

ON A QUANTUM FUTURE

history and society

28 Maggio 2018
Dalle ore 15.00 alle 18.30
Aula Capitò Ed. 7
Viale delle Scienze

Intervention

Chairman
Prof. Rosario Lo Franco
(Università di Palermo, progetto CORI - Unipa)

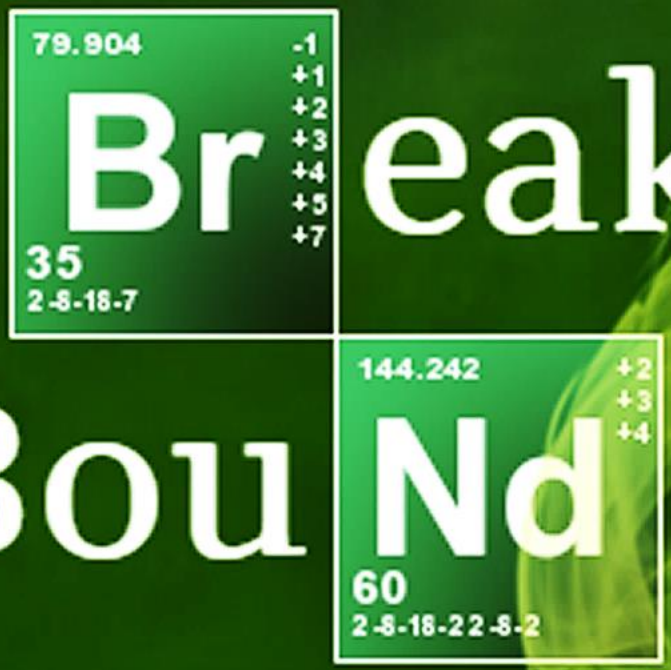
Prof. Andreas Winter
(ICREA, Universitat Autònoma de Barcellona)
"Quantum Correlations:
From Foundations to Technology"

Prof. Gerardo Adesso
(University of Nottingham)
"Breaking boundaries: A quantum journey"

Sponsorizzato dal progetto CORI
(Cooperazione Internazionale per la
formazione e la Ricerca) - Unipa

ON A QUANTUM FUTURE
history and society

Breaking Boundaries



Gerardo Adesso

University of Nottingham
UK | CHINA | MALAYSIA

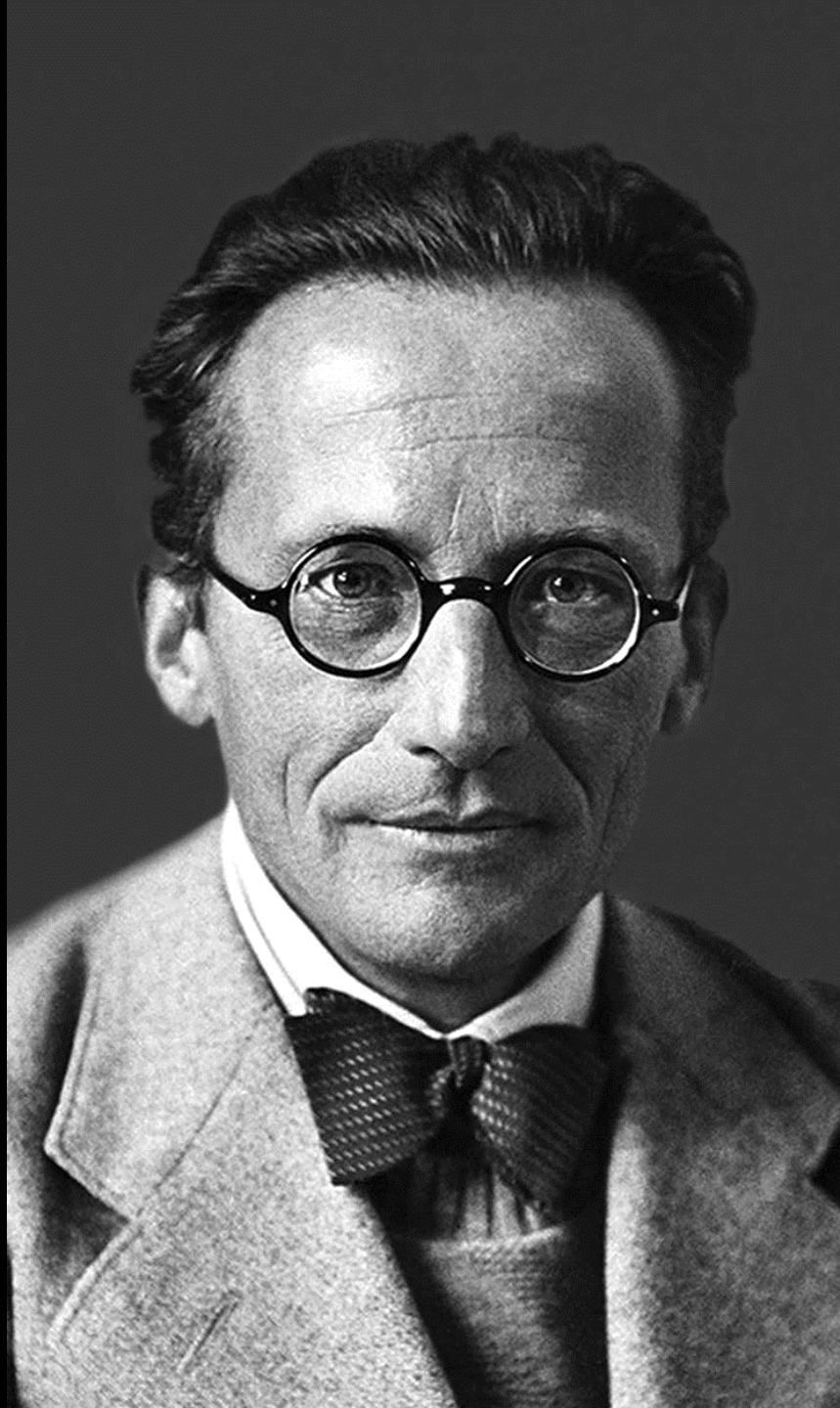
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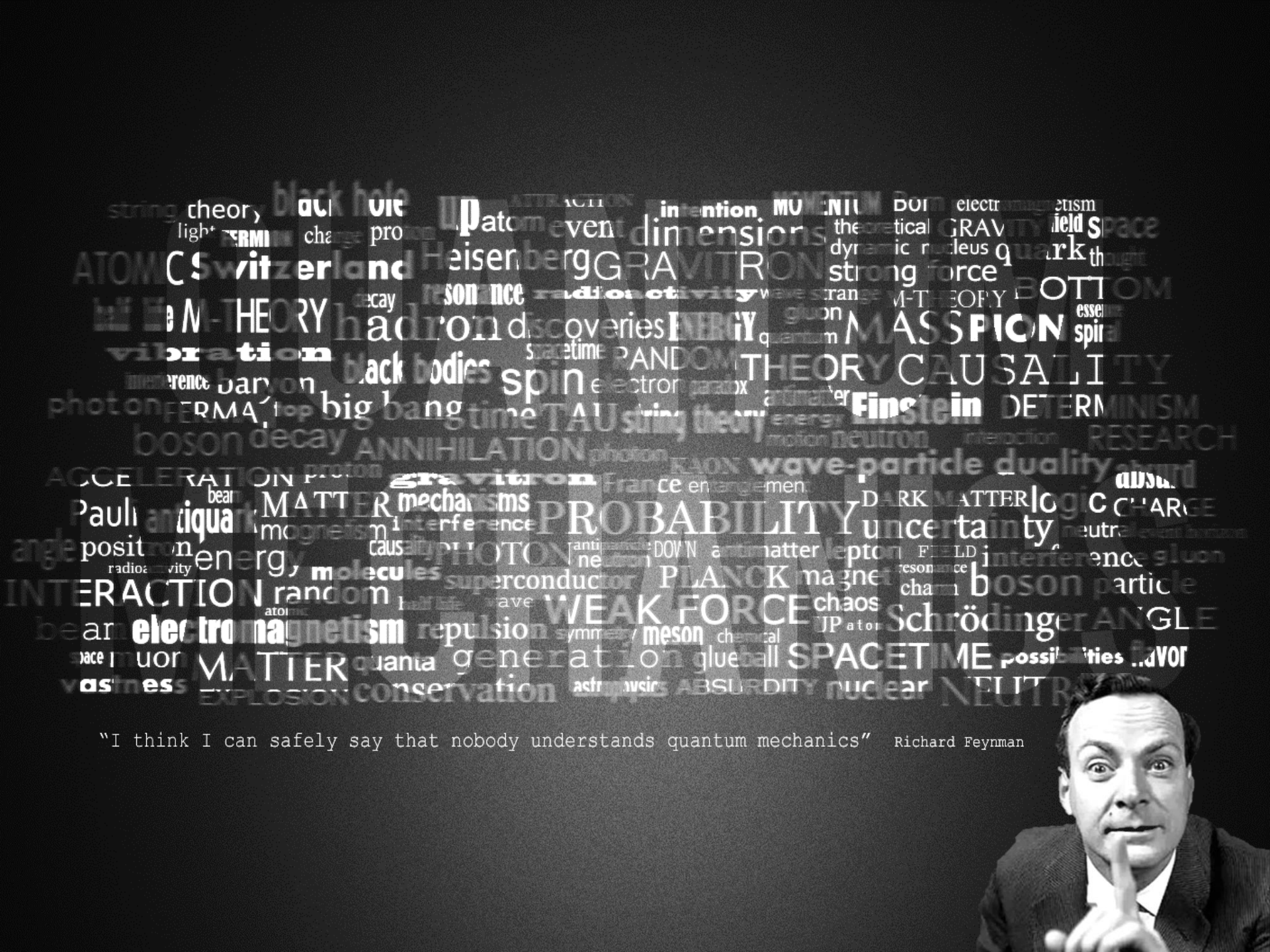


