CAN YOU SEE A SINGLE PHOTON?

Probing the lower limit of human vision with a single-photon source

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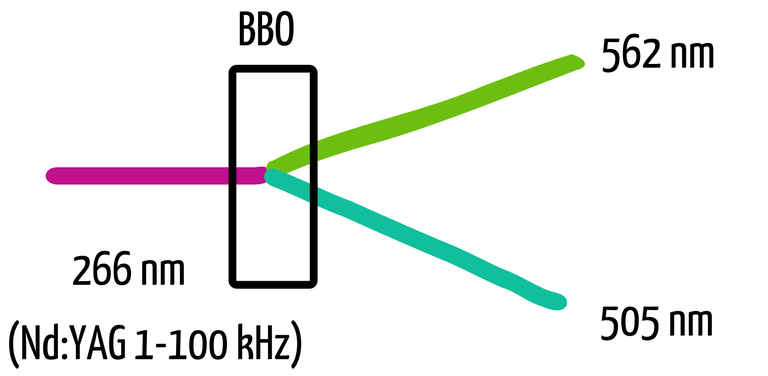
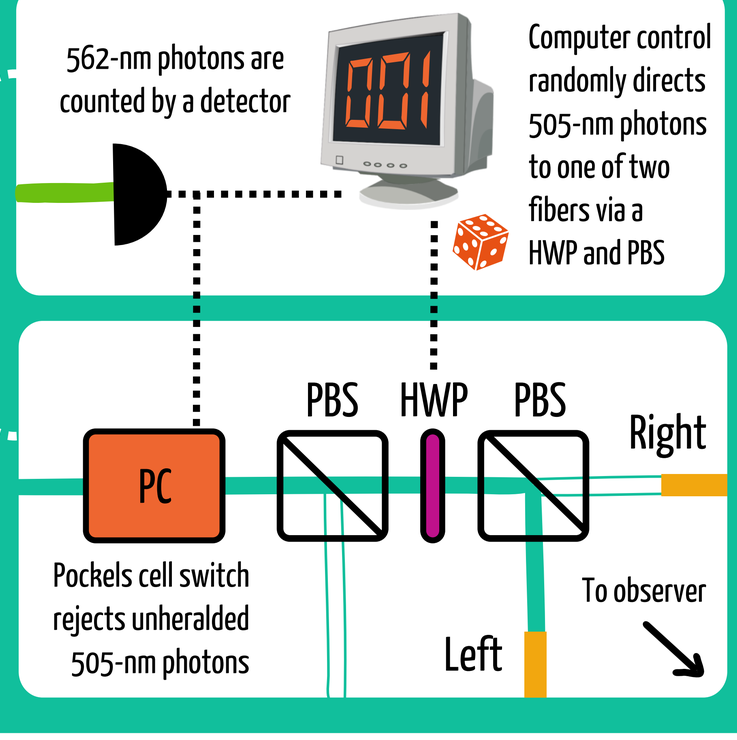
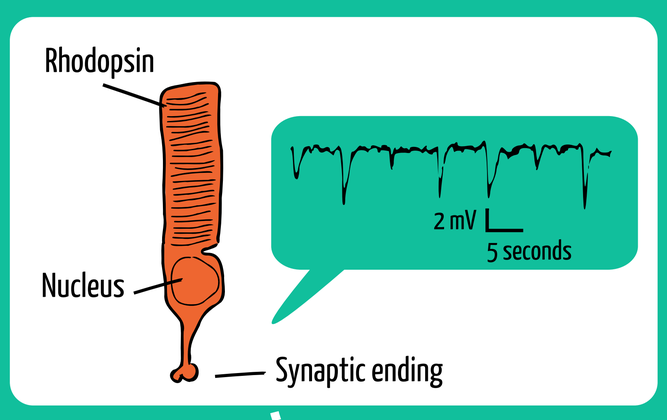
SINGLE-PHOTON SOURCE



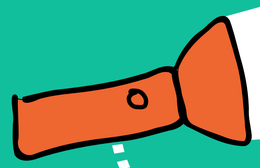


ROD CELLS CAN DETECT SINGLE PHOTONS



BUT CAN YOU?

PREVIOUS RESEARCH



CLASSICAL LIGHT SOURCES

Poisson statistics

Did you see the light?

Yes-or-no experimental designs

No.

HOW TO DO BETTER

$|1\rangle$ Single-photon source

Forced-choice experimental design

WHERE did you see it?

Left.

