

Li-Fi

Future Mobile Applications by Light

Professor Harald Haas

<http://www.eng.ed.ac.uk/drupal/hxh>



10 December, 2013



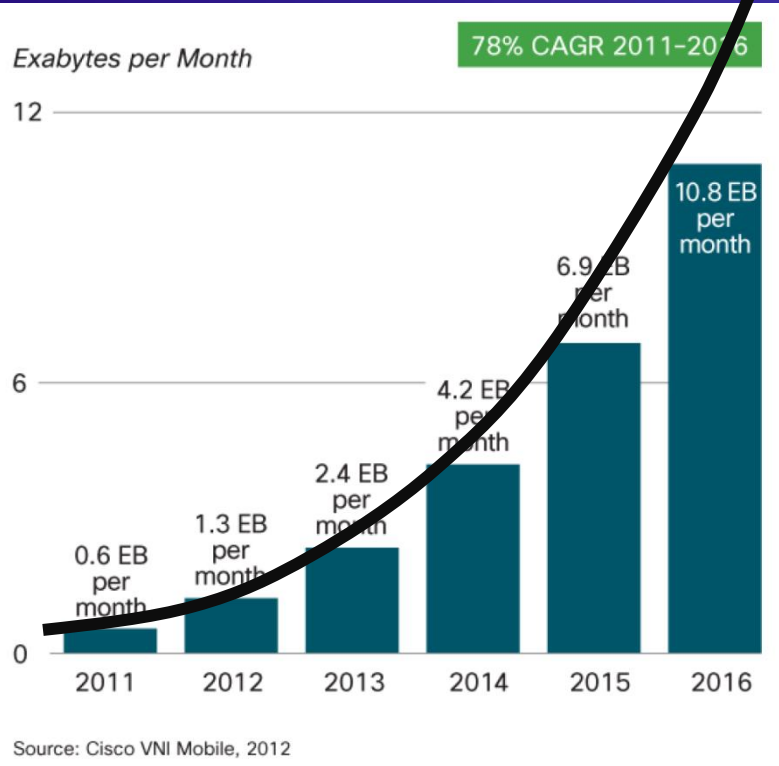
Li-Fi in the Press...

- ▶ **Li-Fi: TED Online video watched more than 1.4 million times**
- ▶ **TIME Magazine listed among “50 best inventions in 2011”**
- ▶ **Shortlisted for World Technology Award, New York, 2011**
- ▶ **Spin-off company, pureLiFi Ltd**

