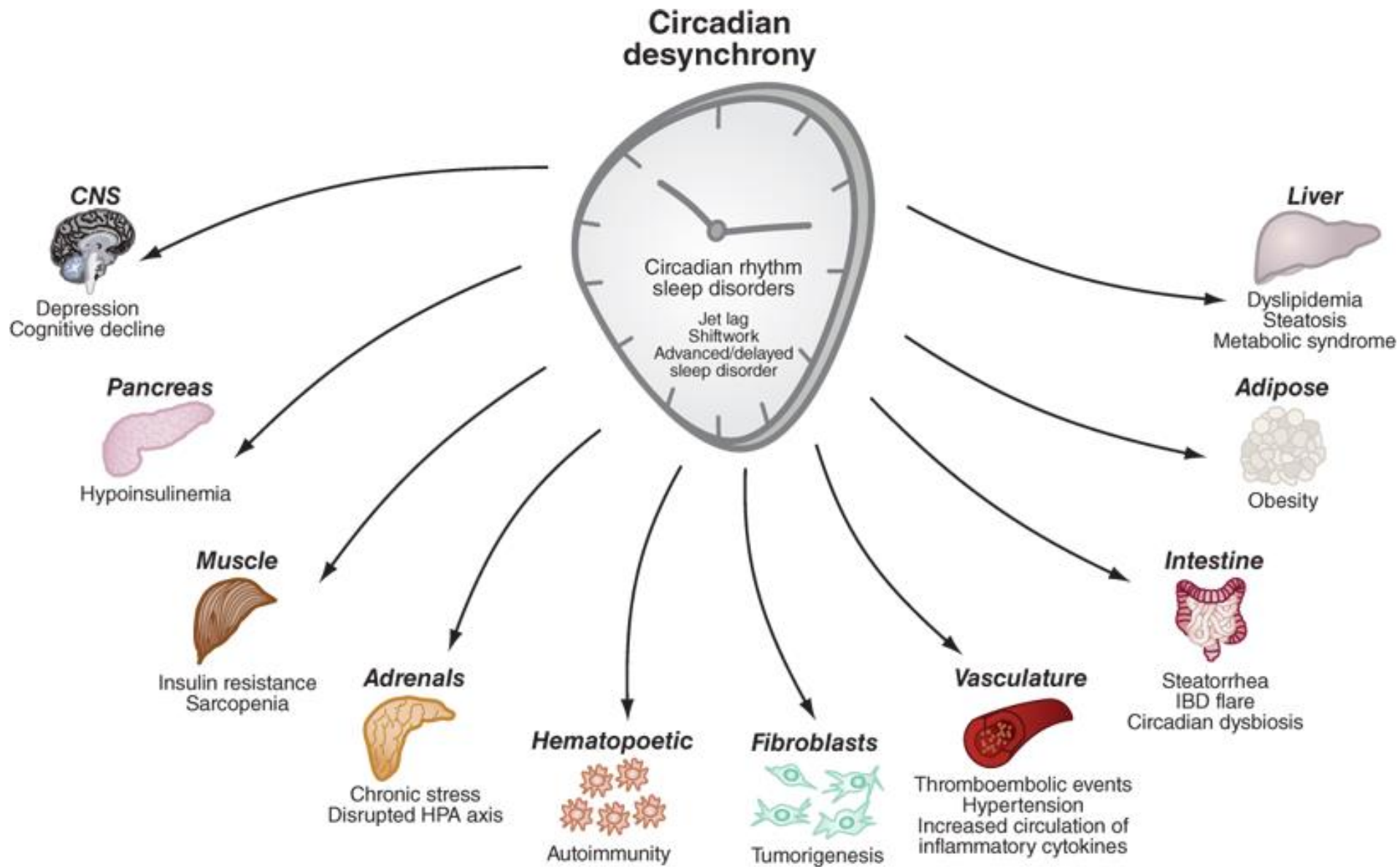
SOURCES: Nature Neuroscience; Harvard Health Publications; ACS, Sleep Med Rev, American Macular Degeneration Foundation; European Society of Cataract and Refractive Surgeons; JAMA Neurology



Salvador Dalí, *Orologio molle* - 1954

BLUE LIGHT AT NIGHT IS A CIRCADIAN DISRUPTOR!

Source: J.L. Jameson, A.S. Fauci, D.L. Kasper, S.L. Hauser, D.L. Longo, J. Loscalzo: Harrison's Principles of Internal Medicine, 20th Edition Copyright © McGraw-Hill Education. All rights reserved.



