Reach out!

A webinar on science communication

Who are we?

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The setup

- *What is science communication, really?*

We start from the beginning

- *Different logics, different rules*

Why our messages sometimes miss the mark – and how to fix it

- *How do we get people´s attention?*

Real-life examples to help you break through the noise.

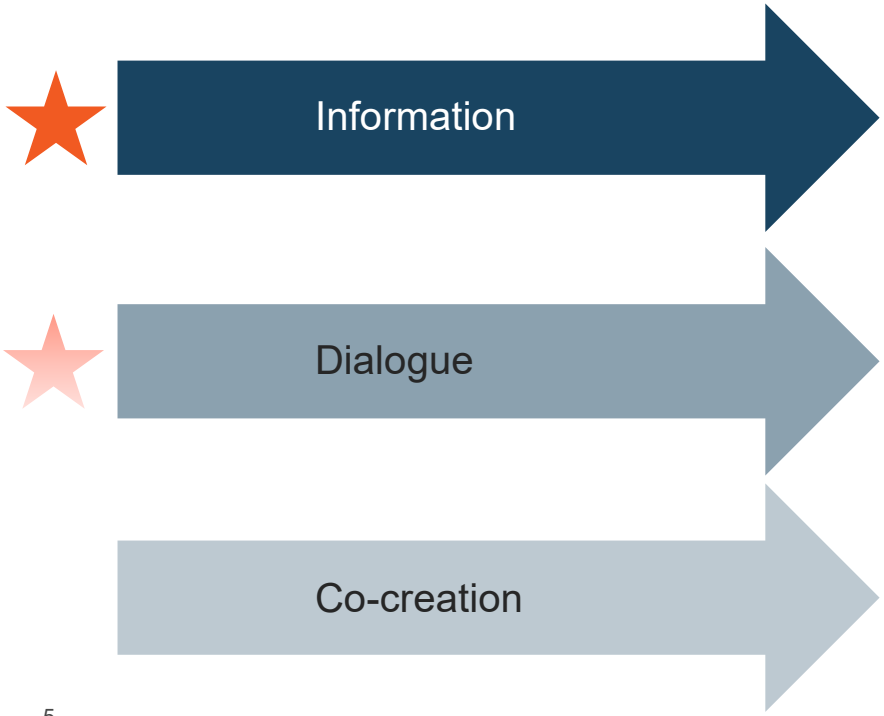
- *Time to practice!*

No pressure, just playful learning.

What is science communication?

- *To communicate research outside the scientific community,*
- *To adjuste the communication to the specific target group,*
- *To understand what your target group is and how to reach it*

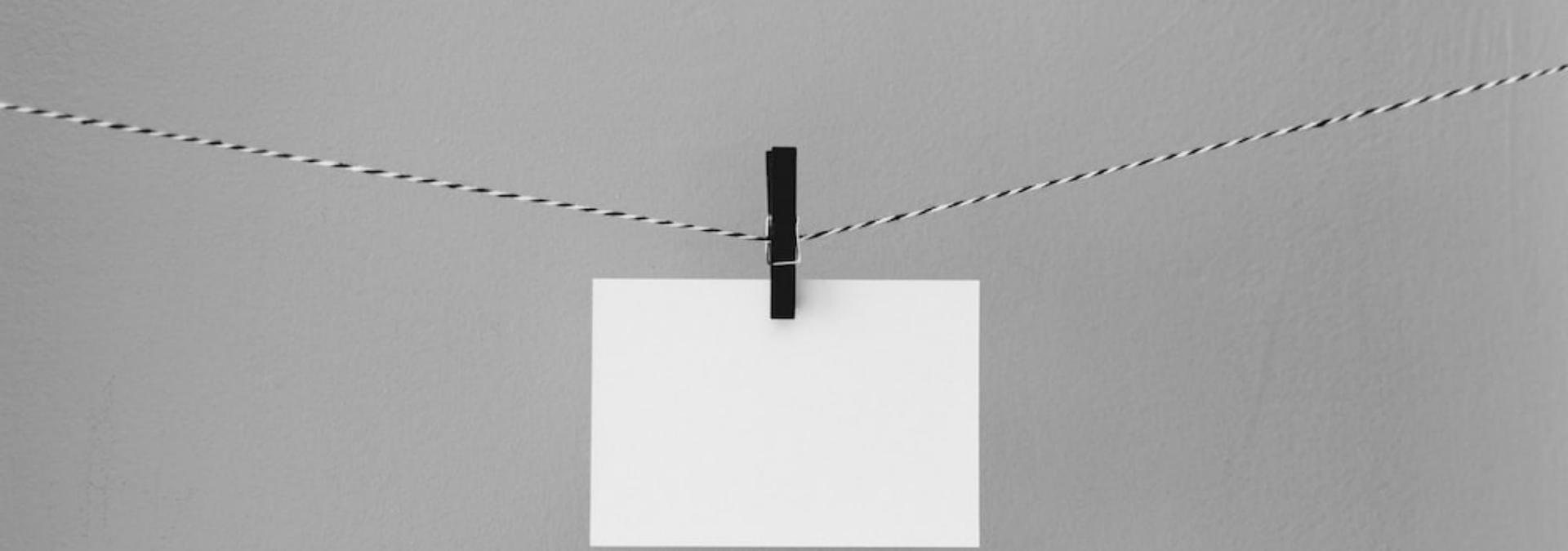
What is science communication?