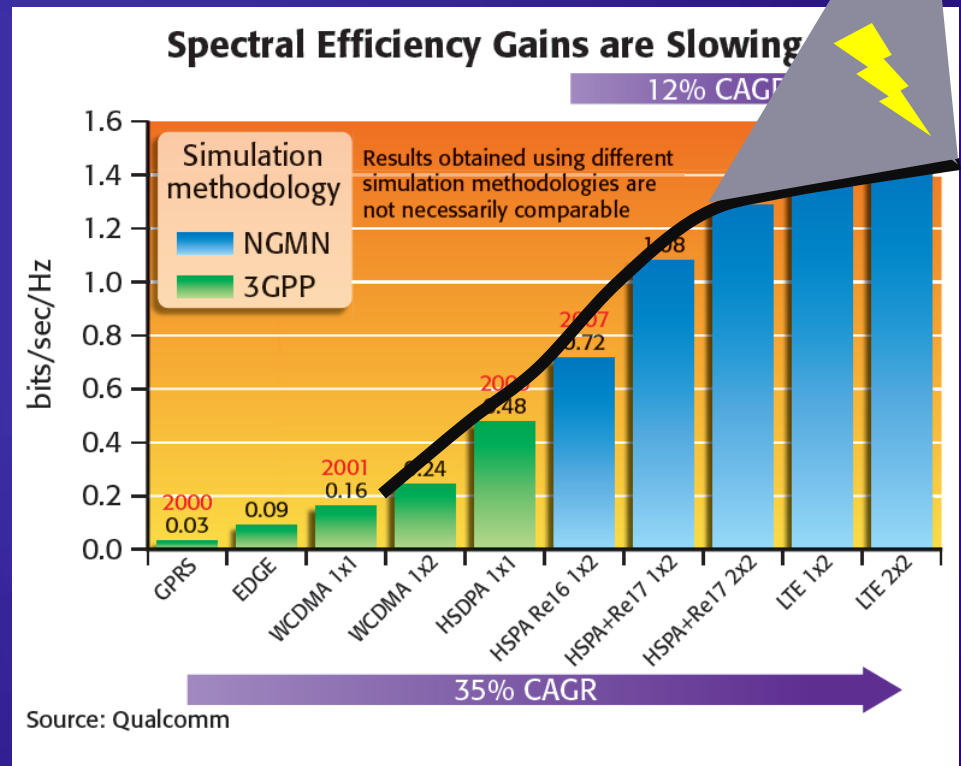


... radio spectrum shortage

Global Mobile Data Traffic



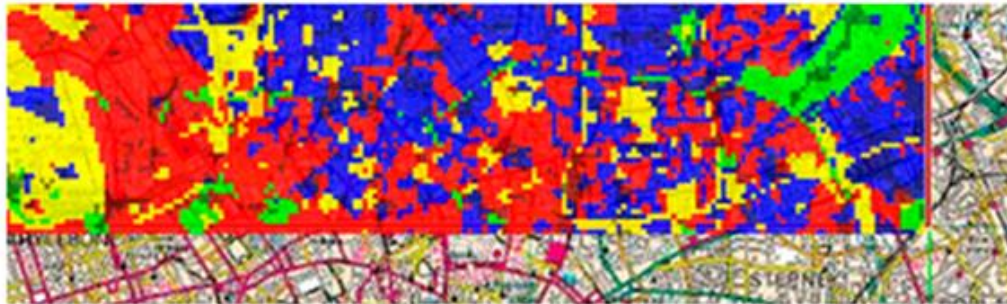
How Efficiently We Use RF Spectr





... radio spectrum shortage

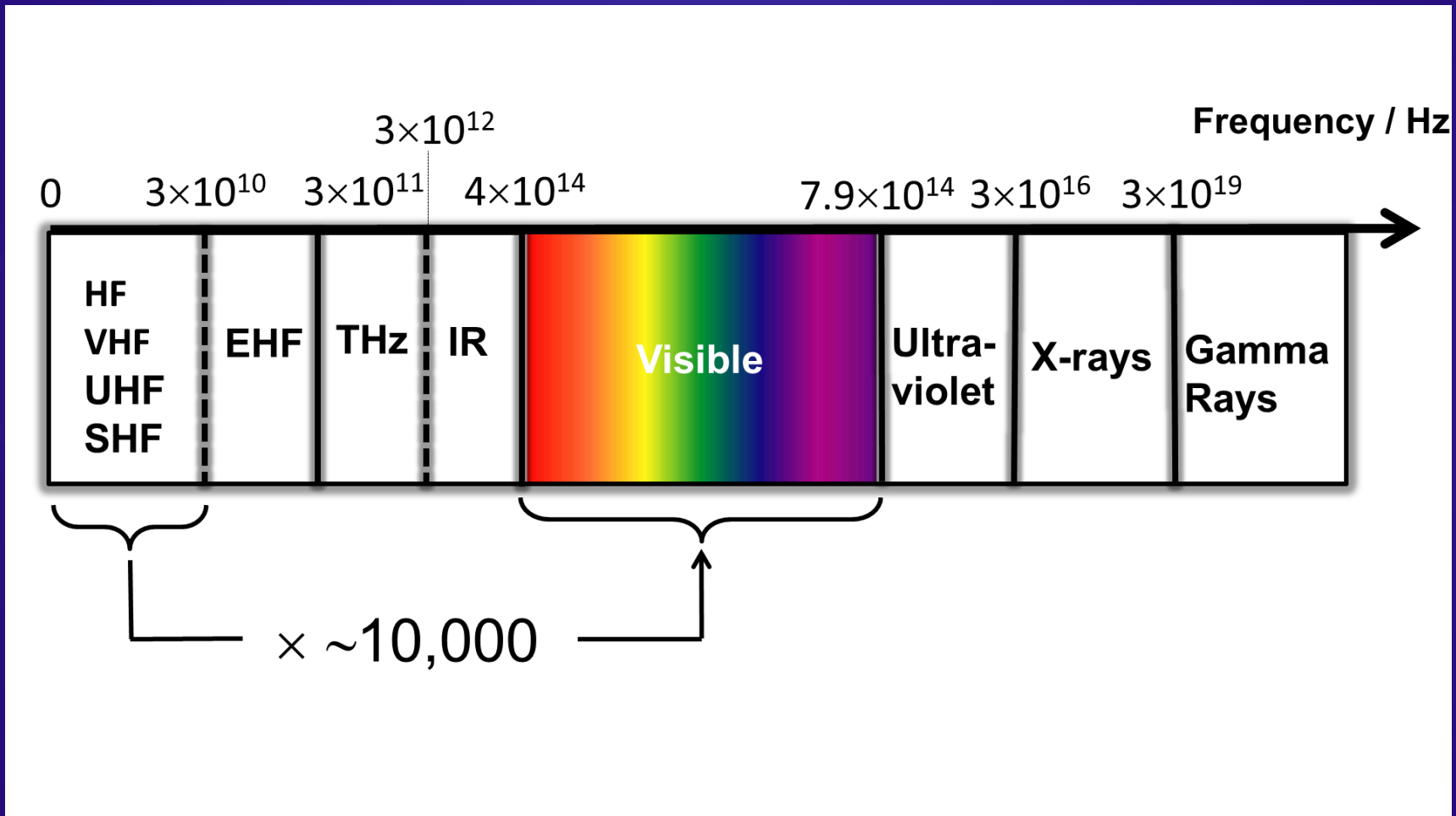
Spectrum Shortages Hit the Headlines



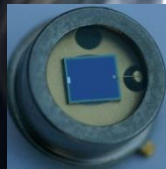
A **Real Wireless** report recently hit the national headlines in the UK predicting that the UK's mobile and Wi-Fi networks will be unable to cope with demand for data by 2020.

The report is now available to download **from our website.**

The electromagnetic spectrum



Li-Fi



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28 October 2013 Last updated at 13:10 GMT



'Li-fi' via LED light bulb data speed breakthrough

By Matthew Wall

Technology reporter, BBC News

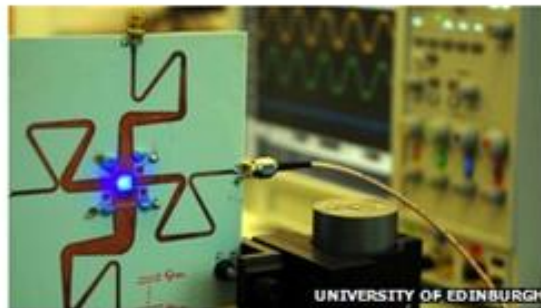
UK researchers say they have achieved data transmission speeds of 10Gbit/s via "li-fi" - wireless internet connectivity using light.

The researchers used a micro-LED light bulb to transmit 3.5Gbit/s via each of the three primary colours - red, green, blue - that make up white light.

This means over 10Gbit/s is possible.

Li-fi is an emerging technology that could see specialised LED lights bulbs providing low-cost wireless internet connectivity almost everywhere.

High speed



Micro-LEDs can transmit large amounts of digital data in parallel

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LED 'li-fi' step closer, says China