RESULTS: Measuring temporal integration

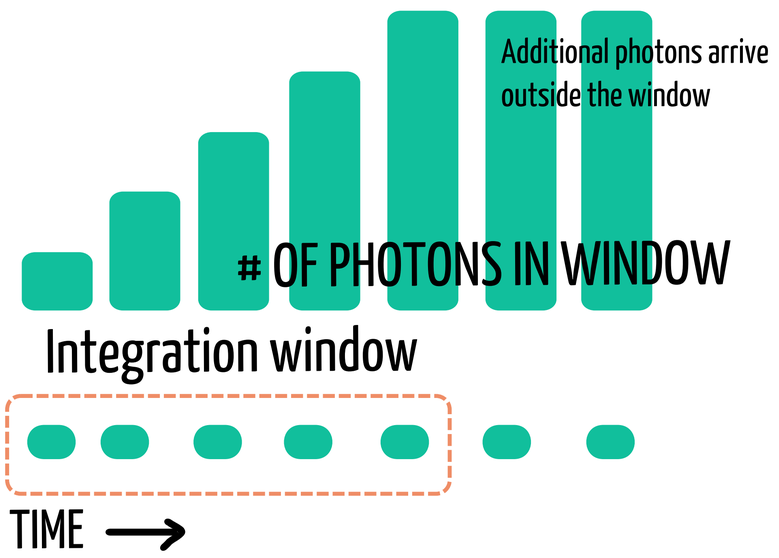
Longer flash of light

More photons are integrated

Easier to detect

Until the duration exceeds the integration window

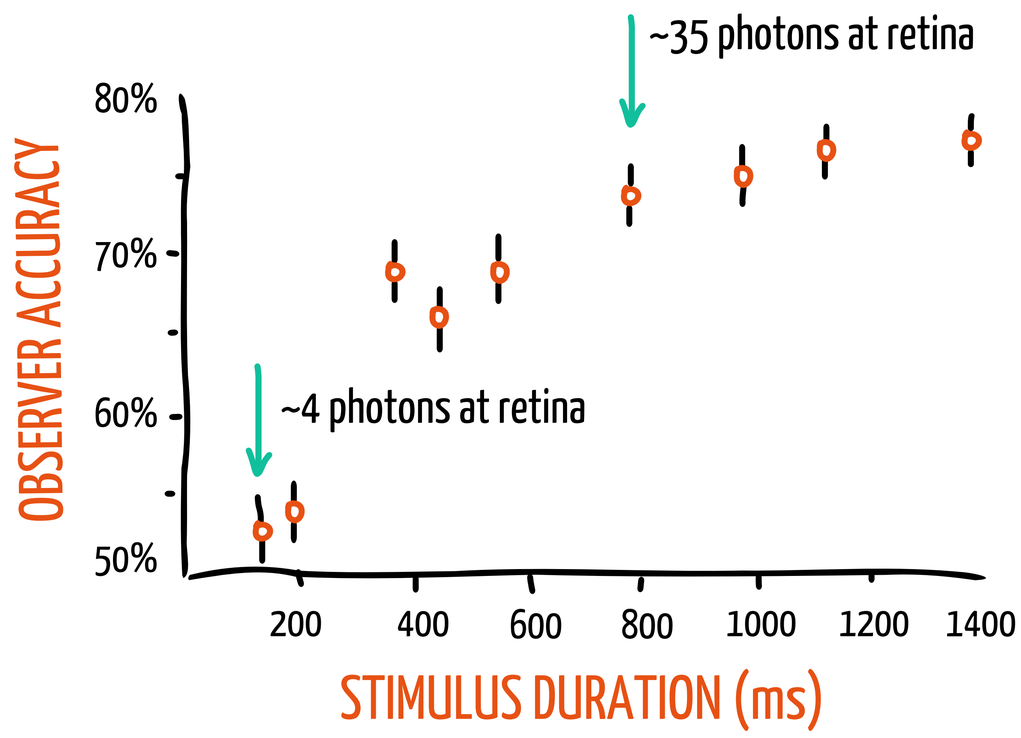
Typical integration window is ~100 ms



MEASURING TEMPORAL INTEGRATION NEAR THE VISUAL DETECTION THRESHOLD

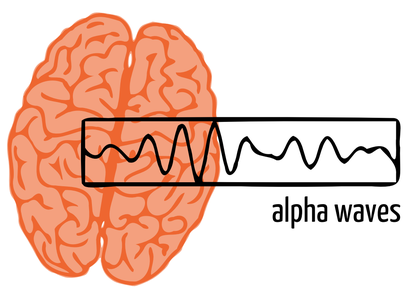
10 subjects
30 minutes dark adaptation
300 trials each

Spline regression (not shown): integration window is ~800 ms



FUTURE DIRECTIONS

EEG-contingent presentation



Single-photon test

Phototaxis

ACKNOWLEDGMENTS

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