Introduction

Quantum Computing for High Energy Physics Workshop

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November 5th & 6th 2018

Welcome!!

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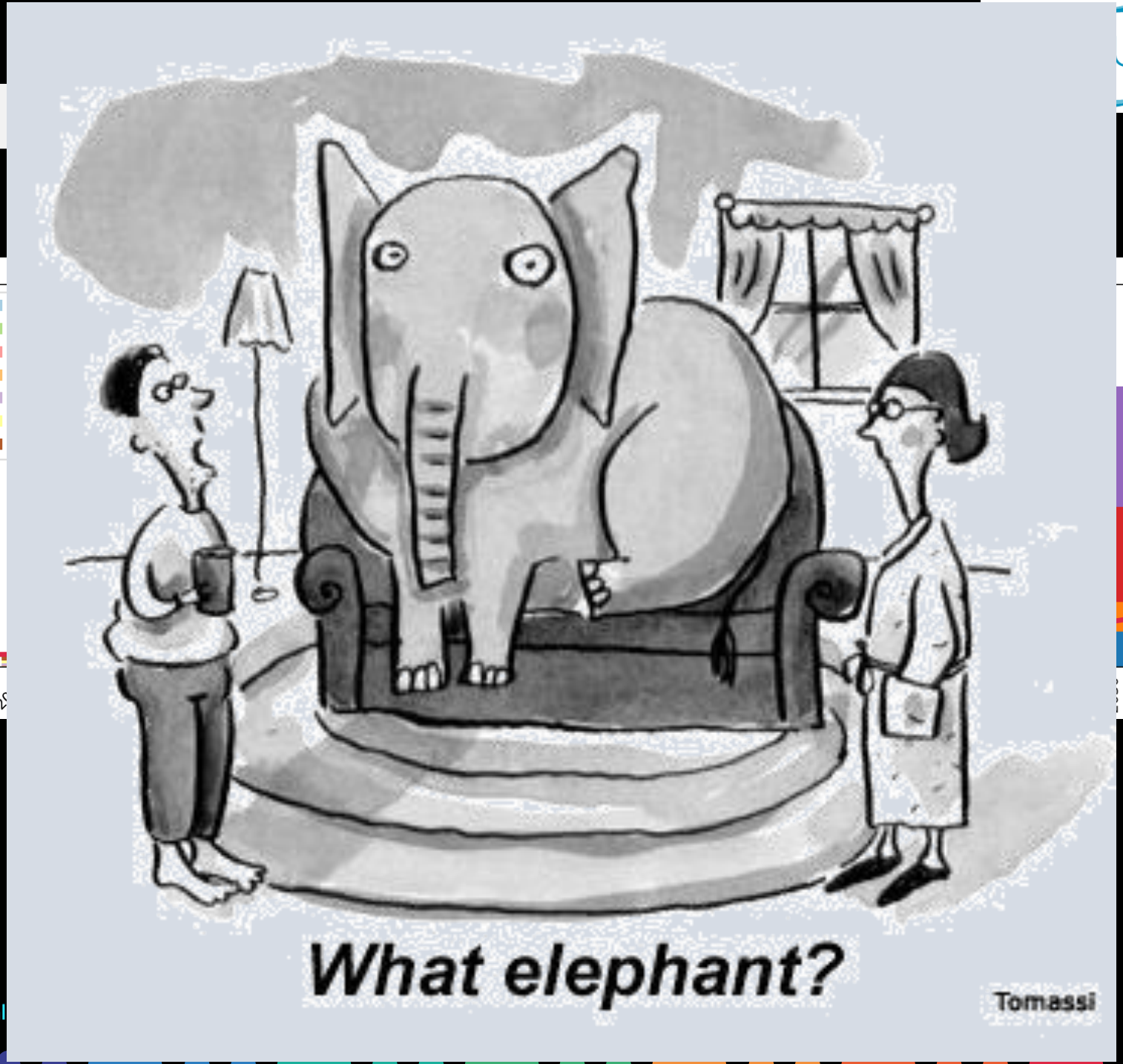
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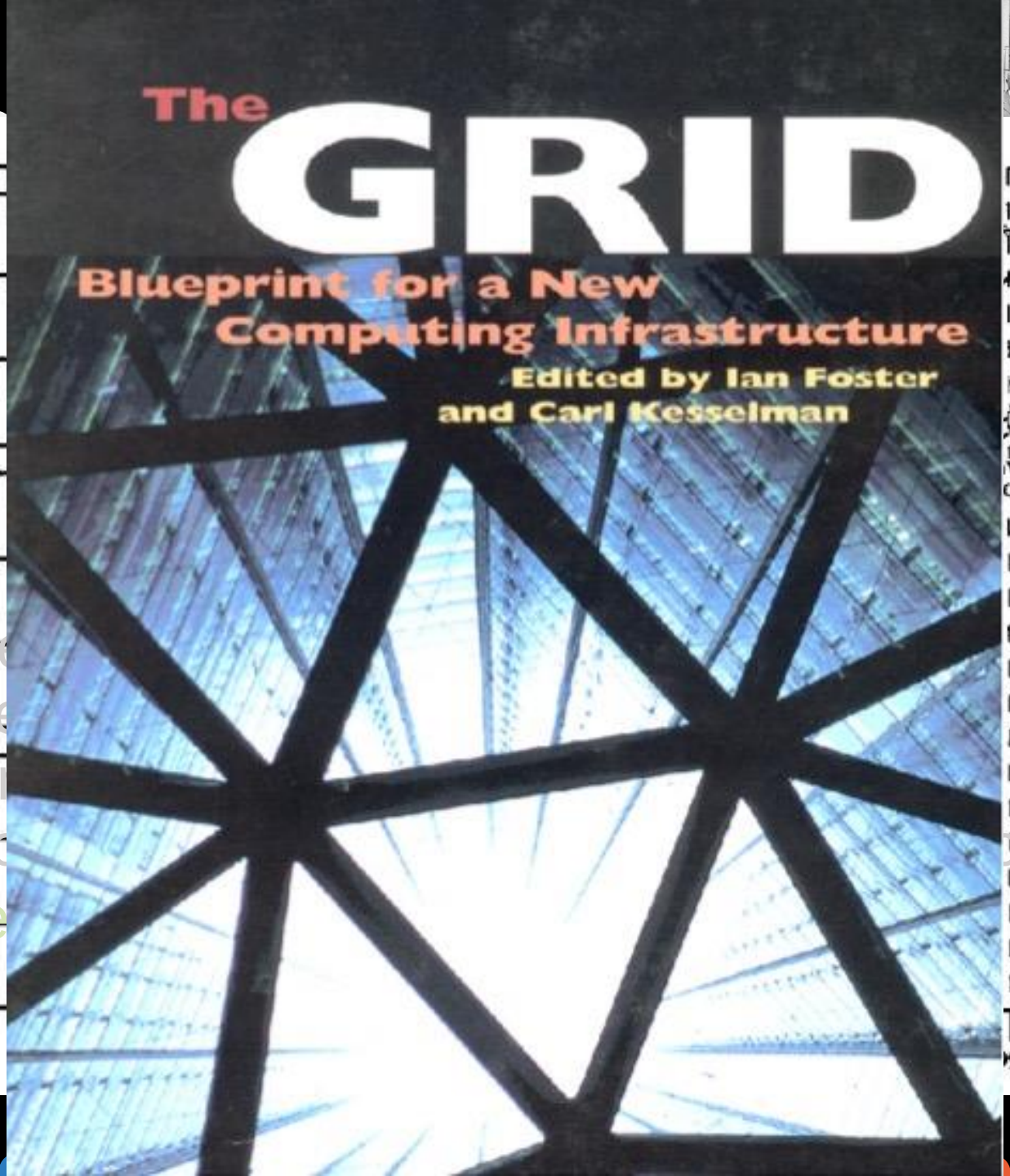