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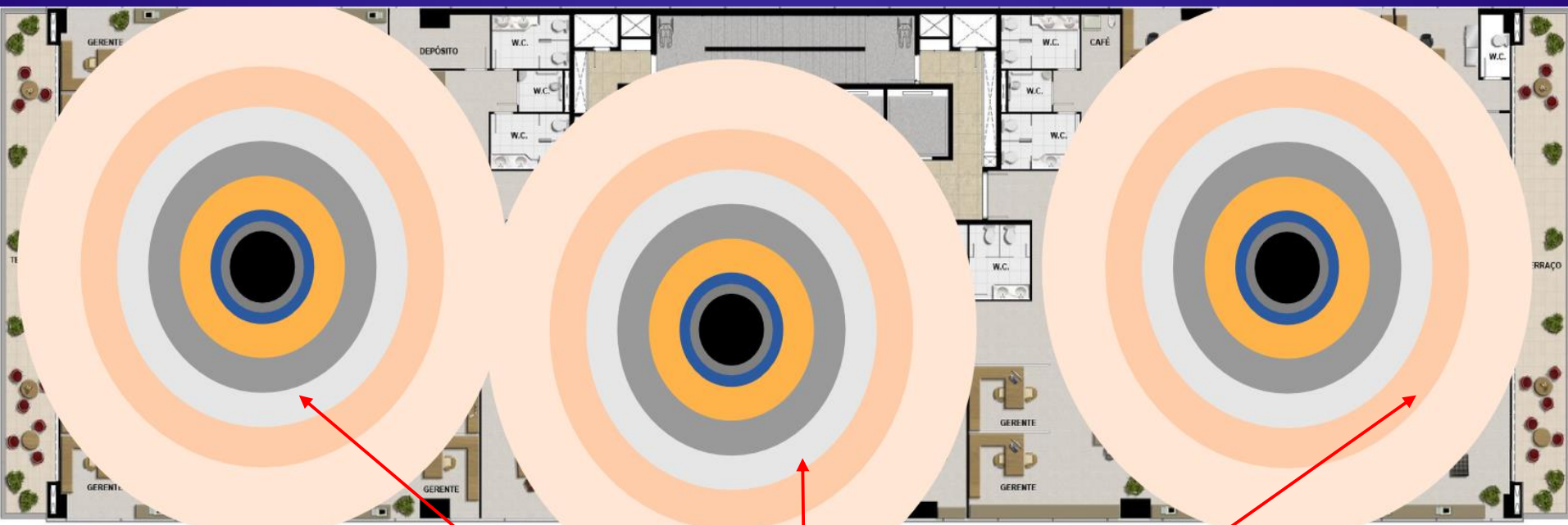