Source: J.L. Jameson, A.S. Fauci, D.L. Kasper, S.L. Hauser, D.L. Longo, J. Loscalzo: Harrison's Principles of Internal Medicine, 20th Edition
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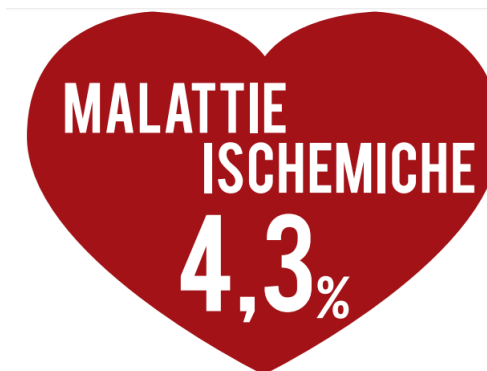
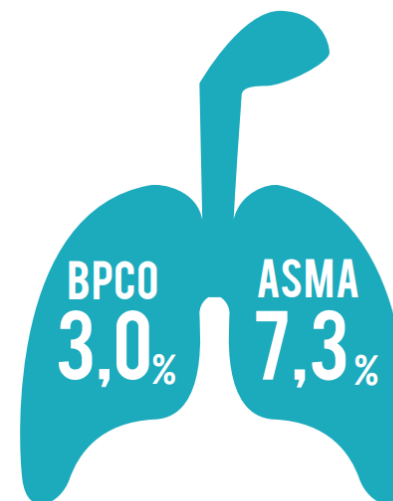
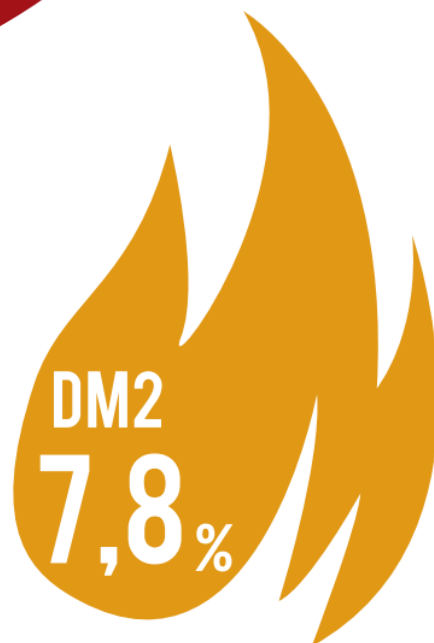
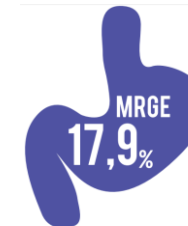
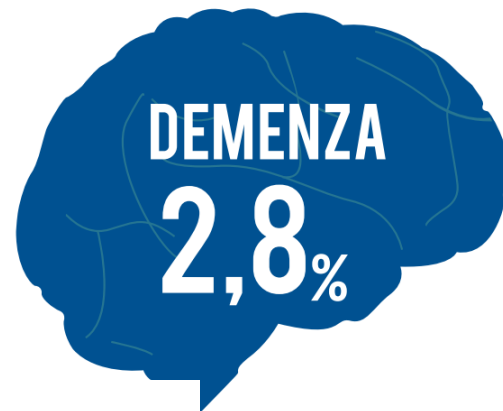
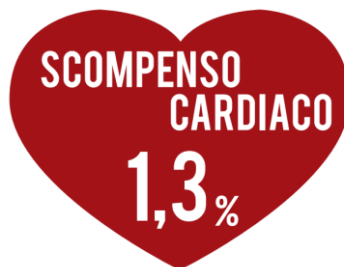
Prevalenza di malattia in Italia



Health Search

Istituto di Ricerca della Società Italiana di Medicina Generale (SIMG)