HEISENBERG




WANTED
DEAD & ALIVE
SCHRÖDINGER'S CAT

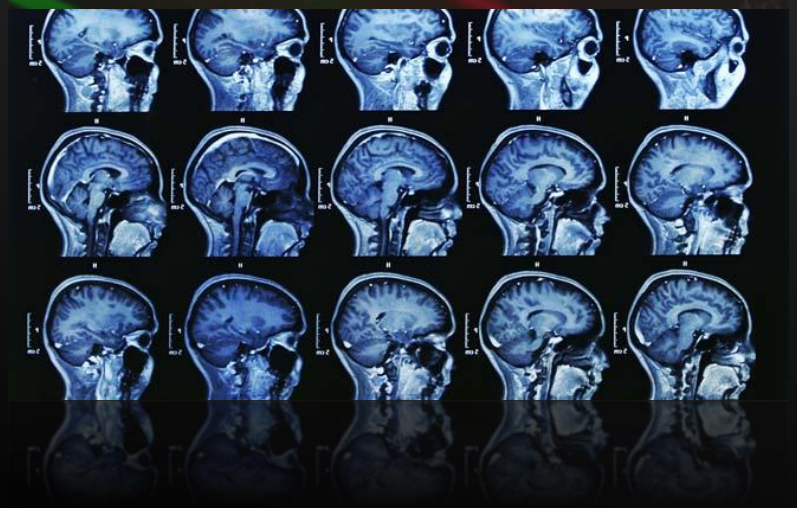


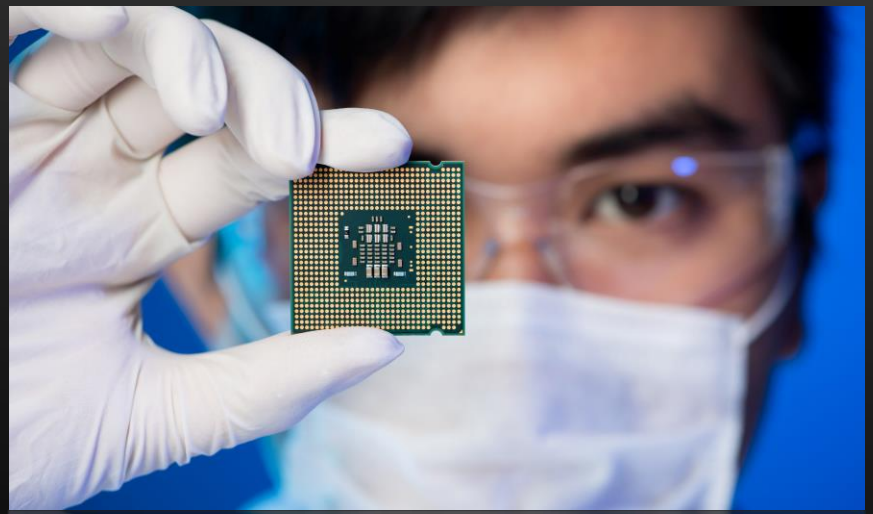

"I think I can safely say that nobody understands quantum mechanics" Richard Feynman