State-of-the-Art: Wi-Fi





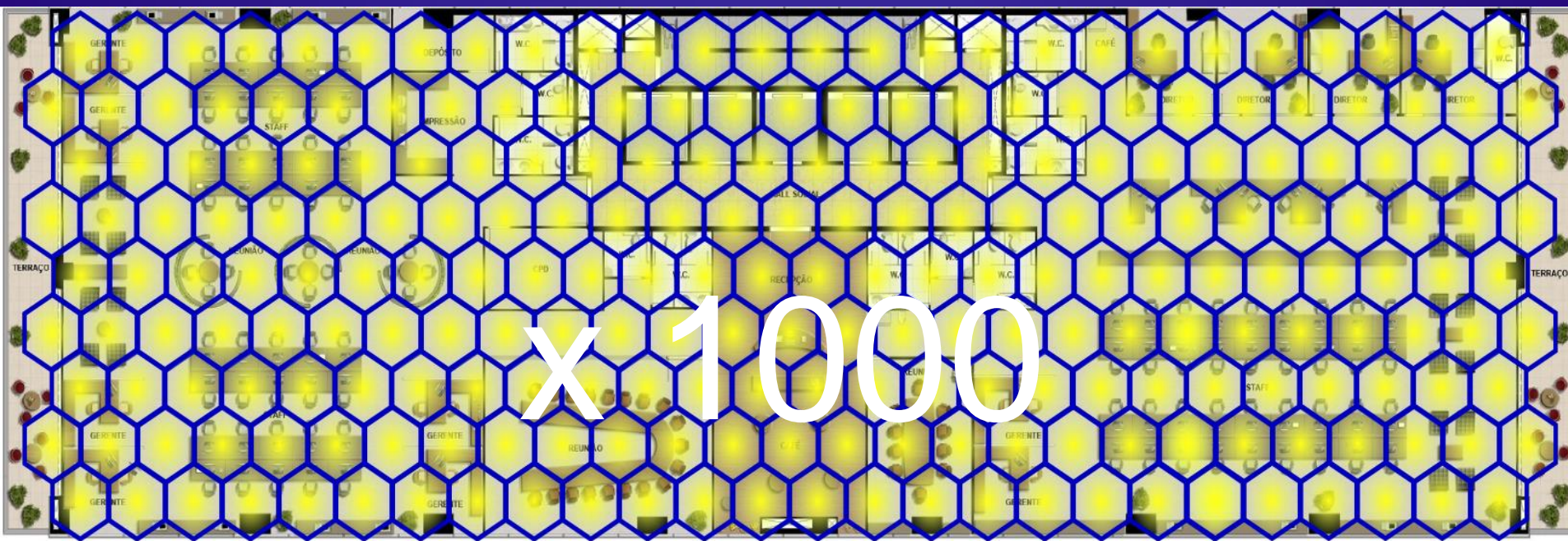
State-of-the-Art: Wi-Fi



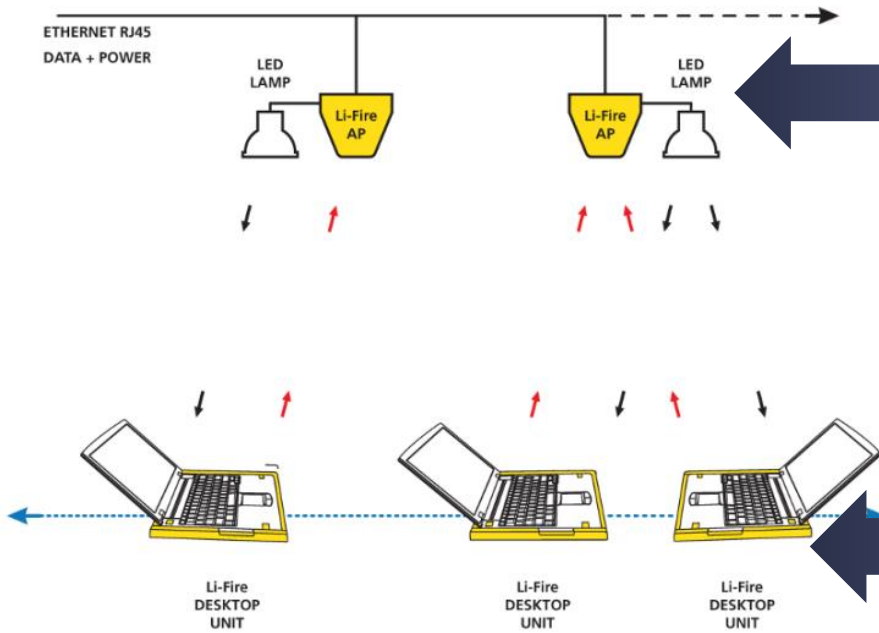
Wi-Fi Routers



Optical Attocell Network



- **Existing infrastructure**
- **Energy efficiency**





Security

A long, brightly lit hallway with a patterned carpet and wall sconces. The hallway is long and narrow, with a repeating pattern of light-colored carpet with a dark border and a central decorative motif. The walls are light-colored with dark wood paneling and wall sconces. The ceiling has recessed lighting. The hallway leads to a dark doorway at the end.