XII Report
2019



INSOMNIA

SLEEP DISORDER

Circadian Disruption

DIABETES MELLITUS Type 2

Insulin Resistance

METABOLIC SYNDROME

Arterial Hypertension

NAFLD/NASH

CARDIOVASCULAR

DISEASE (CVD)
Anxiety

DEPRESSION OSAS

Memory Loss **INFERTILITY**

ADHD Dysmenorrhea Premenstrual Syndrome

Sport Injury **BONE FRACTURE**

CANCER Risk

**NEURODEGENERATIVE
DISEASE**

Dementia

Alzheimer's disease

Parkinson's disease

INFECTIOUS DISEASE

Work Accident

CAR CRASH

Asthma IBS

AUTOIMMUNITY

GERD

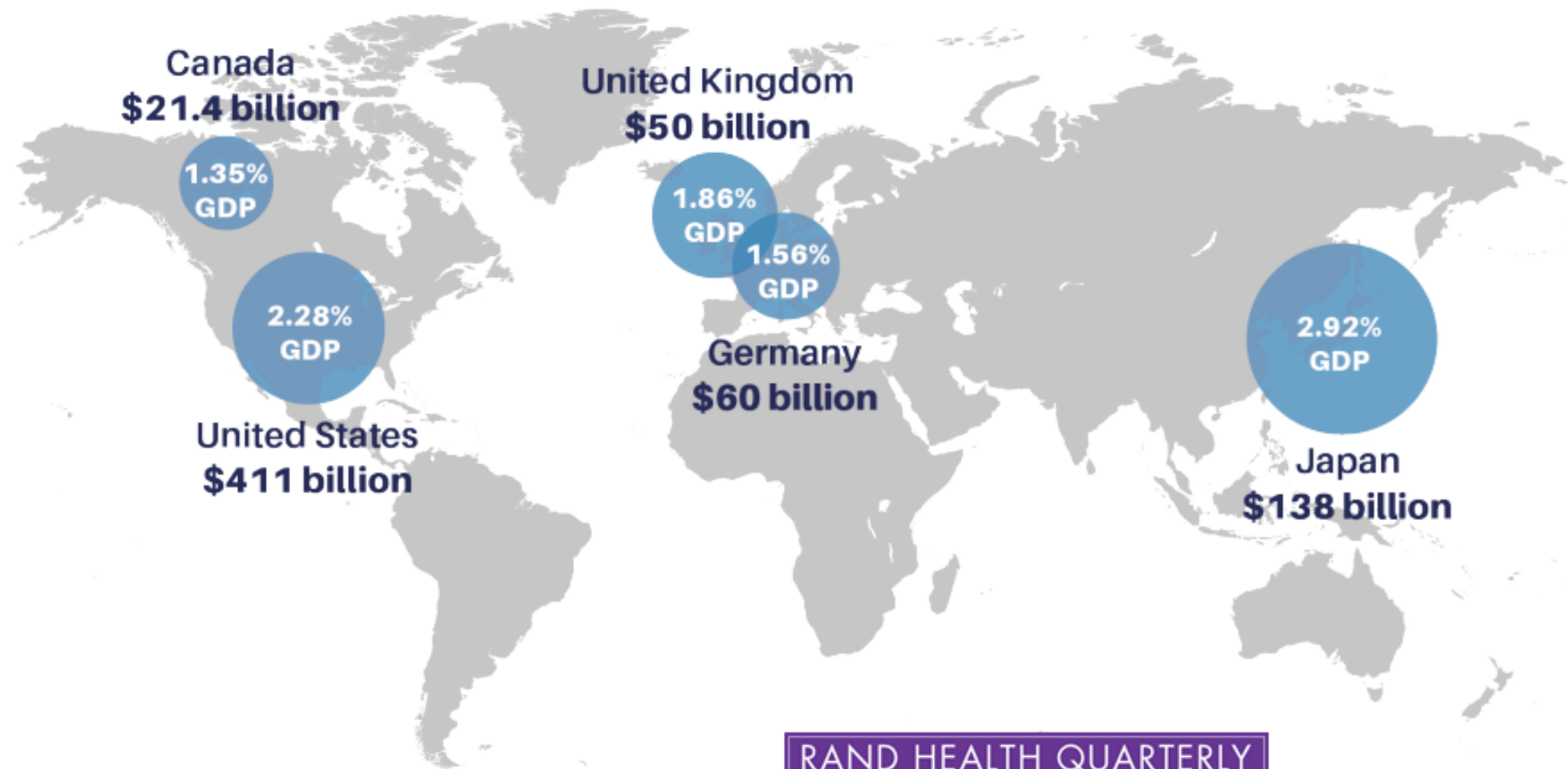
Flu

Chronic Stress

Asthenia

Why Sleep Matters?