QUANTUM TECHNOLOGIES 1.0

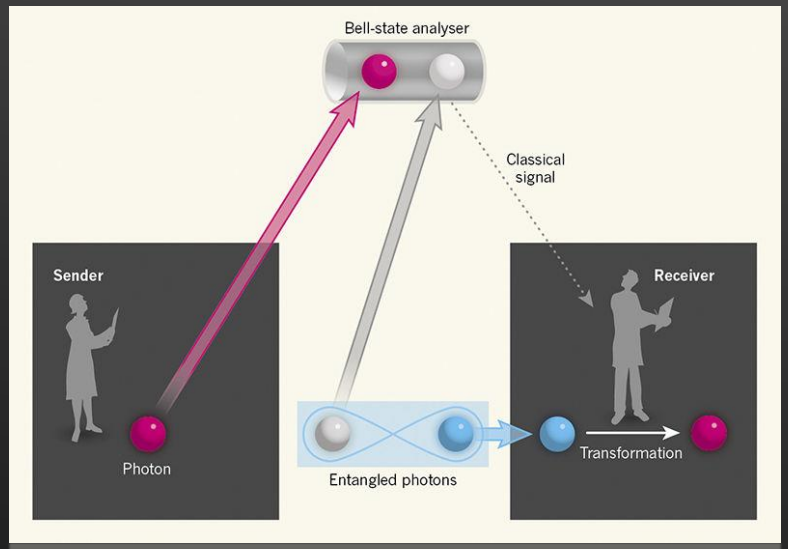


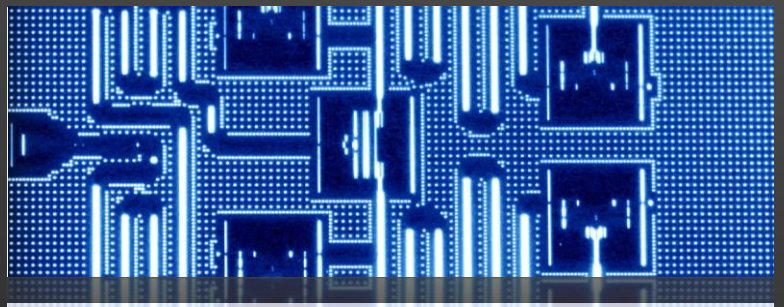


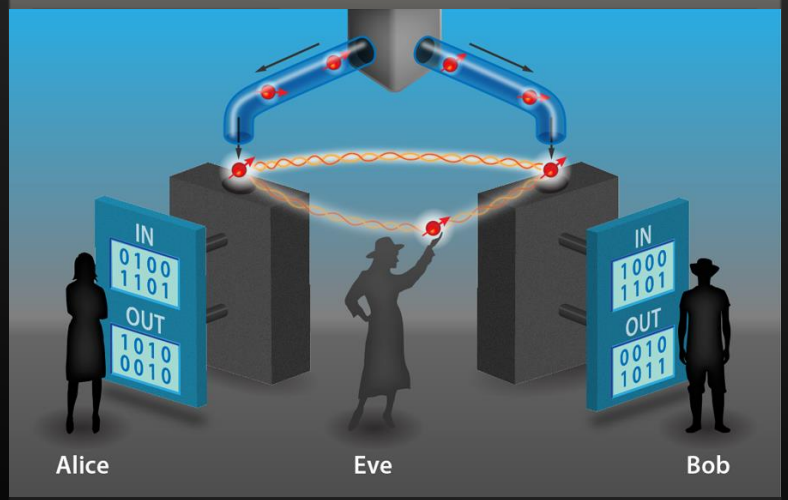


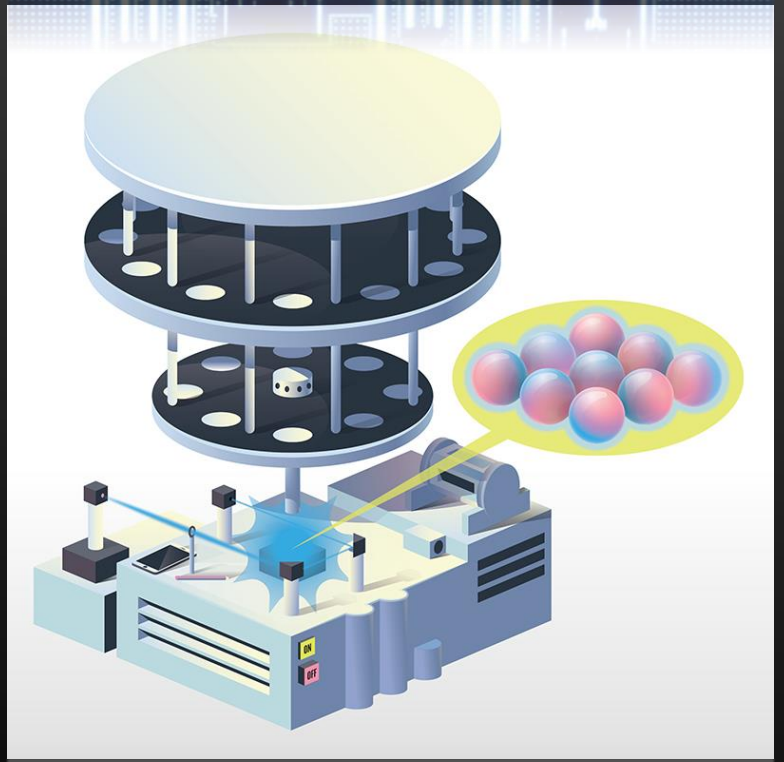


QUANTUM TECHNOLOGIES 2.0

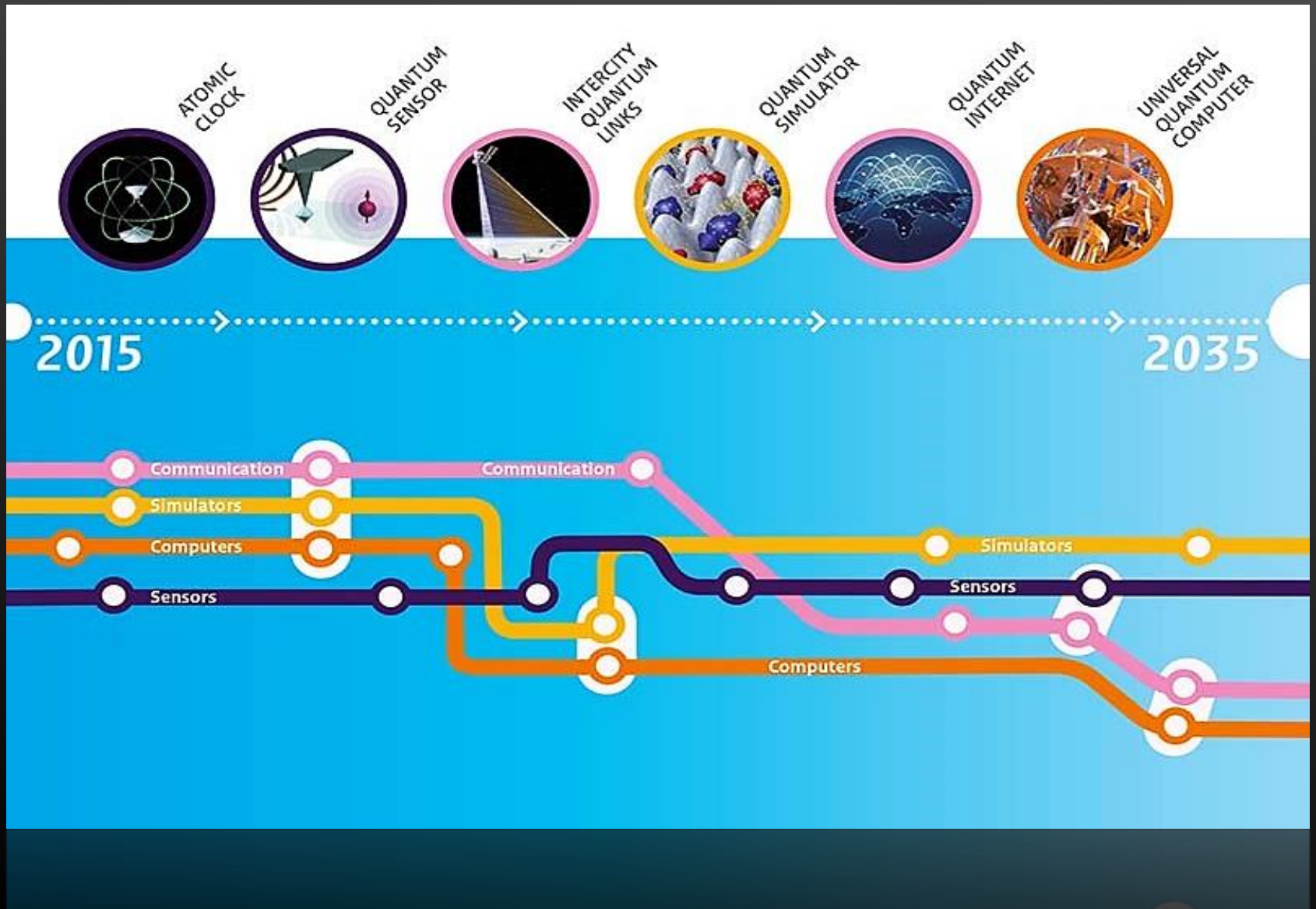


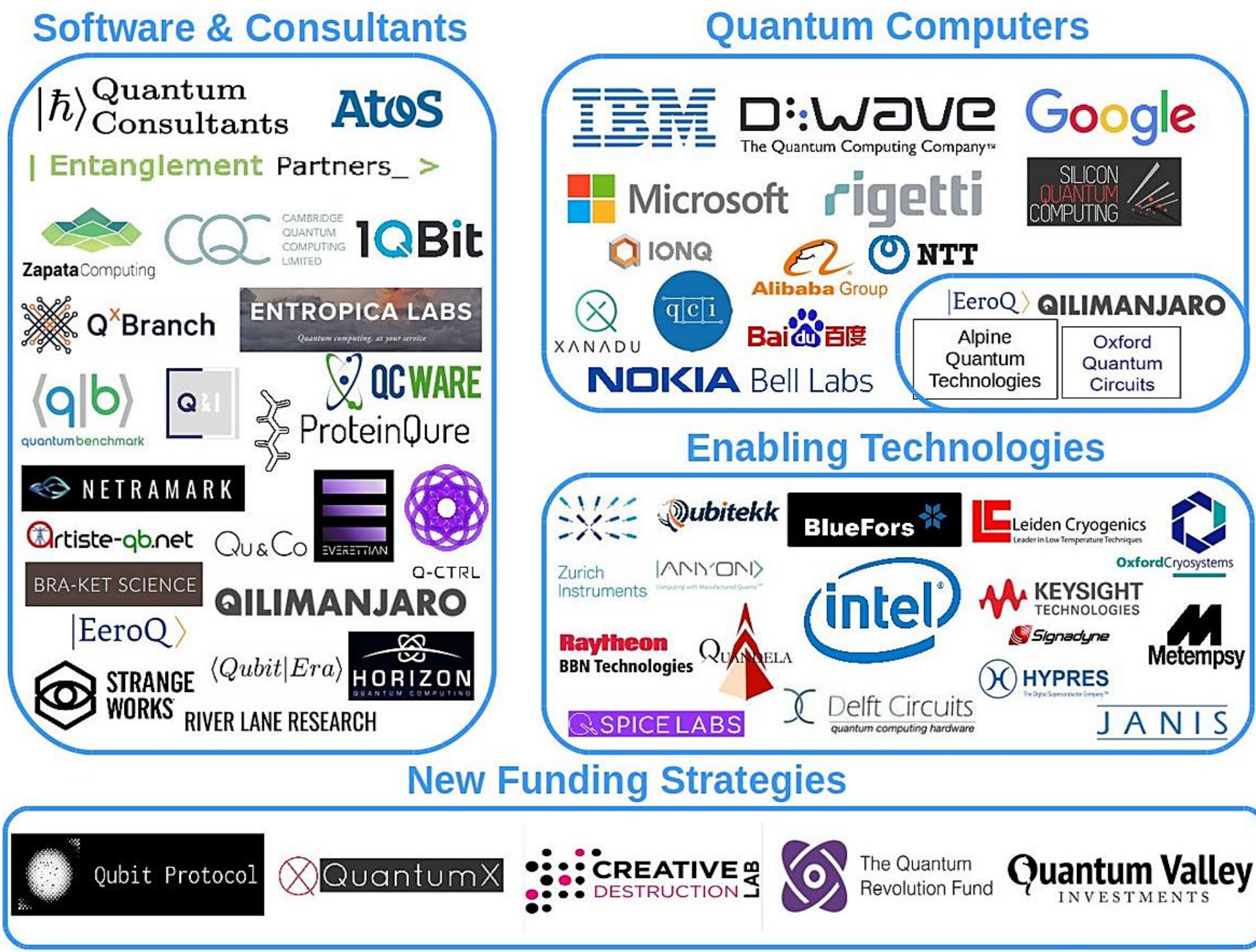






QUANTUM TECHNOLOGIES 2.0




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Quantum Consultants
Atos
Entanglement Partners
Zapata Computing
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CAMBRIDGE QUANTUM COMPUTING LIMITED
1QBit
QXBranch
ENTROPICA LABS
Quantum computing, at your service
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quantumbenchmark
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RIVER LANE RESEARCH
Quantum Computers
IBM
D-Wave
The Quantum Computing Company™
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SILICON QUANTUM COMPUTING
IONQ
NTT
Alibaba Group
XANADU
qci
Baidu 百度
NOKIA Bell Labs
EeroQ
QILIMANJARO
Alpine Quantum Technologies
Oxford Quantum Circuits
Enabling Technologies
Qubitekk
BlueFors
Leiden Cryogenics
Leader in Low Temperature Techniques
OxfordCryosystems
Zurich Instruments
ANYON
intel
KEYSIGHT TECHNOLOGIES
Signadyne
Metempsy
Raytheon BBN Technologies
QUANTELA
HYPRES
Delft Circuits
quantum computing hardware
SPICE LABS
JANIS
New Funding Strategies
Qubit Protocol
QuantumX
CREATIVE DESTRUCTION LAB
The Quantum Revolution Fund
Quantum Valley INVESTMENTS

WHY QUANTUM?




A STEP BACK

ENTANGLEMENT

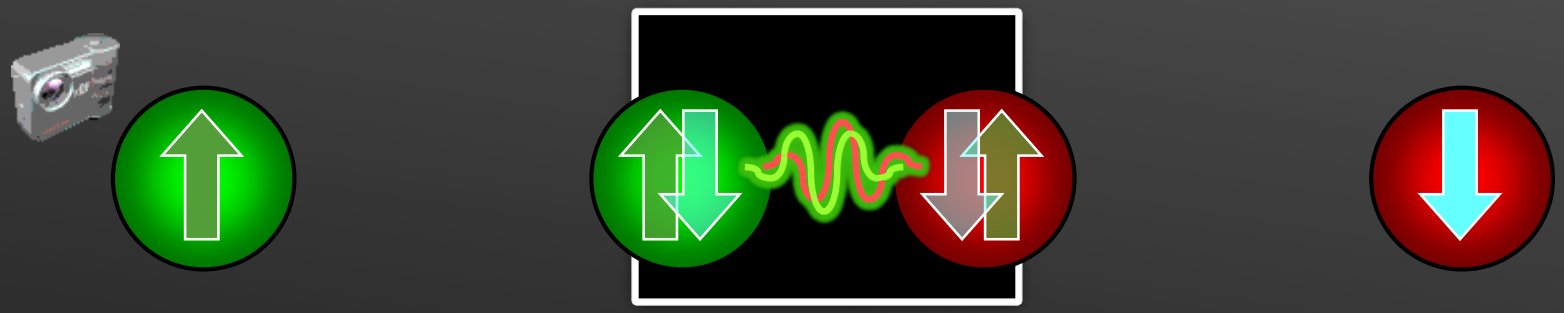


Pamela Ott *"Entanglement"* 58x71cm (1999)

1999-2003 Physics MSc
University of Salerno, IT



ENTANGLEMENT



When two systems come to interact…

…a form of quantum correlation may arise between them…

…which persists even when the two systems are separated away.

Performing a local measurement on the first system…

…then the quantum state of the second is automatically determined.