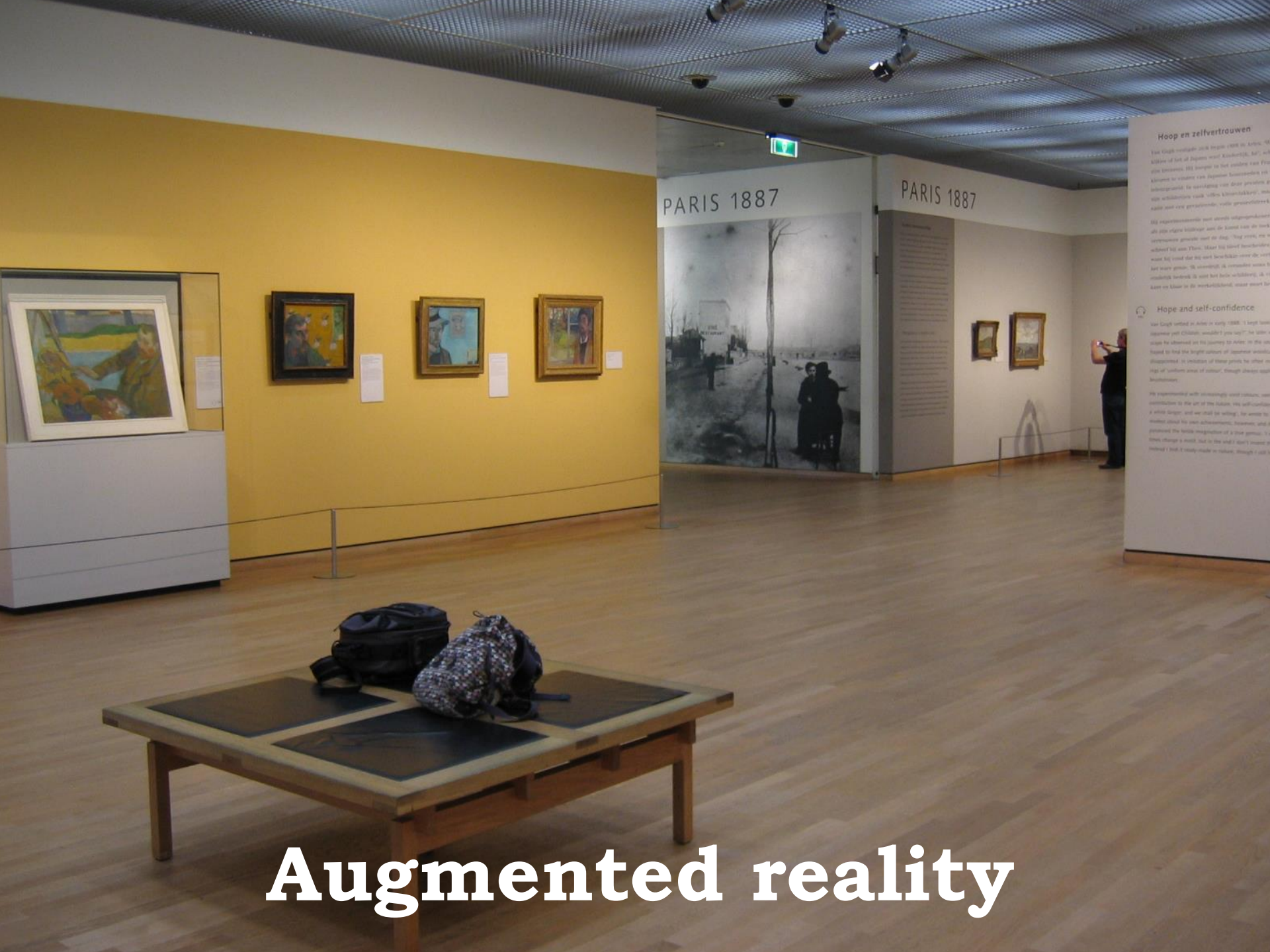
Dense environments



Cellular communications



EMI sensitive environments



PARIS 1887

PARIS 1887

Hope en zelfvertrouwen

Van Gogh maakte zijn tekening in 1888 in Arles. De
kijken of het al Japan was. Koolhaas, het
zijn tekenen. Hij terug te het tekenen
kijken te vinden van Japanse kunstenaars
schiedkundige te vertellen van deze periode
van schilderen vaak velen kromme. Het
naar het van gescheiden, naar gescheiden.

