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**George E. Pake Prize Lecture: Physical Sciences Research at IBM: Still at the Cutting Edge**

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The information technology revolution is in its “build out” phase. The foundational scientific insights and hardware inventions are now many decades old. The microelectronics industry is maturing. An increasing fraction of the total research investment is in software and services, as applications of information technology transform every business and every sector of the public and private economy. Yet IBM Research continues to make substantial investments in hardware technology and the underlying physical sciences. While some of this investment is aimed at extending the established transistor technology, an increasing fraction is aimed at longer-term and possibly disruptive research – new devices for computing, such as tunneling field-effect transistors and nanophotonic circuits, and new architectures, such as neurosynaptic systems and quantum computing. This research investment is a bet that the old foundations of information technology are ripe for reinvention. After all, today’s information technology devices and systems operate far from any fundamental limits on speed and energy efficiency. But how can IBM make risky long-term research investments in an era of global competition, with financial markets focused on the short term? One important answer is partnerships. Since its early days, IBM Research has pursued innovation in information technology and innovation in the ways it conducts the business of research. By continuously evolving new models for research and development partnerships, it has extended its global reach, increased its impact on IBM’s customers, and expanded the breadth and depth of its research project portfolio. Research in the physical sciences has often led the way.

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