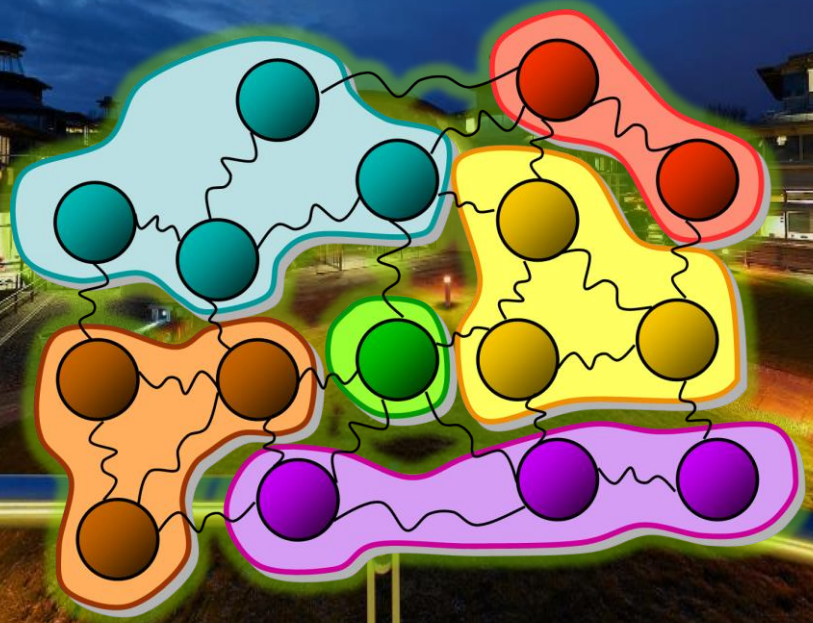
This non-local and non-classical correlation is known as **quantum entanglement**

⇒ The two systems are non-separable

© GA 2003

2003-2007 Physics PhD
Salerno & Cambridge

"Entanglement of Gaussian states"



© D. Oi

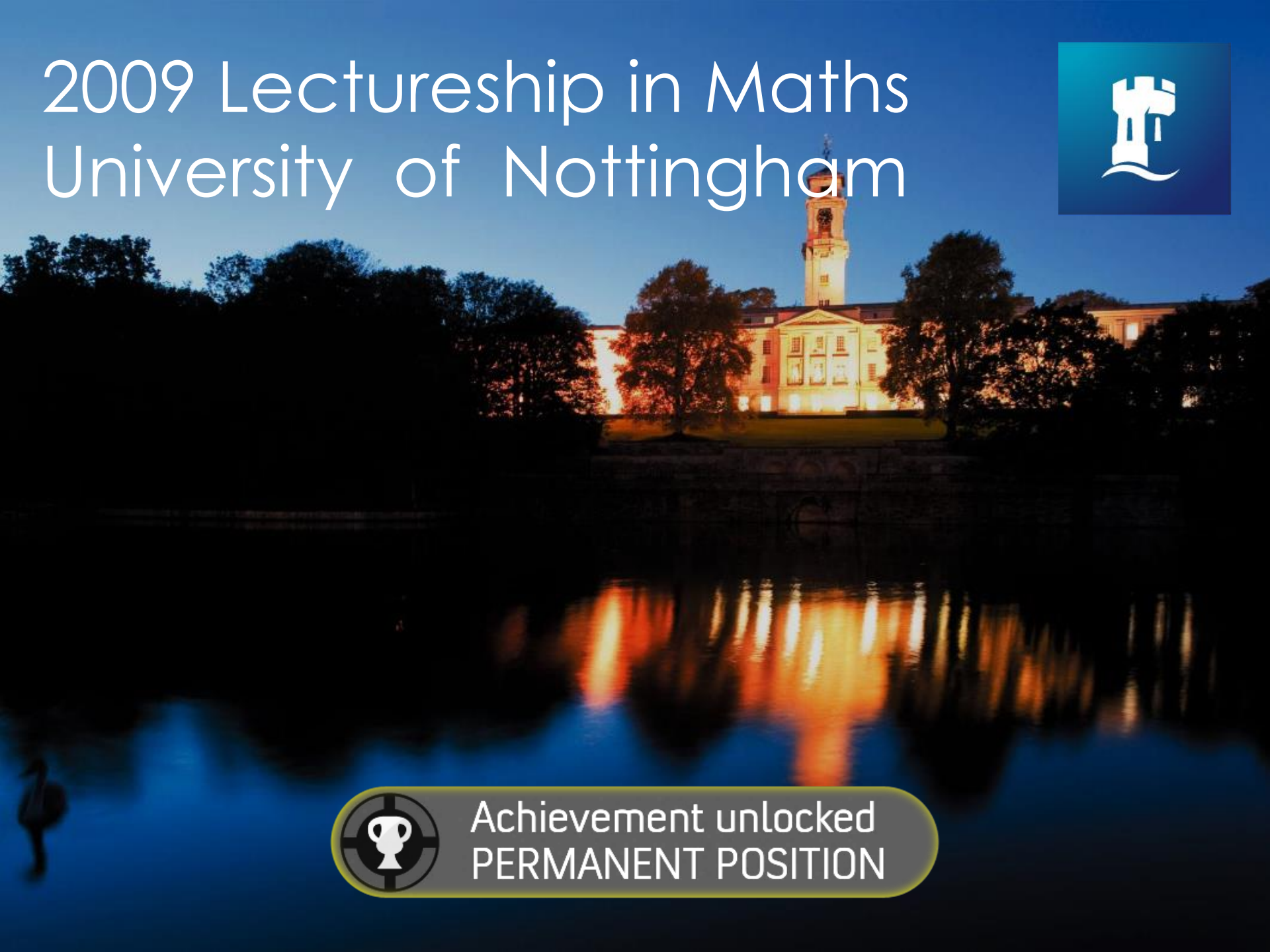
2005 Samanta



2007 Giovanni



2009 Lectureship in Maths
University of Nottingham



WHAT NEXT?