- Press release
- Op-ed article (opinion editorial)
- Lecture

- Science festival activities
- ”Borrow a researcher”
- Science café

- Citizen research
- Patient participation

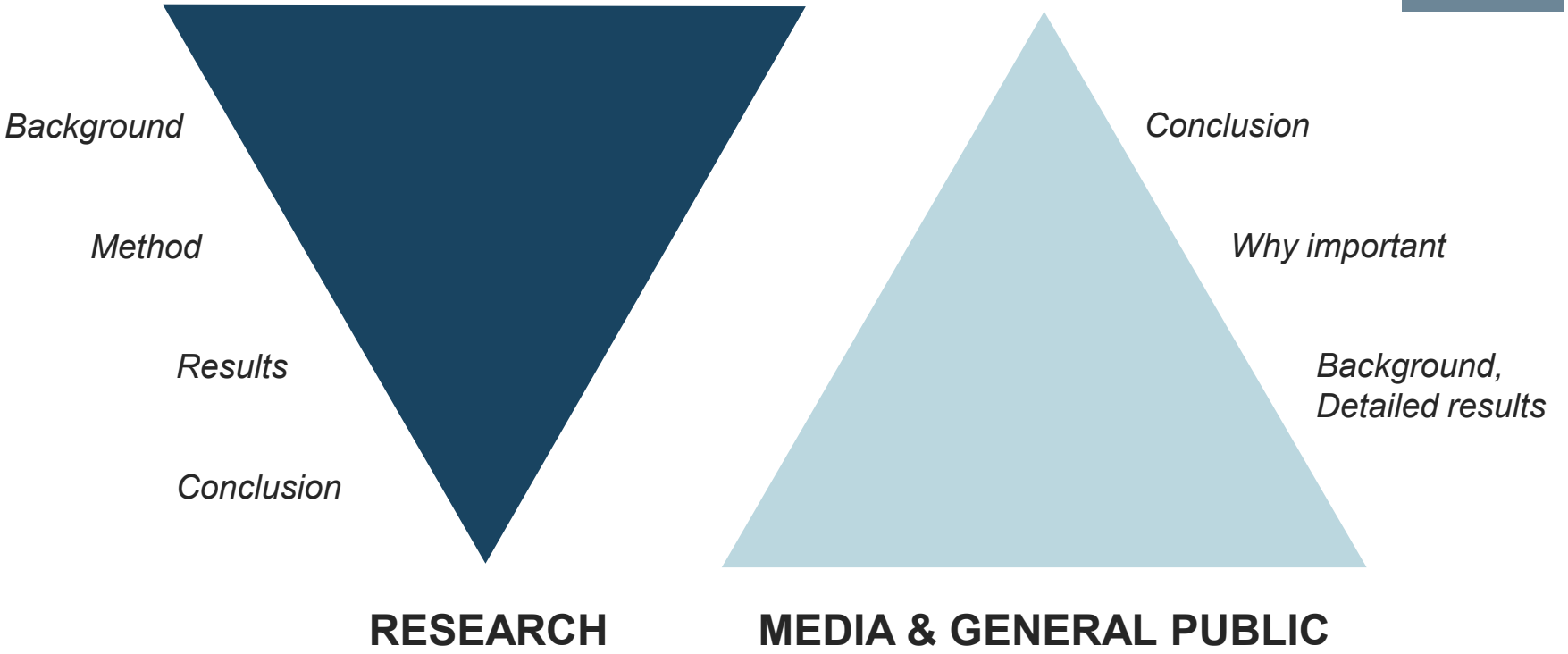


Why is science communication important?