Why Sleep Matters?
The Economic Costs of Insufficient Sleep
Rand Health Q, 2017



Patrizia Caraveo

Saving the Starry Night

Light Pollution and Its Effects on Science, Culture and Nature



Urban Lighting for People

EVIDENCE-BASED LIGHTING DESIGN FOR THE BUILT ENVIRONMENT



Protege Noctem

Elogio del buio

Alla riscoperta della bellezza della notte in difesa dei ritmi naturali di tutti gli esseri viventi



Light Zone City

Light Planning in the Urban Context

Christa van Santen



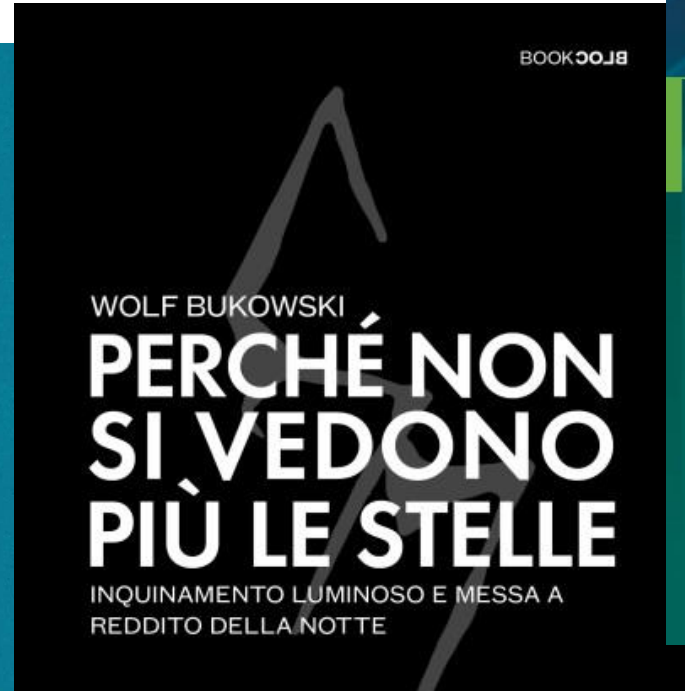
Johan Eklöf

BOOKOOJB

WOLF BUKOWSKI

PERCHÉ NON SI VEDONO PIÙ LE STELLE

INQUINAMENTO LUMINOSO E MESSA A REDDITO DELLA NOTTE



Nona Schulte-Römer
Etta Dannemann
Josiane Meier

light pollution a global discussion



Maurizio Rossi

Circadian Lighting Design in the LED Era

Fondazione Politecnica di Milano



Se il sonno non fosse essenziale, ci aspetteremmo di trovare:

- Specie animali che non dormano affatto
- Animali che non necessitano di dormire al fine di riposare dopo aver svolto azioni di veglia e attività più lunghe del normale
- Animali che non subiscano serie conseguenze sulla propria condizione fisica come risultato della deprivazione di sonno

