The Age of Computation is yet to Come

Artur Ekert

University of Oxford, UK

artur.ekert@maths.ox.ac.uk

The theory of classical universal computation was laid down in 1936, it was implemented within a decade, became commercial within another decade, and dominated the world's economy half a century later. The unavoidable step to the quantum level promises entirely new modes of computation that do not have classical analogues. At present it is not clear when, how and even whether fully-fledged quantum computers will eventually be built; but notwithstanding this, the quantum theory of computation already plays a much more fundamental role in shaping our world-view than its classical predecessor ever did. But what if the theory is eventually refuted—if some deeper limitation foils the attempt to build a scalable quantum computer? I would be thrilled to see that happen. Such an outcome is by far the most desired one. Not only would it lead to a revision of our fundamental knowledge about physics, we would expect it to provide even more fascinating types of computation. For if something stops quantum mechanics, we shall expect to have an exciting new whatever-stops-quantum-mechanics theory, followed by exciting new whatever-stops-quantum-computers computers. From this perspective it appears as though the age of computation has not yet even begun!