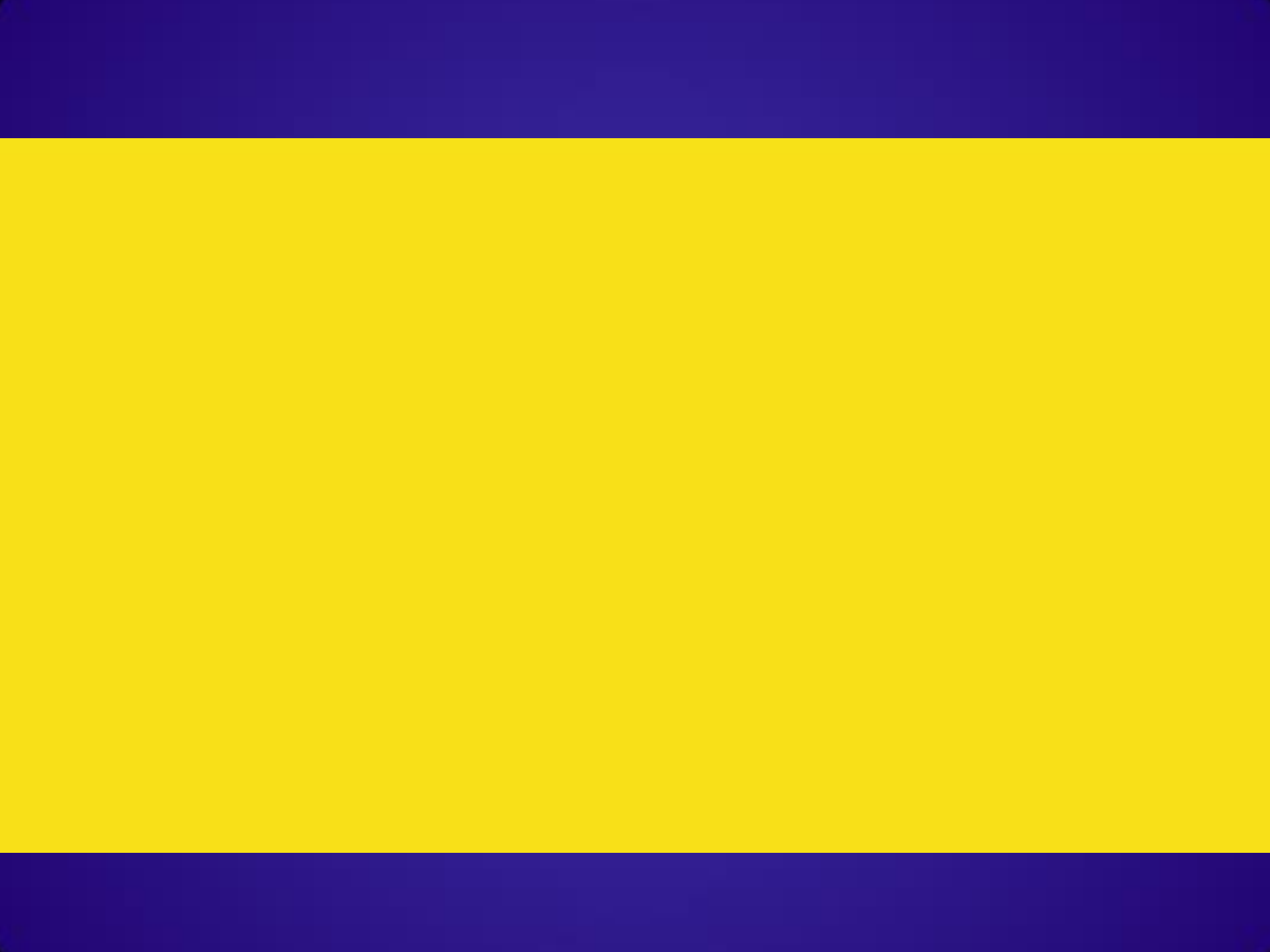
Hij experimenteerde met verschillende
als zijn enige klinkende van de kunst van de
vertrouwen gevuld met en dat. "Het was, en
schied bij een. Maar hij werd beschouwd
want hij vond dat hij niet kon. Het was
het waar. Het was. Het was. Het was. Het was.
indisch. Het was. Het was. Het was. Het was.
aan en naar in de wereld. Het was. Het was.

Hope and self-confidence

Van Gogh visited in Arles in early 1888. I kept
Japanese art. "Would you say?" he later
escape the aftermath of his journey to Arles. In the
tragedy to find the bright colors of Japan.
disappeared. In addition, these people he often
step of "culture areas of color" through design
travellers.

