

# Air disinfection with ultraviolet light as potential infection control in libraries

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February 3, 2022

# COVID-19 response to date



*"Here comes Edward Bear now, down the stairs behind Christopher Robin. **Bump! Bump! Bump!** on the back of his head. It is, as far as he knows, the only way of coming down stairs. He is sure that **there must be a better way, if only he could stop bumping for a moment to think of it**"*

A. A. Milne, *Winnie-the Pooh*, Chapter 1

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# COVID-19 transmission is primarily through shared breathing air

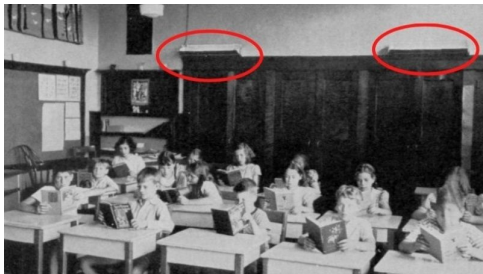
- ▶ virus-laden respiratory droplets of varying sizes
- ▶ larger droplets travel shorter distances; smaller droplets float longer and travel farther
- ▶ the proverbial “6 feet” is a useful rule of thumb, but it is not absolute
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- ▶ transmission via library materials and other objects is not a meaningful issue (wash your hands!)
- ▶ libraries are not exactly hotbeds of COVID-19 transmission
  - ▶ but libraries are a place where people gather—at least they have been, and we’d like them to be again

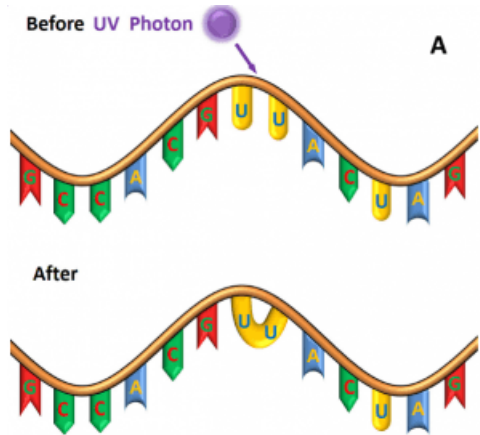
# It's all about shared breathing air

Can we scrub the air? Yes! With germicidal ultraviolet light

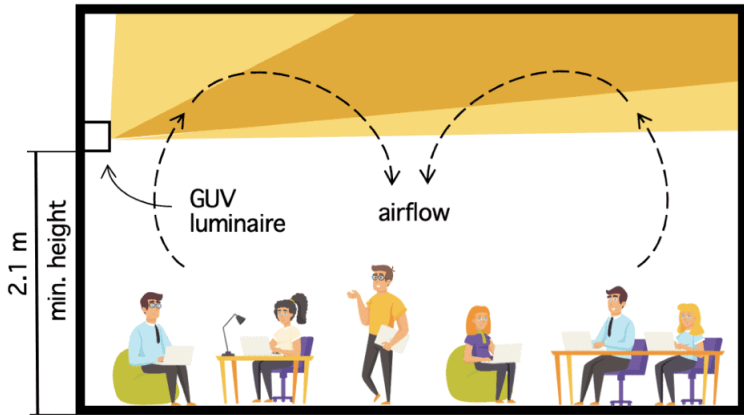


- ▶ Upper-air 254 nm ultraviolet
- ▶ Direct 222 nm ultraviolet

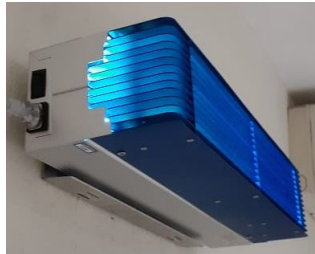
# How GUV it works



# Why upper-air UV works



# What upper-air 254 nm UV looks like today





# What direct 222 nm GUV looks like



# Effectiveness and safety

## ► Effectiveness

- 80 years of use, mostly for tuberculosis control
- reduced classroom transmission of measles in the 1940s
- in the lab: UV light inactivates COVID-19, influenza, and many other respiratory pathogens
- in real use: no definitive studies to show reduced COVID-19 transmission in any particular space
  - such studies are difficult and time-consuming; too early in the pandemic

## ► Safety

- 254 nm UV can cause skin redness and eye irritation
  - hence the upper-room placement, above occupants' heads
  - minimal exposure and no additional risk from a professionally designed and installed upper-room system
  - reputable vendors adhere to published exposure standards
- 222 nm poses no known risk to humans
  - blocked by the very superficial layers of skin (cells already dead)
  - blocked by the tear film on the surface of the eye

# What does GUV cost? (very rough estimates)

- ▶ upper-room 254 nm
  - ▶ about \$1000 to \$1400 per fixture
  - ▶ about \$3.50 to \$6.00 per square foot

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- ▶ direct 222 nm
  - ▶ about \$2500 per fixture
  - ▶ about \$6.25 per square foot

# Ideas for libraries

- ▶ 254 nm upper room or 222 nm downlighting throughout?
- ▶ 222 nm downlighting above circulation and reference desks?
- ▶ staff work rooms and break rooms?
- ▶ public group rooms?
- ▶ other ideas?