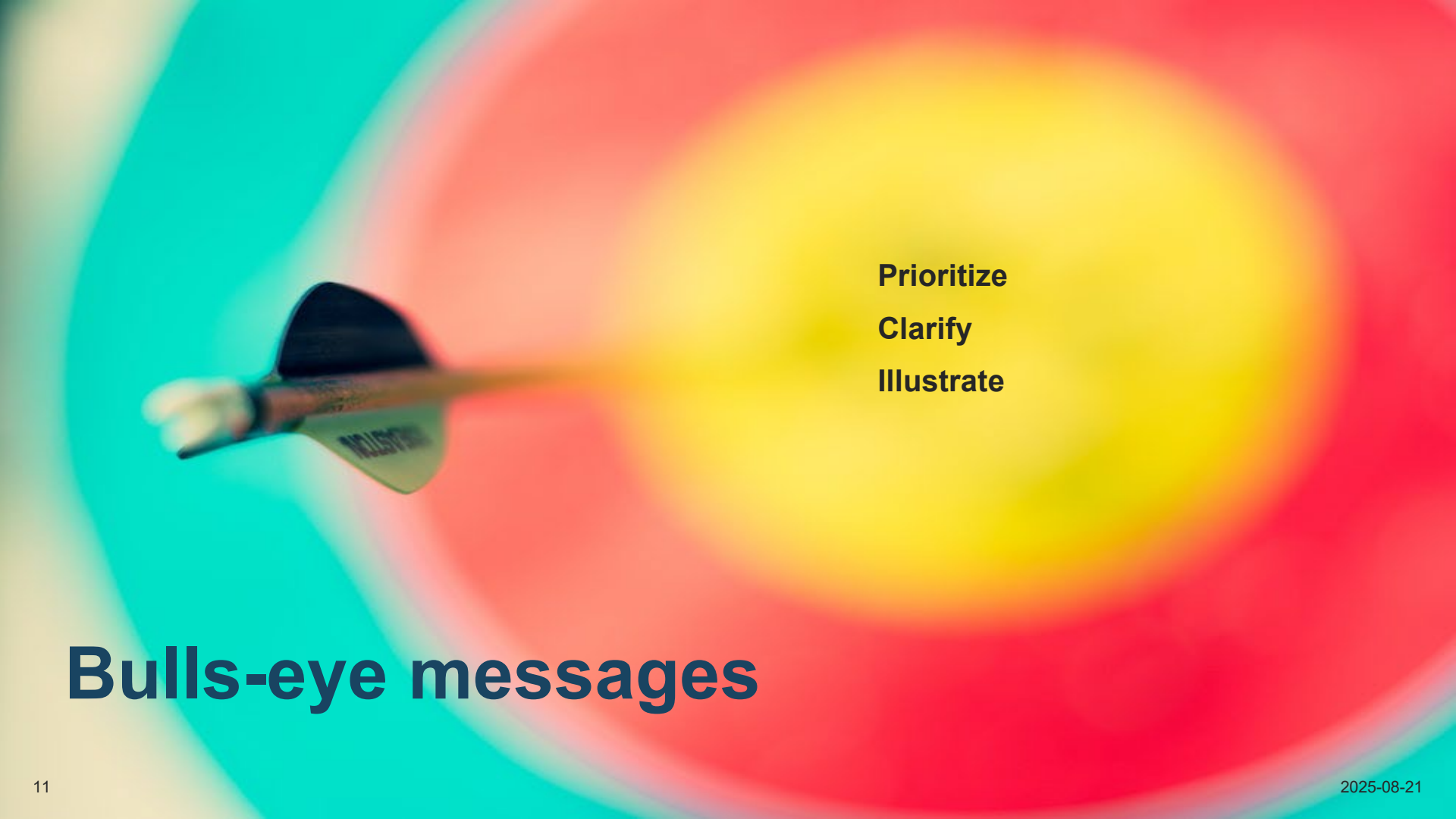
Good comunication benefits everyone

- Advantages for the researcher
- Advantages for the university
- Advantages for the society