SLEEP PATTERNS CHANGINGS DURING AGES

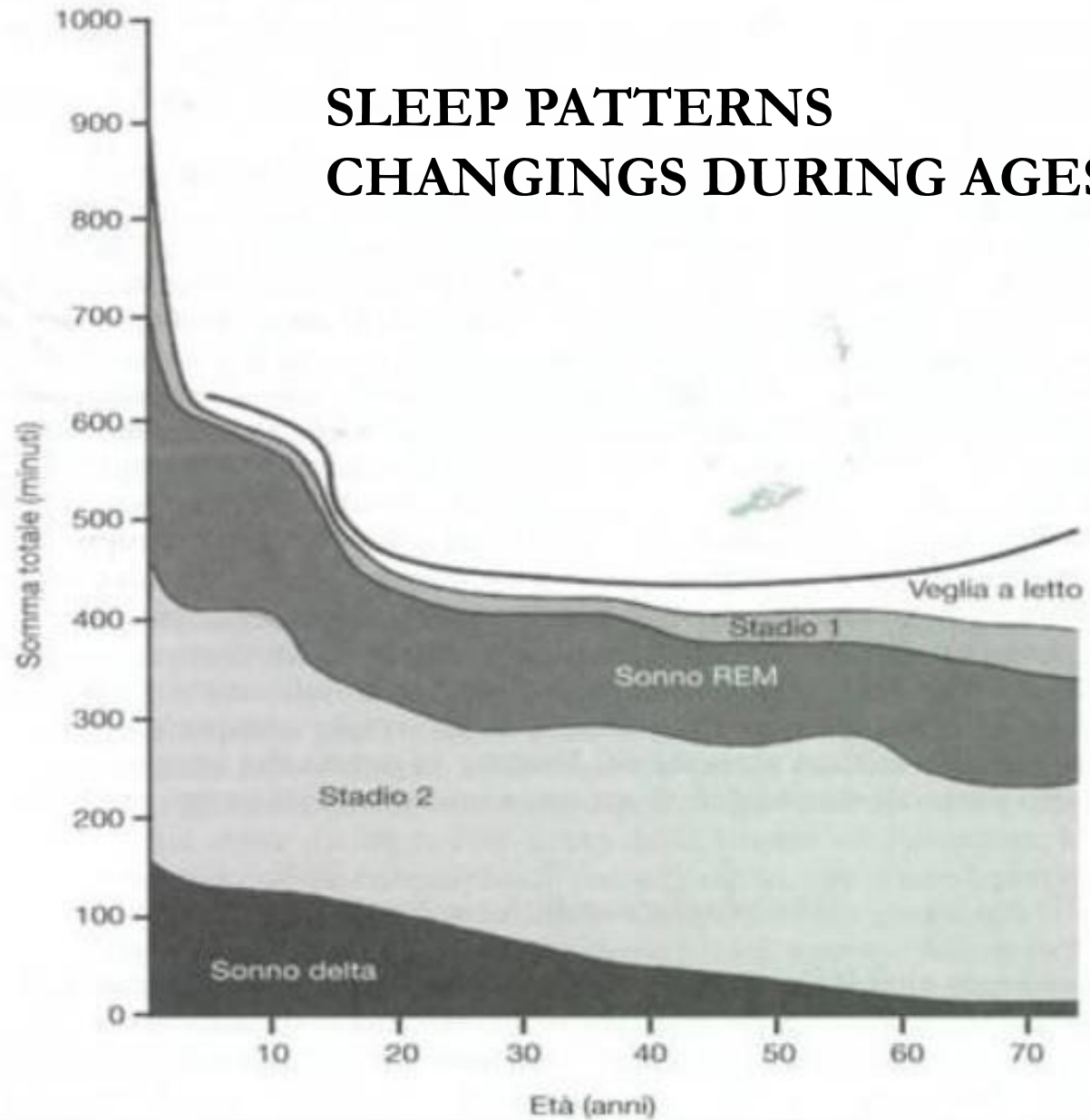


Figura 1.2 Modificazioni dei pattern del sonno con l'avanzare dell'età (da: Hauri, P.J. (1982). *The sleep disorders*. Kalamazoo, MI: Upjohn, riproduzione autorizzata).



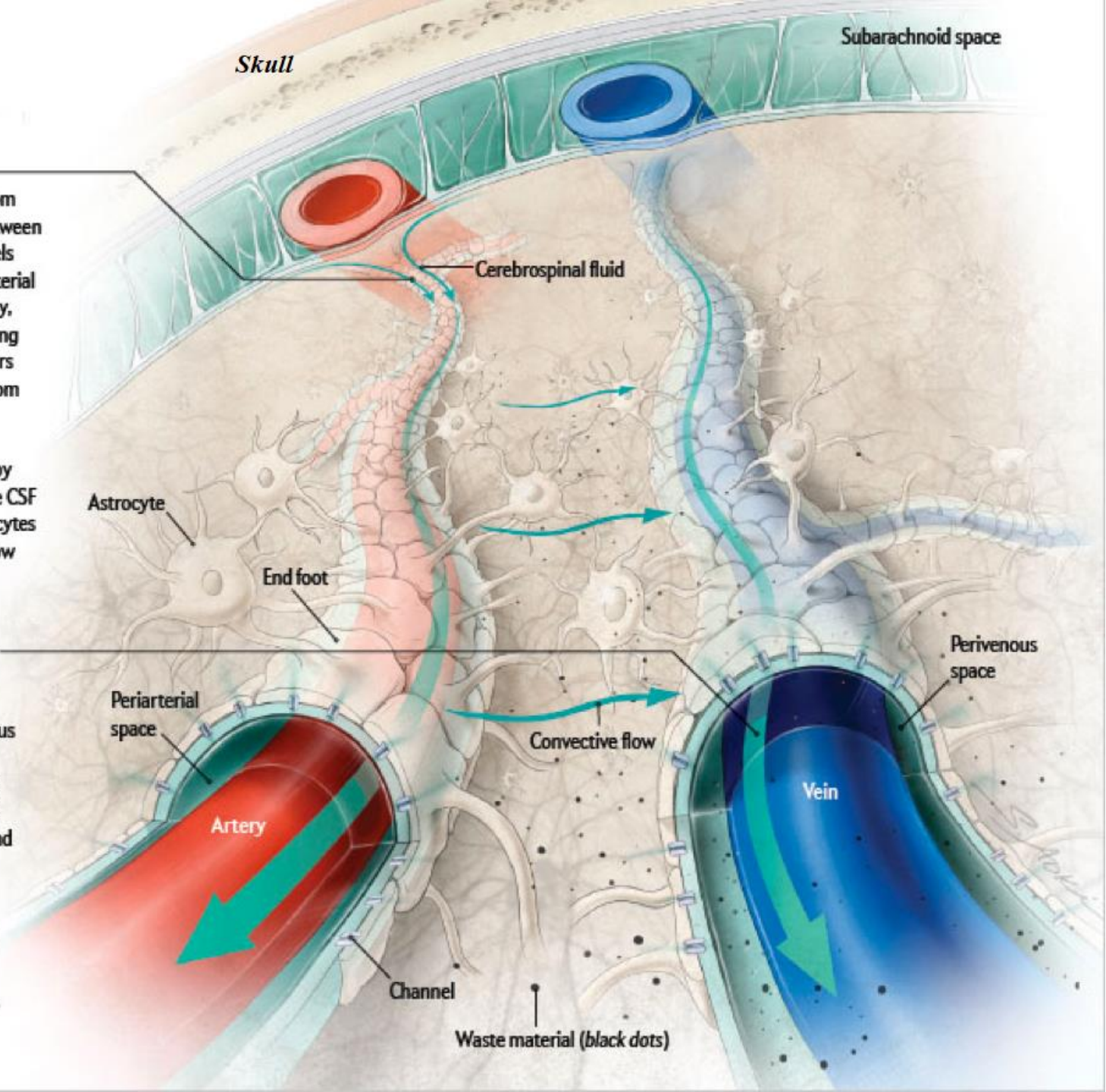
GLYMPHATIC
 ETYMOLOGY
 =
 GLIAL
 (ASTROCYTES)
 +
 LIMPATIC