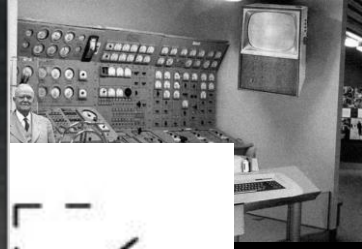

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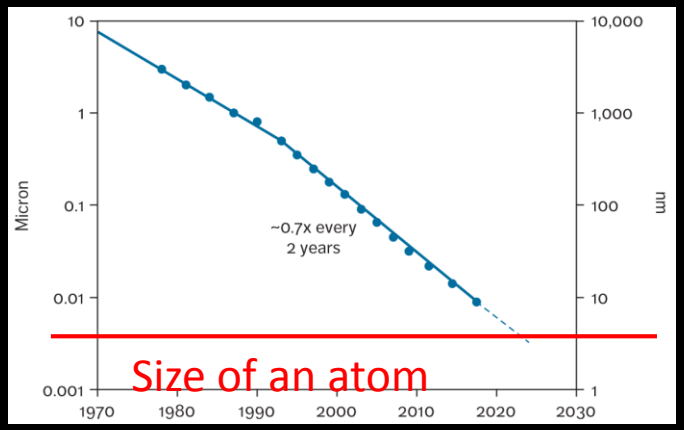
Moral

- HEP has regularly faced ICT “requirement walls”
- We have been very good to “seize opportunities” and turn emerging technologies into production facilities
- This has also provided a productive dialogue with the ICT community
- One essential element is to have people already investigating the field, i.e. the “seeds” of competence
- The only question is who will be the next “savior(s)”

Quantum Computing ?



"Nature is quantum, goddamn it! So if we want to simulate it, we need a quantum computer."
R.Feynman, 1981, Endicott House, MIT

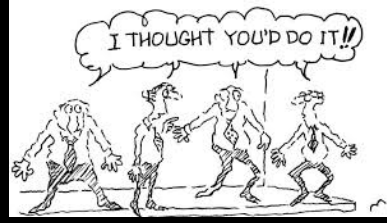
Is Quantum Computing a natural consequence of Moore's law?

- Short distance -> High Energy Physics
- Long distance -> Cosmology
- Entanglement (i.e. complexity) -> Quantum Information Technology
- QC makes the "hardness" of a problem dependent on the physical apparatus used

Just for the skeptical

- I think there can be a world market for maybe five computers. (Thomas Watson, CEO of IBM, 1943)
- There is no reason for an individual to have a computer at home . (Ken Olsen , president, director and founder of Digital Equipment Corp., 1977)
- I think that this thing that Tim (Berners-Lee) has shown me has no future (F.Carminati, 1989)

CERN openlab role



Industry

HEP Community

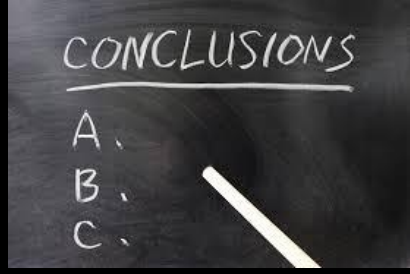
CERN openlab

I(Q)CT experts

Research paths in QC

- Access emulators and simulators to assess development tools, languages and APIs and develop proof-of-concept algorithms for HEP
- Access to real devices, benchmark, compare results
- Understand the role that HEP community can play as part of broader QC development initiatives

Conclusions



- Quantum computing seems to be behind the curve (but how far?)
- Potentially it could provide substantial benefits to our field
- It is the right time for HEP to get involved and liaise with the different initiatives already underway
- CERN openlab has a long and successful experience of engaging with industry to bring new technologies to HEP