Different logics of communications


Background
Method
Results
Conclusion
Conclusion
Why important
Background,
Detailed results
RESEARCH
MEDIA & GENERAL PUBLIC

The message we want the audience to grasp



Bulls-eye messages

Put the target group in the center

- We write in a polished, simple, and understandable way.
- We do not use any specialised terms at all, and if we have to, we need to explain them in more plain language
- Ultimately, it's about democracy: ensuring everyone’s right to understand what is written in texts produced by public entities.

From study title to headline

Unveiling the Multifunctional Carbon Fiber Structural Battery
IMS, Advanced Materials, Sep 2024

→ Novelty

→ Affect many

↓

World's strongest battery paves way for light, energy-efficient vehicles

→ Novelty explained

→ Effect explained

From study title to headline

More examples from Chalmers

Nutritional Composition and Estimated Iron and Zinc Bioavailability of Meat Substitutes Available on the Swedish Market	→	*Low nutritional quality in vegetarian meat*
Development of mesoporous silica-based active coatings for methylmercury removal: Towards enhanced active packaging	→	*Mercury content in tuna can be reduced with new packaging solution*
Poly(benzodifurandione) Coated Silk Yarn for Thermoelectric Textiles	→	*The silk thread that can turn clothes into charging stations*

nature physics

Article | Open access | Published: 09 January 2025

Thermally driven quantum refrigerator autonomously resets a superconducting qubit

Mohammed Ali Aamir ✉, Paul Jamet Suria, José Antonio Marin Guzmán, Claudia Castillo-Moreno, Jeffrey M. Epstein, Nicole Yunger Halpern ✉ & Simone Gasparinetti ✉

Nature Physics **21**, 318–323 (2025) | Cite this article

16k Accesses | **3** Citations | **268** Altmetric | Metrics

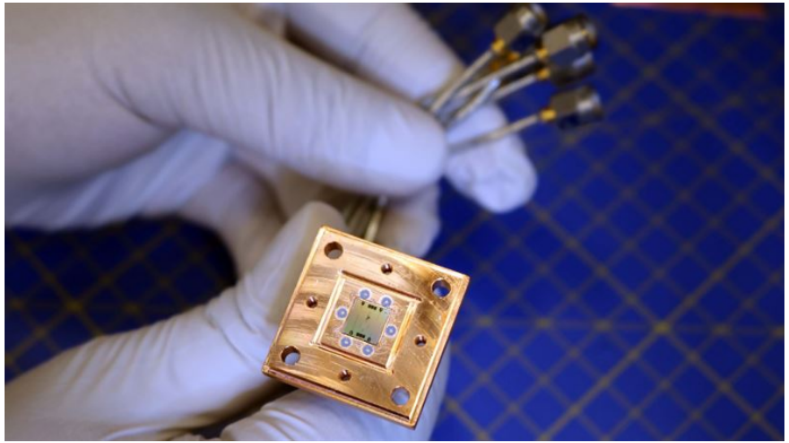
Abstract

Although classical thermal machines power industries and modern living, quantum thermal engines have yet to prove their utility. Here, we demonstrate a useful quantum absorption refrigerator formed from superconducting circuits. We use it to cool a transmon qubit to a temperature lower than that achievable with any one available bath, thereby resetting the qubit to an initial state suitable for quantum computing. The process is driven by a thermal gradient and is autonomous, requiring no external feedback. The refrigerator exploits an engineered three-body interaction between the target qubit and two auxiliary qudits. Each auxiliary qudit is coupled to a physical heat bath, realized with a microwave waveguide populated with synthesized quasithermal radiation. If the target qubit is initially fully excited, its effective temperature reaches a steady-state level of approximately 22 mK, lower than what can be achieved by existing state-of-the-art reset protocols. Our results demonstrate that superconducting circuits with propagating thermal fields can be used to experimentally explore quantum thermodynamics and apply it to quantum information-processing tasks.