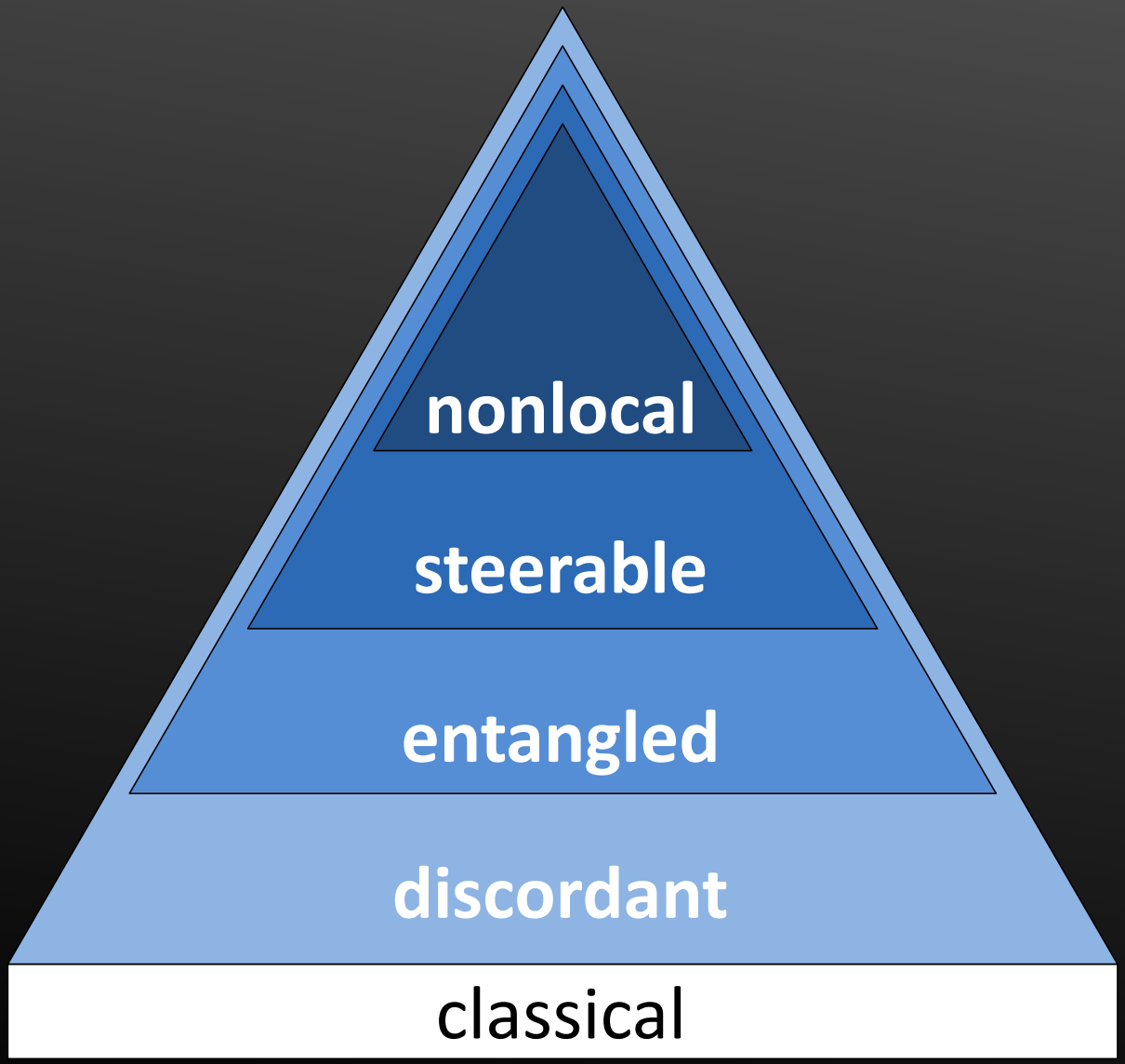
THE BORDER TERRITORY



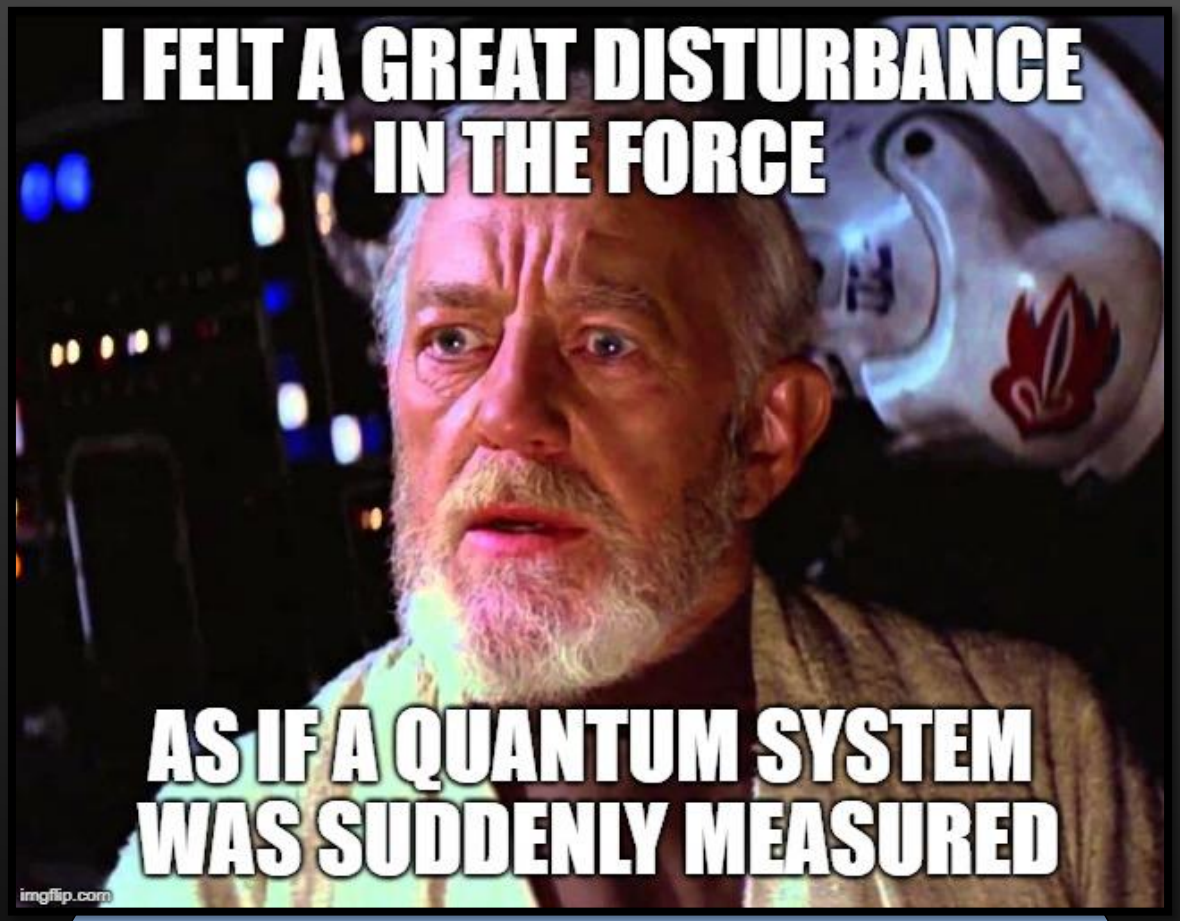
1 SIZE (# OF ATOMS) 10^{23}

© W. H. Zurek

THE MANY SHADES OF QUANTUM



THE MANY SHADES OF QUANTUM

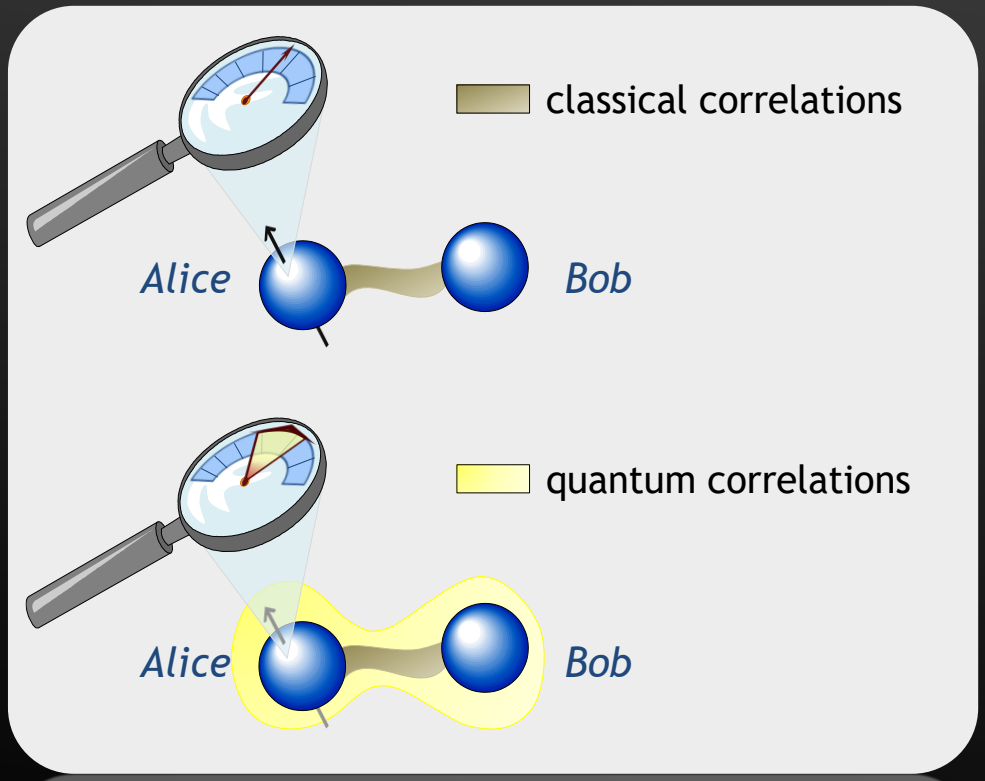


discordant

classical

QUANTUM CORRELATIONS BEYOND ENTANGLEMENT

Even if two systems do not share entanglement (e.g. in highly noisy conditions) we can detect **quantumness in their correlations**: this is revealed e.g. as an unavoidable **uncertainty** on local measurements



Schroedinger's rat

Thursday, 18 October 2012

Research lines that lead nowhere (I): Quantum Discord

The Quantum Pontiff

A College of Quantum Cardinals



Pop goes the discord bubble

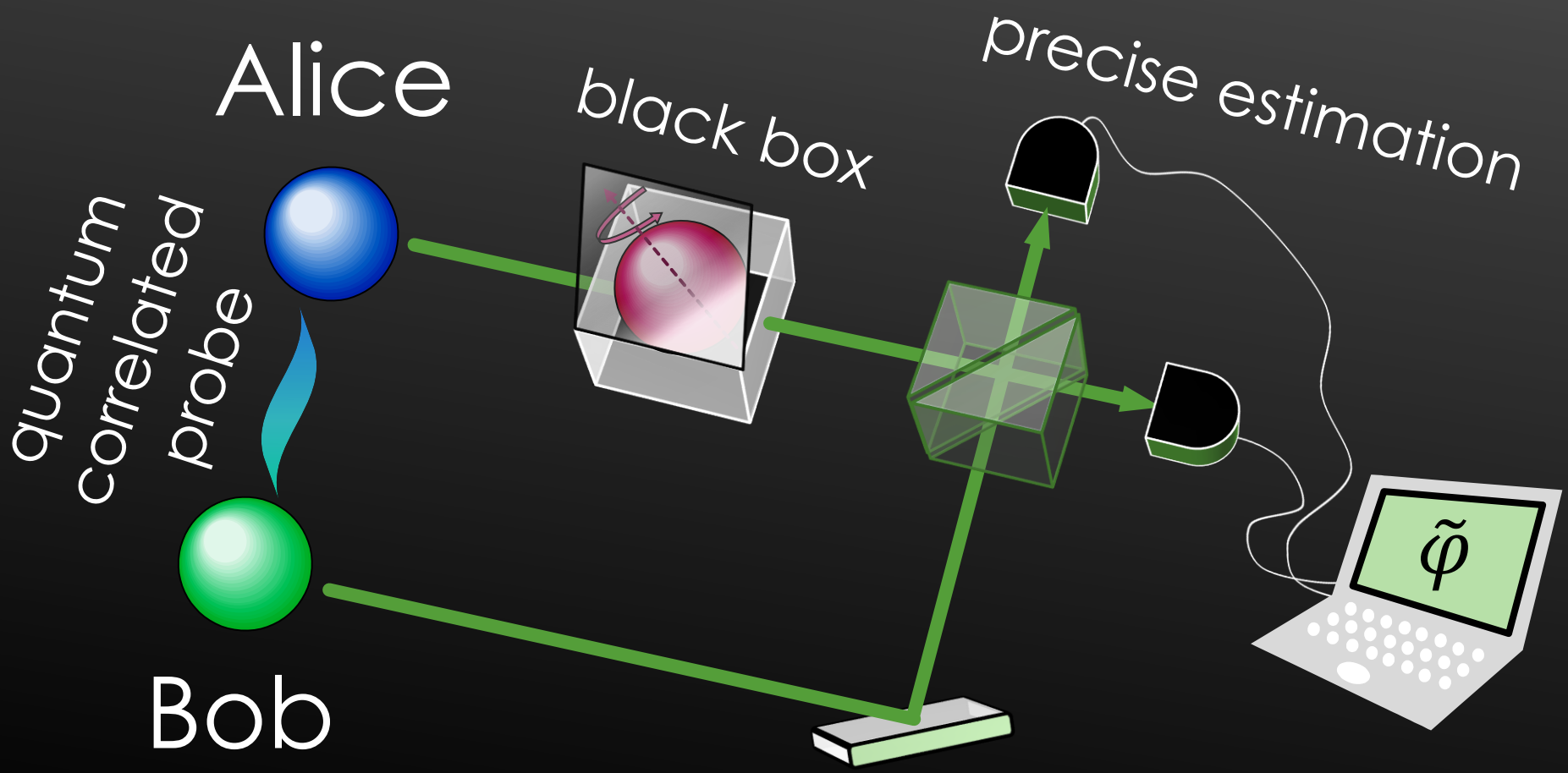
Posted on December 31, 2012 by sflammia

Reflections on the Discord Bubble

Posted on April 8, 2013 by sflammia

The following is a guest post by Marco Piani.