Incoming Fluid

Cerebrospinal fluid (CSF) from the subarachnoid space, between the skull and the brain, travels through a cavity (the periarterial space) surrounding an artery, propelled along by the pulsing of blood flow. This fluid enters tiny channels that extend from the cavity into cells called astrocytes, whose end feet form the periarterial space by encircling blood vessels. The CSF then moves out of the astrocytes and travels by convective flow through brain tissue.

Outgoing Wastes

The fluid, having picked up wastes from brain tissue, is transported to the perivenous space, which surrounds a network of veins that drains blood from the brain. In this cavity, the fluid passes around progressively larger veins that eventually reach the neck (*detail of brain above*). The wastes then move into the lymphatic system and eventually the bloodstream.



Studio Morfeo: insomnia in primary care, a survey conducted on the Italian population

Abstract

Background and purpose: To carry out an **observational epidemiological survey** (Studio Morfeo), to determine: (1) the **frequency of insomnia** in a large Italian population presenting directly to the general physician (GP); (2) the **impact of insomnia on the quality of life**, on the use of health-care resources and on co-morbidity.

Patients and methods: The study was accomplished by GPs, trained by sleep specialists accredited by the Italian Association of Sleep Medicine. **Only patients spontaneously presenting to their GP for medical problems** were surveyed. Each GP was asked to enroll at least five patients across a routine week of medical activity including both morning and afternoon clinics. The first patient of each weekday was recruited after obtaining written consent. According to the responses to the **sleep-related questions**, patients were classified into three categories: (1) no insomnia, (2) level 1 insomnia with absence of day-time dysfunction and (3) level 2 insomnia with presence of day-time dysfunction.

Results: **A total of 3284 patients were enrolled by 738 GPs** in this Italian survey. **Insomnia was reported by 64%** of all interviewed patients, with 20% classified as level 1 and 44% as level 2. Logistic analysis indicated that **depression** (odds ratio, 2.70), involvement of > 1 organ systems (odds ratio, 1.24), **female gender** (odds ratio, 1.19), **unemployment** (odds ratio, 1.18), **low education** (odds ratio, 1.18) and increasing **age** (odds ratio, 1.02) were the **major risk factors** for insomnia.

Conclusions: Our findings indicate that insomnia is a frequent disturbance in the Italian primary care population, is associated with high risk of **co-morbid conditions**, and results in increased use of health-care resources.

Original article

(2004)

sleepmedicine