2,6 billion + in potential reach

Record cold quantum refrigerator paves way for reliable quantum computers

THU, JAN 09, 2025 11:00 CET



Quantum computers require extreme cooling to perform reliable calculations. One of the challenges preventing quantum computers from entering society is the difficulty of freezing the qubits to temperatures close to absolute zero. Now, researchers at Chalmers University of Technology, Sweden, and the University of Maryland, USA, have engineered a new type of refrigerator that can autonomously cool superconducting qubits to record low temperatures, paving the way for more reliable quantum computation.

Quantum computers have the potential to revolutionise fundamental technologies in various sectors of society, with applications in medicine, energy, encryption, AI, and logistics. While the building blocks of a classical computer – bits – can take a value of either 0 or 1, the most common building blocks in quantum computers – qubits – can have a value of 0 and 1 simultaneously. The phenomenon is called superposition and is one of the reasons why a quantum computer can perform parallel computations, resulting in enormous computational potential. However, the time a quantum computer can work on a calculation is still significantly constrained, because it spends a lot of time correcting errors.

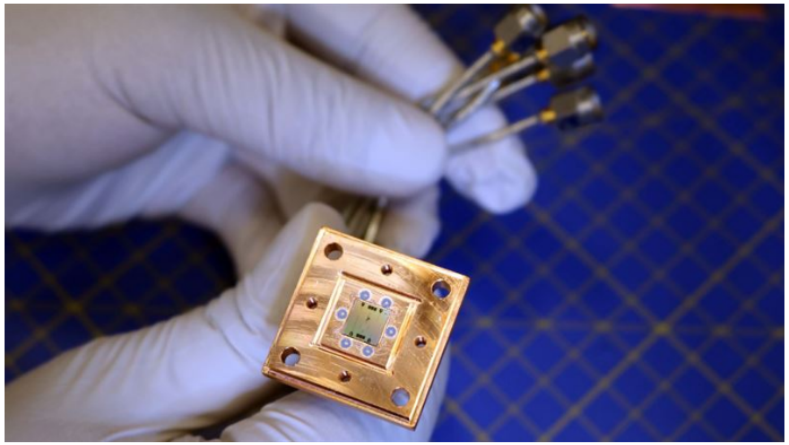
"Qubits, the building blocks of a quantum computer, are hypersensitive to their environment. Even extremely weak electromagnetic interference leaking into the computer could flip the value of the qubit randomly, causing errors – and subsequently hindering quantum computation," says Aamir Ali, research specialist in quantum technology at Chalmers University of Technology.

Record cold quantum refrigerator paves way for reliable quantum computers

Headline: the "hook" in short

THU, JAN 09, 2025 11:00 CET

Report this content



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Preamble: Challenges, solution and societal wins (the hook explained)

Quantum computers have the potential to revolutionise fundamental technologies in various sectors of society, with applications in medicine, energy, encryption, AI, and logistics. While the building blocks of a classical computer – bits – can take a value of either 0 or 1, the most common building blocks in quantum computers – qubits – can have a value of 0 and 1 simultaneously. The phenomenon is called superposition and is one of the reasons why a quantum computer can perform parallel computations, resulting in enormous computational potential. However, the time a quantum computer can work on a calculation is still significantly constrained, because it spends a lot of time correcting errors.

"Qubits, the building blocks of a quantum computer, are hypersensitive to their environment. Even extremely weak electromagnetic interference leaking into the computer could flip the value of the qubit randomly, causing errors – and subsequently hindering quantum computation," says Aamir Ali, research specialist in quantum technology at Chalmers University of Technology.

Context: The potential of the technology and challenges

Demonstrates record low temperatures

Sub-heading: Summerizes the coming paragraph

Context: Background facts and challenges

Today, many quantum computers are based on superconducting electrical circuits that have zero resistance and therefore preserve information very well. For qubits to work without errors and for longer periods in such a system, they need to be cooled to a temperature close to absolute zero, equivalent to minus 273.15 degrees Celsius or zero Kelvin, the scientific unit of temperature. The extreme cold puts the qubits into their lowest-energy state, the ground state, equivalent to value 0, a prerequisite for initiating a calculation.