QUANTUM METROLOGY

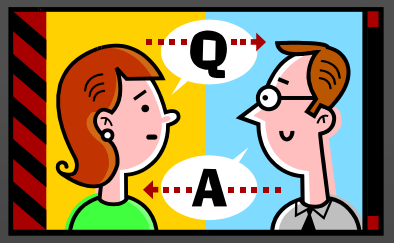


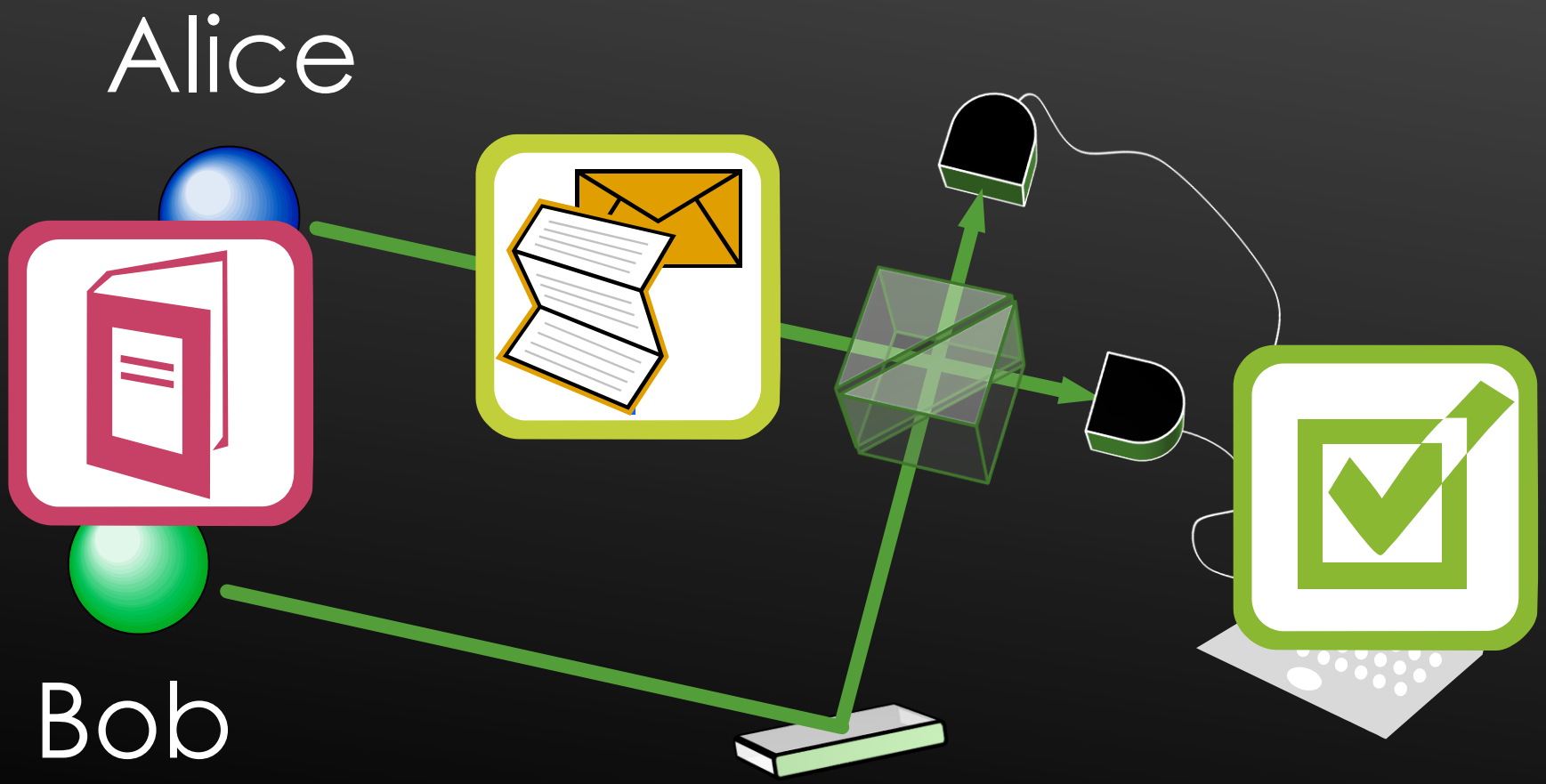
PHYS.ORG

Physics | Nanotechnology | Earth | Astronomy & Space | Chemistry | Biology | Technology | Other Scie

Home » Physics » Quantum Physics » May 16, 2014

Quantum correlations make you never fail a test again

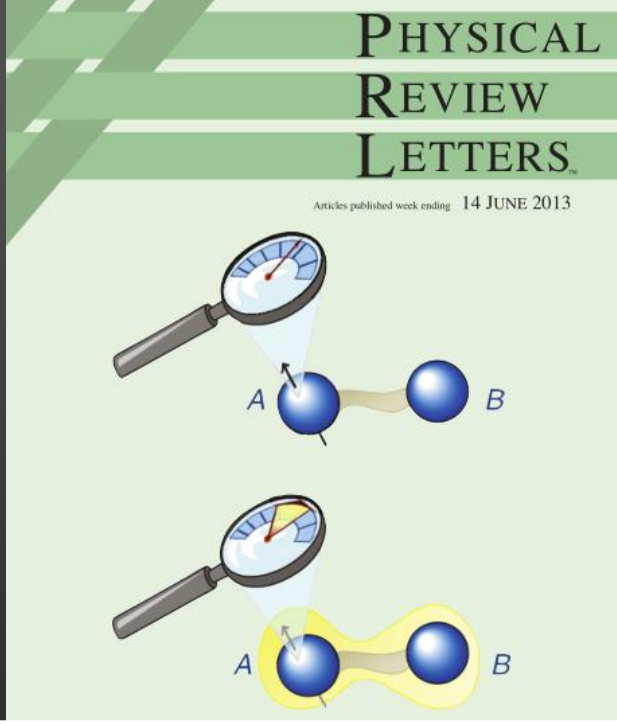




That led somewhere…

QUANTUM

CLASSICAL



2013 FQXi Foundational Questions Institute

2014 erc European Research Council Established by the European Commission

2015 The Royal Society

2016 FQXi Foundational Questions Institute

2014 Reader
2016 Professor

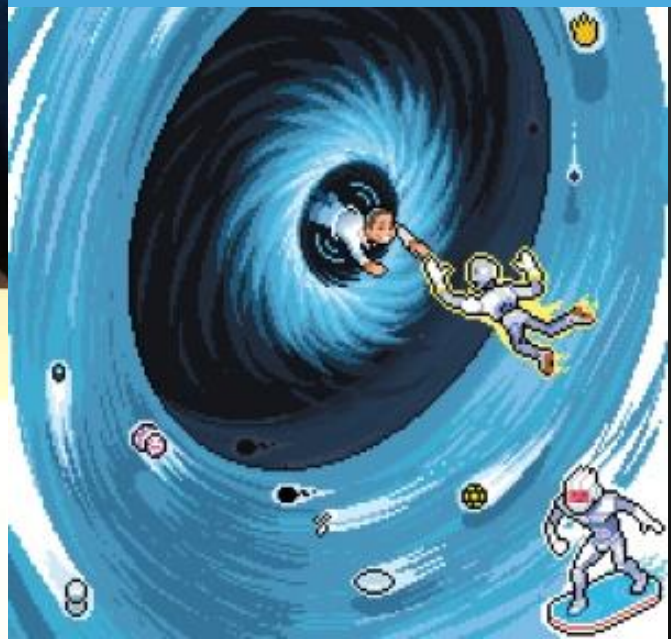


2016

Let researchers try new paths

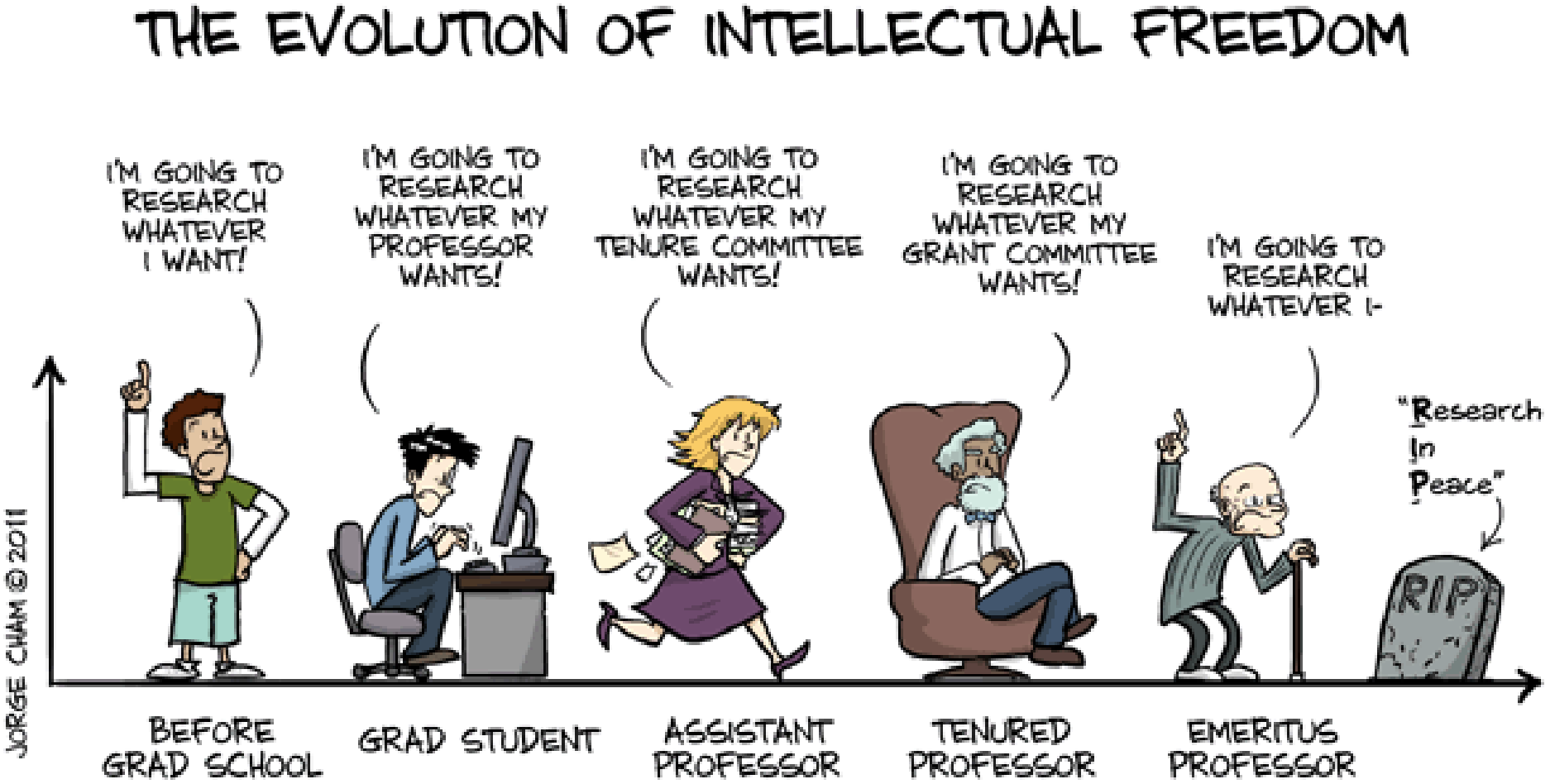






ADESSO

BREAK BOUNDARIES IN ACADEMIA!





