
FOREWORD

The New York Times, in a front-page article in its September 17, 1997, issue declared that "... Moore's Law, a long-standing axiom of the computer age, is no longer true"; concluding that "Powerful innovation in chip design could speed obsolescence of today's computers." That announcement heralded a new development which in effect altered the basic physics of computer chip design and which destroyed the basic premise of forecasting the certainty of the rate at which computer chips became obsolete. In 1965, as a research engineer at Fairchild Semiconductor, I made the observation that as the result of advancements in electrical engineering, materials science, and the evolution of computer chip design, the power of microchips would double every 18 months with proportionate cost decreases. That observation became known as Moore's Law; the fact that it has persevered for this time does not reflect on the challenges facing our research institutions, as well as the unsung contributions they have made to the advancement of science and society.

The National Institute of Standards and Technology will be celebrating in March, 2001 the centennial of its founding as the National Bureau of Standards. Through its leadership in accurate measurement and its ability to solve a myriad of technical problems, NBS/NIST has contributed to the evolution of a number of technological developments impacting the lives of all around the world. These have included such contributions as the automobile, the airplane, radio and television, computers and their functionality, and space flight.

The first fifty years of the NBS are covered by Rexmond C. Cochrane's *Measures for Progress*, which was published in 1966 by the U.S. Department of Commerce. It is a book well worth reading, for it captures the masterful achievements through which NBS expertise permeated the technical advancements of our country during a period of revolutionary change in science and technology, in part driven by two world wars. The end of this period also coincided with the beginning of a new age, the Information Age, heralded by the invention of the transistor in 1947.

The transistor is the basic unit of information storage on a computer chip. Today we can squeeze 32 million transistors on one microchip. Newly announced versions will have the capability of storing 64 million bits of data. The development of the transistor moved the computer from the special-purpose, large, climate-controlled rooms to the desktop. This computer revolution is best characterized not solely by the growth in computing power of the machine, but by the enhancement of the reach of the human spirit. Nearly every school child in America and, increasingly so, people in most of the other developed countries of the world have finger-tip electronic access to information compiled by libraries, governmental agencies, and private institutions and individuals. We drive automobiles that incorporate electronic circuits and computers for ignition control, and in some cases for braking and security.

I understand that NIST has an average of two computers for each staff member. Many of these are used for conducting experimental research, theoretical modeling and simulation, as well as for accessing and manipulating the knowledge bases that are

needed to develop new knowledge. NIST has remained in the forefront of this new revolution, both through imaginative scientific work and by helping to create standards for the use and protection of this information exchange. As has been the case throughout its existence, NIST is home to chemists, physicists, metallurgists, mathematicians, engineers, and experts in many other technical disciplines. Some see themselves as individuals focusing on the arcane details of their chosen profession, while others engage in extensive interdisciplinary activities that cut across a variety of professions. They are driven to understand, to measure, and to communicate. They provide objective, precise information to be used by others throughout the fabric of America's workplace and home; assembled into teams, they help to make whole industries better competitors in the world marketplace. They operate within a world-renowned culture of scientific integrity, an integrity which has withstood the test of time and politics.

This volume, *A Unique Institution*, records the challenges that have faced NBS/NIST and the opportunities of which it availed itself to maintain a high level of excellence in discharging its mission as a national resource. It is a distinct pleasure and a great honor to commend this history to readers everywhere.

Gordon E. Moore
Chairman Emeritus
Board of INTEL Corporation