The cooling systems used today, so-called dilution refrigerators, bring the qubits to about 50 millikelvin above absolute zero. The closer a system approaches to absolute zero, the more difficult further cooling is. In fact, according to the laws of thermodynamics, no finite process can cool any system to absolute zero. Now, the researchers at Chalmers University of Technology and University of Maryland have constructed a new type of quantum refrigerator that can complement the dilution refrigerator and autonomously cool superconducting qubits to record-low temperatures. The quantum refrigerator is described in an article in the journal Nature Physics.

Solution: How the innovation solves the problem

"The quantum refrigerator is based on superconducting circuits and is powered by heat from the environment. It can cool the target qubit to 22 millikelvin, without external control. This paves the way for more reliable and error-free quantum computations that require less hardware overload," says Aamir Ali, lead author of the study and continues:

Quotes

"With this method, we were able to increase the qubit's probability to be in the ground state before computation to 99.97 per cent, which is significantly better than what previous techniques could achieve, that is, between 99.8 and 99.92 per cent. This might seem like a small difference, but when performing multiple computations, it compounds into a major performance boost in the efficiency of quantum computers."

Powered naturally by the environment

Sub-heading: Summerizes the coming paragraph

The refrigerator utilises interactions between different qubits, specifically between the target qubit to be cooled and two quantum bits used for cooling. Next to one of the qubits, a warm environment is engineered to serve as a hot thermal bath. The hot thermal bath gives energy to one of the quantum refrigerator's superconducting qubits and powers the quantum refrigerator.

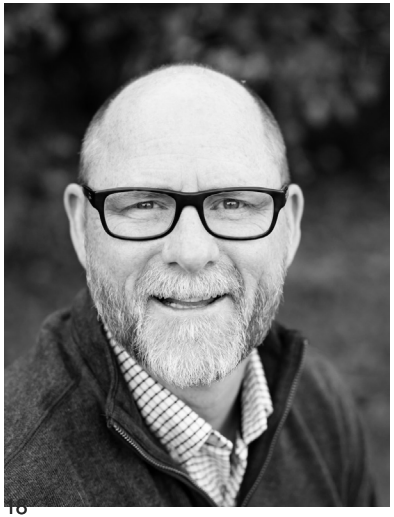
"Energy from the thermal environment, channeled through one of the quantum refrigerator's two qubits, pumps heat from the target qubit into the quantum refrigerator's second qubit, which is cold. That cold qubit is thermalised to a cold environment, into which the target qubit's heat is ultimately dumped," says Nicole Yunger Halpern, NIST Physicist and Adjunct Assistant Professor of Physics and IPST at the University of Maryland, USA.

Method: The technicalities of how it works

The system is autonomous in that once it is started, it operates without external control and is powered by the heat that naturally arises from the temperature difference between two thermal baths.

"Our work is arguably the first demonstration of an autonomous quantum thermal machine executing a practically useful task. We originally intended this experiment as a proof of concept, so we were pleasantly surprised when we found out that the performance of the machine surpasses all existing reset protocols in cooling down the qubit to record-low temperatures," says Simone Gasparinetti, Associate Professor at Chalmers University of Technology and lead author of the study.