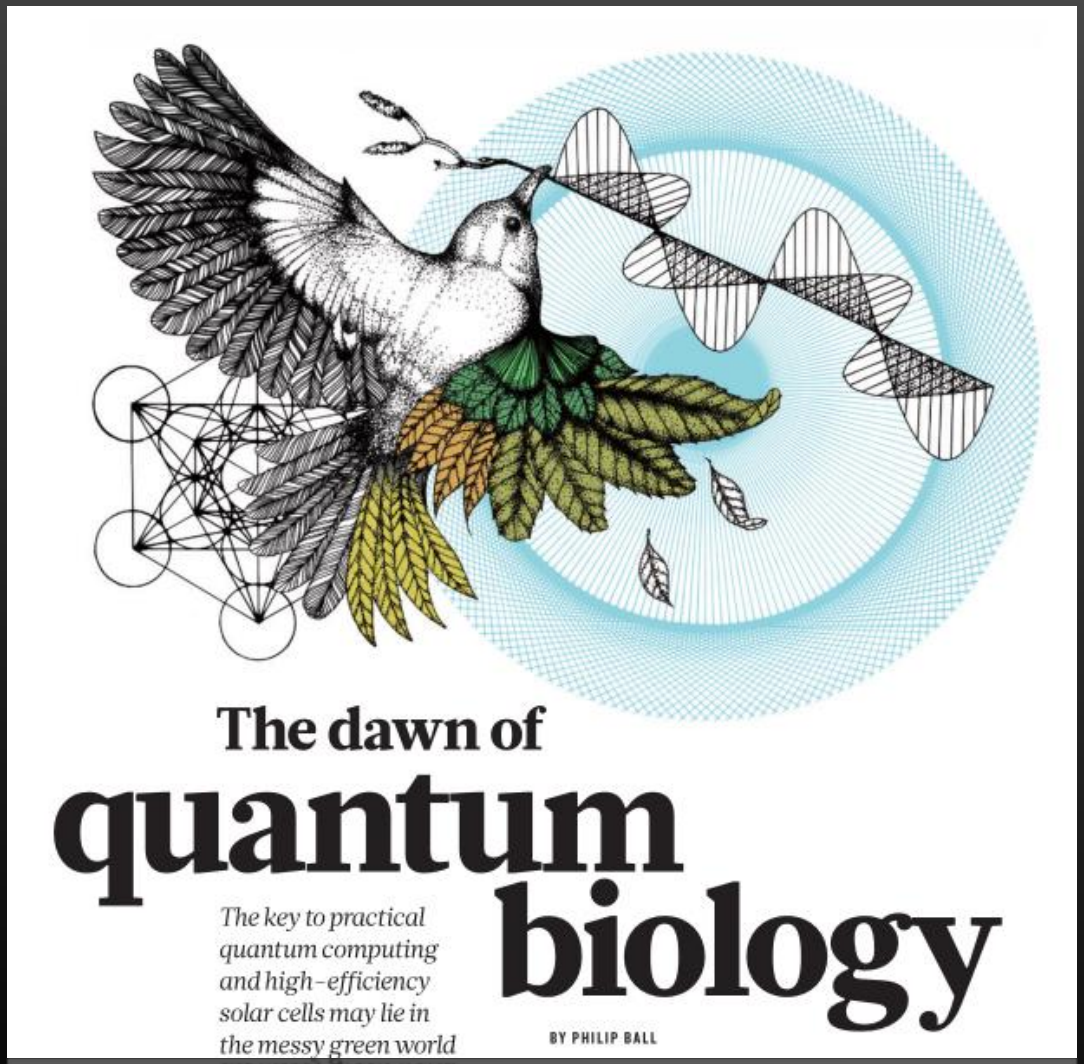
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history and society