He experimented with increasingly used colors, and
concentrated on the art of the future. His self-confidence
it would longer, and he still be willing. He wrote to
mother about his own achievement. However, and
promised the little recognition of a true genius. It
times change a world, but in the end it's never
instead I wish it ready-made in nature, through a gift

Augmented reality



Melrose Av



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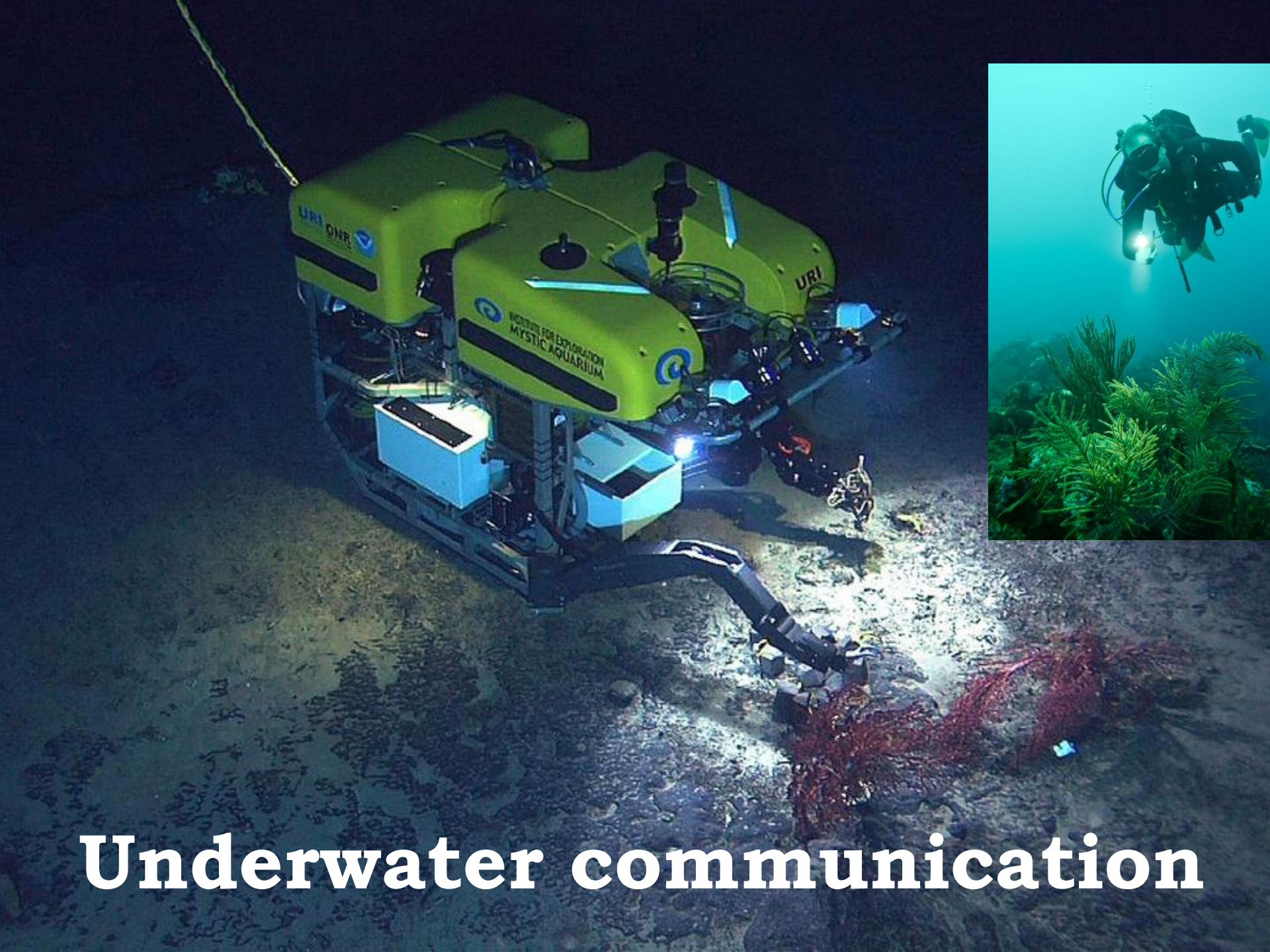
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Advertising



Underwater communication



Intelligent transportation systems



Smart homes



Health



Indoor navigation



... Li-Fi Outlook

- ▶ Emerging technology
- ▶ Potential to create new industry:
 - ▶ “Future cellular communications”
 - ▶ “Smart homes”,
 - ▶ “Smart cities”,
 - ▶ “Smart environments”,
 - ▶ “Internet-of-Things”.