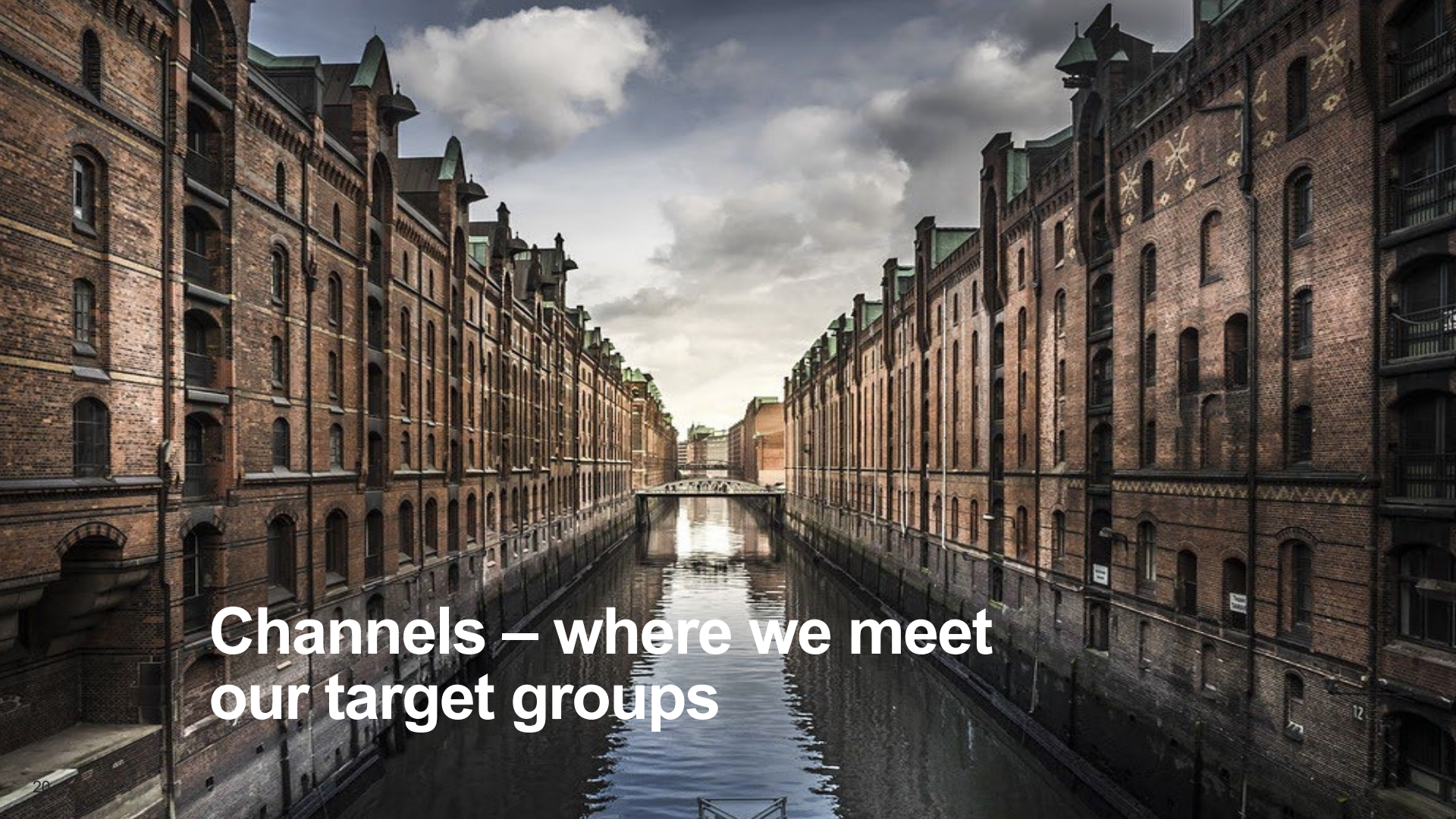
Wrap-up: Emphasizing hook and next step




Target groups

Common university target groups

- Decision-makers & politicians
- Industry & partners
- School children & youth
- Media
- Potential employees
- Funding agencies
- "The general public"



Channels – where we meet our target groups

Common university channels

- Media activities
- Website
- Social media platforms (Instagram, Linkedin, Facebook, Youtube, Twitter/X,)
- Lectures and seminairs
- And more

Note! You can also use your own and others' social channels.

Communication planning

WHAT DO I WANT TO SAY? *(MESSAGE)*	WHO DO I WANT TO SAY IT TO? *(TARGET GROUP)*	HOW DO I REACH THEM? (CHANNEL)


And now, lets practice!

Exercise: Pitch your news story

Background:

Judy Post is an editor at the British daily newspaper The Guardian. Every week, she receives numerous excellent proposals for news articles from researchers who believe their work deserve attention.

Judy Post is highly selective about what she approves for publication. The content that makes it into print must be truly outstanding for the target group.

The readers of the newspaper primarily fall within the age range of 25 – 44 and the majority has a university degree. They are interested in science news, societal development and pursuing lifelong learning.

This is the task:

Select a research projectand its result that you want to communicate to the readers.

*What you need to do now is to craft a **headline and an intro** that are compelling enough to convince Judy Post that your news should be published.*

Thank you!

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