QUANTUM THERMODYNAMICS

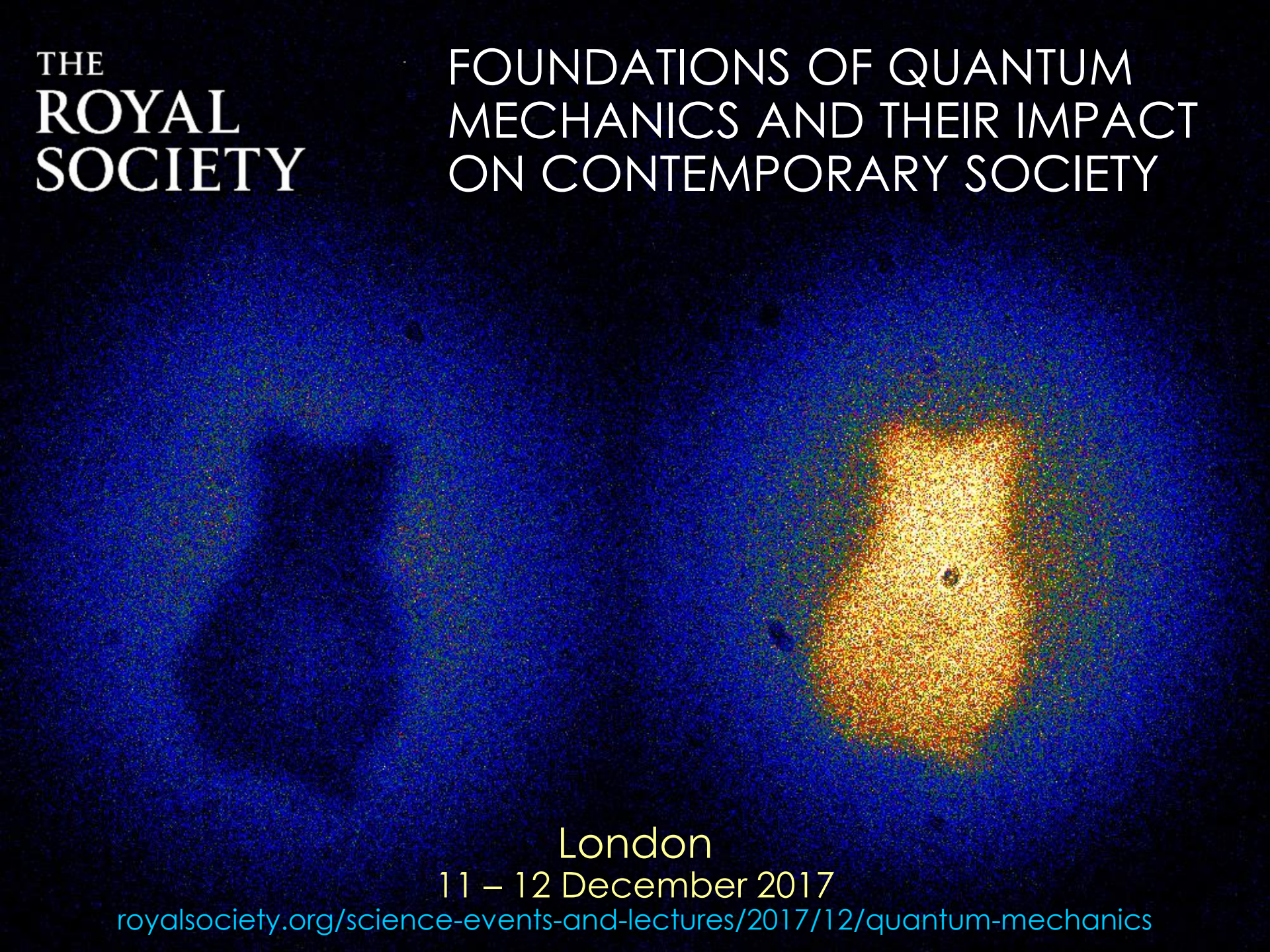


QUANTUM BIOLOGY



THE ROYAL SOCIETY

FOUNDATIONS OF QUANTUM MECHANICS AND THEIR IMPACT ON CONTEMPORARY SOCIETY



London

11 – 12 December 2017

royalsociety.org/science-events-and-lectures/2017/12/quantum-mechanics

THE ROYAL SOCIETY

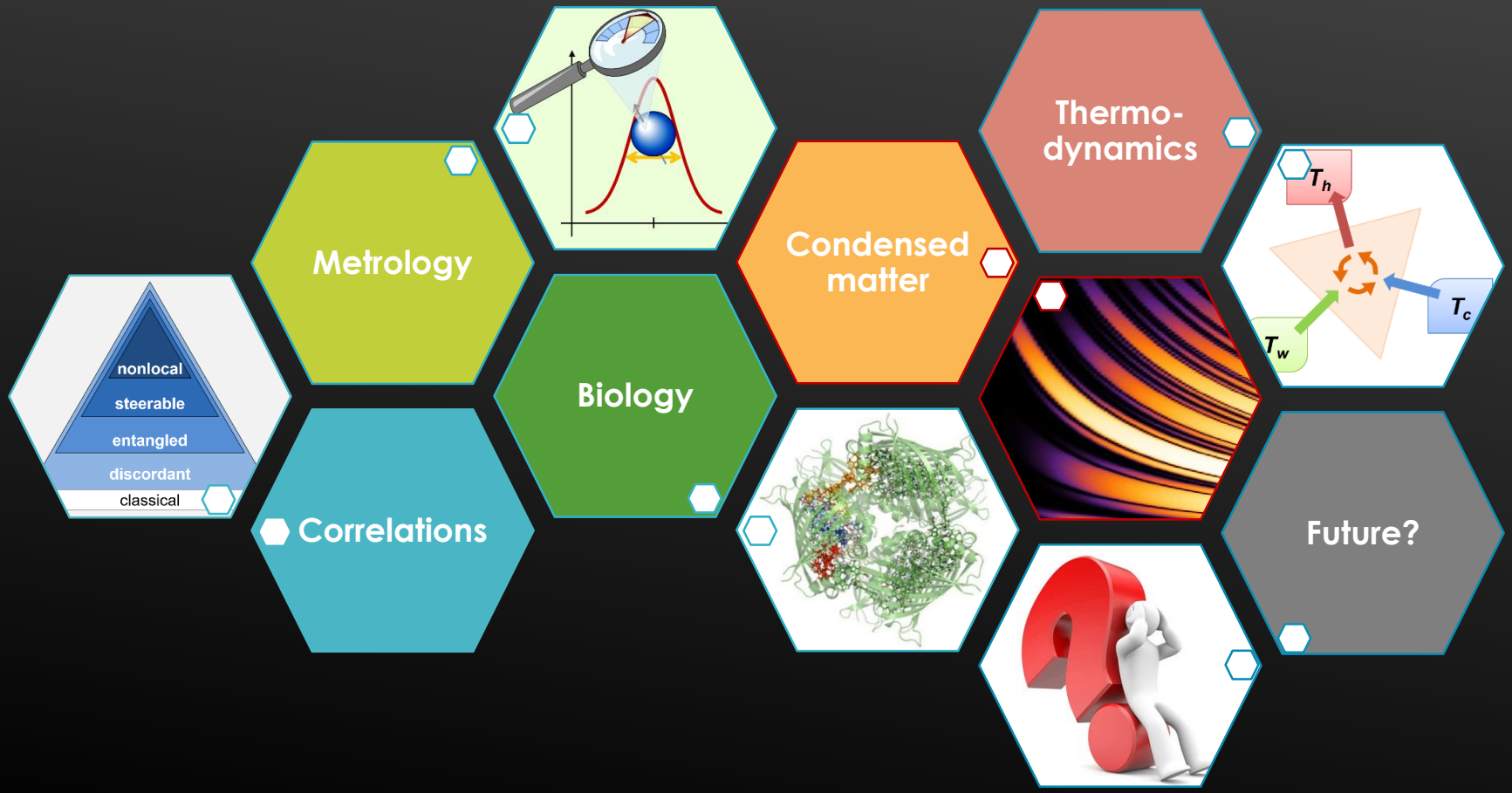
FOUNDATIONS OF QUANTUM MECHANICS AND THEIR IMPACT ON CONTEMPORARY SOCIETY



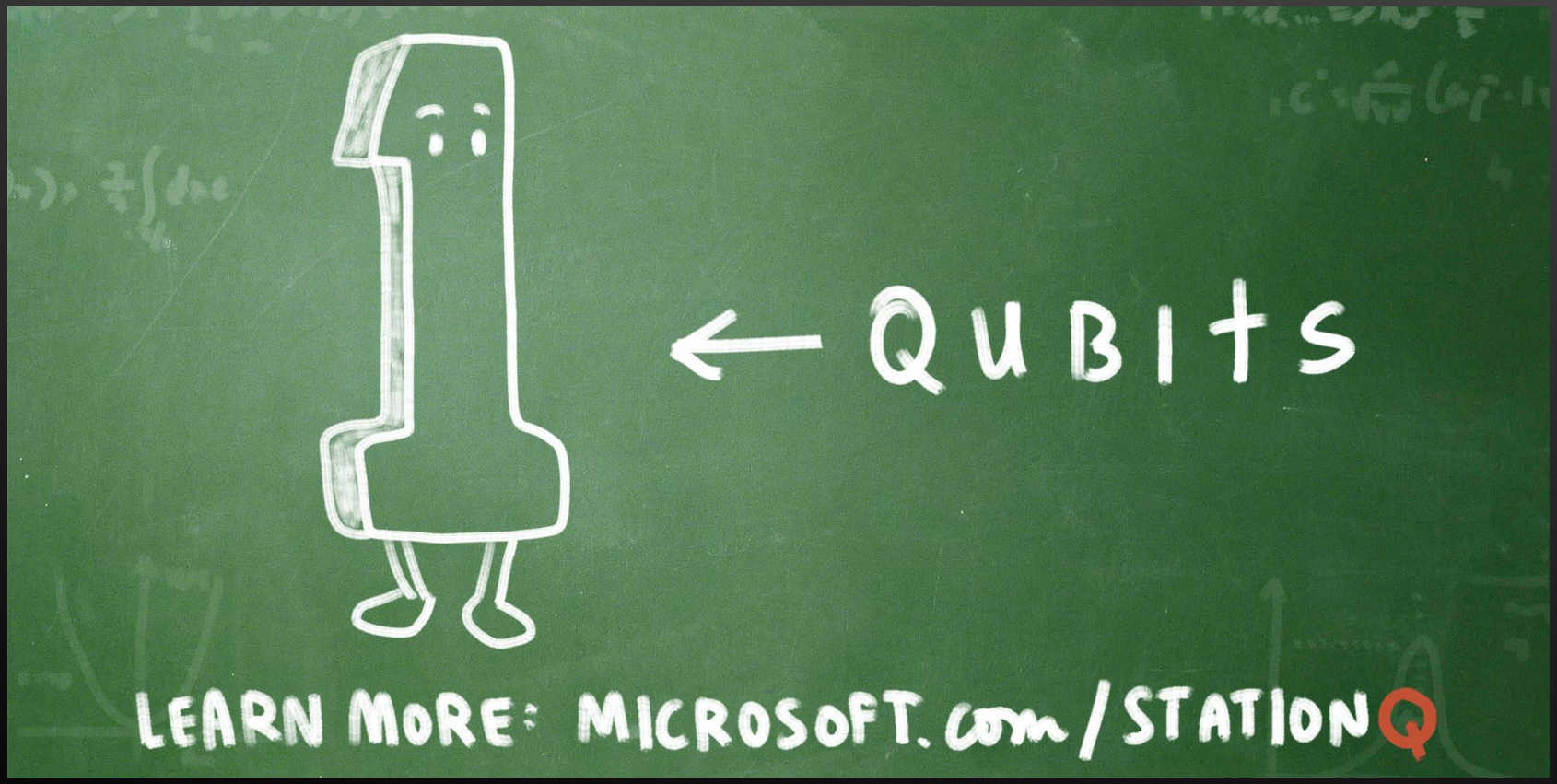
THE ROYAL SOCIETY

Foundations of quantum mechanics and their impact on contemporary society

QUANTUM RESEARCH PUSHES BOUNDARIES OF SCIENCE, TECHNOLOGY & SOCIETY



NEXT REVOLUTION: JUST A QUANTUM BIT AWAY?

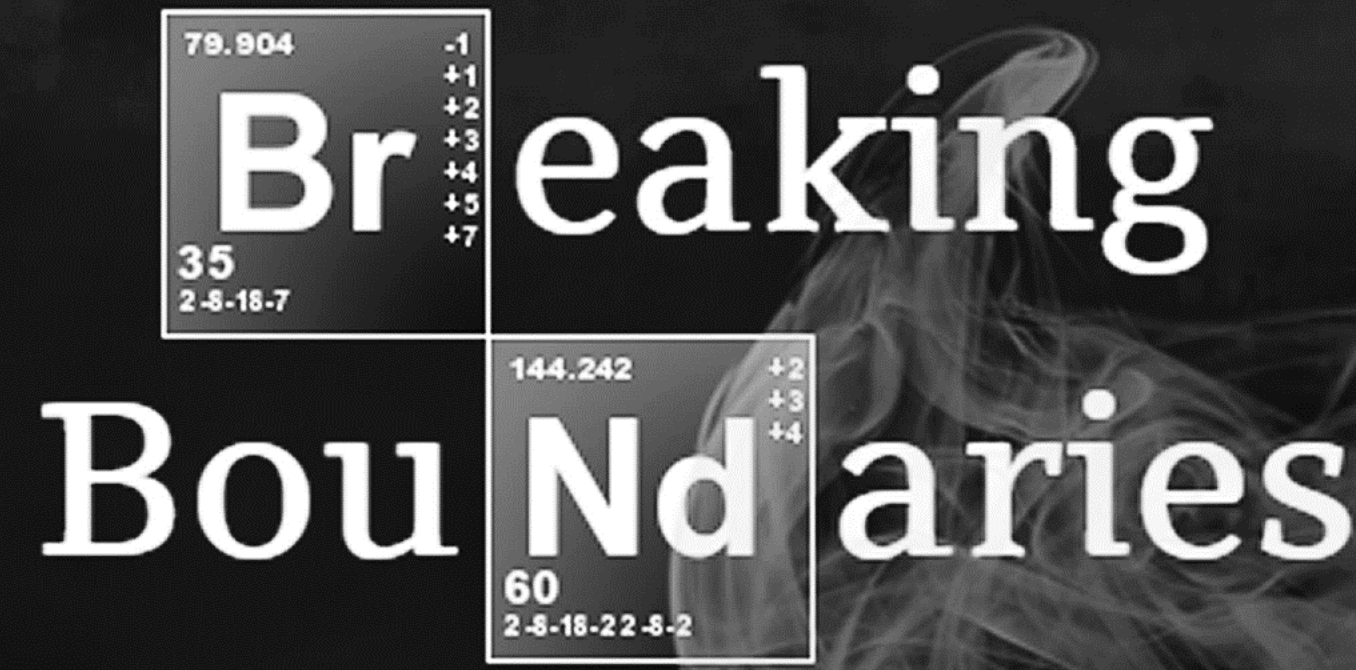




Pamela Ott "Entanglement"
March 1999

Gifted to Gerardo Adesso 2017

THANK YOU



quantumcorrelations.weebly.com