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Remarks by

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Chairman

Board of Governors of the Federal Reserve System

before the

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I am pleased to be able to speak before your third annual National Technology Forum. I very much appreciated the invitation from President Bill Poole of the St. Louis Federal Reserve Bank to participate, and regret that I am not able to join you in person.

As you may know, I have addressed in considerable detail in recent months various issues related to technology and its impact on the economy. I thought that today it would be useful for me to summarize some of those views as a starting point for your afternoon's discussions.

When historians look back at the latter half of the 1990s a decade or two hence, I suspect that they will conclude we are now living through a pivotal period in American economic history. New technologies that evolved from the cumulative innovations of the past half-century have now begun to bring about dramatic changes in the way goods and services are produced and in the way they are distributed to final users. Those innovations, exemplified most recently by the multiplying uses of the Internet, have brought on a flood of startup firms, many of which claim to offer the chance to revolutionize and dominate large shares of the nation's production and distribution system.

While the process of innovation, of course, is never-ending, the development of the transistor after World War II appears in retrospect to have initiated a special wave of innovative synergies. It brought us the microprocessor, the computer, satellites, and the joining of laser and fiber-optic technologies. By the 1990s, these and a number of lesser but critical innovations had, in turn, fostered an enormous new capacity to capture, analyze, and disseminate information. It is the growing use of information technology throughout the economy that makes the current period unique.

However, until the mid-1990s, the billions of dollars that businesses had poured into information technology seemed to leave little imprint on the overall economy. The investment in new technology arguably had not yet cumulated to be a sizable part of the U.S. capital stock, and computers were still being used largely on a stand-alone basis. The full value of computing power could be realized only after ways had been devised to link computers into large-scale networks.

By 1995 the investment boom had gathered momentum, suggesting that earlier expectations of elevated profitability had not been disappointed. In that year, with inflation falling, domestic operating profit margins started to rise, indicating that increases in unit costs were slowing. These developments signaled that productivity growth was probably beginning to move higher, even though official data, hobbled by statistical problems, failed to provide any confirmation. Now, five years later, there can be little doubt that not only has productivity growth picked up from its rather tepid pace during the preceding quarter-century but that the growth rate has continued to rise, with scant evidence that it is about to crest.

At a fundamental level, the essential contribution of information technology to this process is the expansion of knowledge and its obverse, the reduction in uncertainty. Before this quantum jump in information availability, most business decisions were hampered by a fog of uncertainty. Businesses had limited and lagging knowledge of customers' needs and of the location of inventories and materials flowing through complex production systems. In that environment, doubling up on materials and people was essential as a backup to the inevitable misjudgments of the real-time state of play in a company. Decisions were made from information that was hours, days, or even weeks old.

Of course, large voids of information still persist, and forecasts of future events on which all business decisions ultimately depend will always be prone to error. But information has become vastly more available in real time--resulting, for example, from developments such as electronic data interface between the retail checkout counter and the factory floor or the satellite location of trucks. This surge in the availability of more timely information has enabled business management to remove large swaths of inventory safety stocks and worker redundancies. Stated differently, fewer goods and worker hours are now involved in activities that, although perceived as necessary insurance to sustain valued output, in the end produced nothing of value.

The process of information innovation has gone far beyond the factory floor and distribution channels. Computer modeling, for example, has dramatically reduced the time and cost required to design items ranging from motor vehicles to commercial airliners to skyscrapers. In a very different part of the economy, medical diagnoses have become more thorough, more accurate, and far faster. With access to heretofore unavailable information, treatment has been hastened, and hours of procedures have been eliminated. Moreover, the potential for discovering more-effective treatments has been greatly enhanced by the parallel revolution in biotechnology, including the ongoing effort to map the entire human genome. That work would have been unthinkable without the ability to store and process huge amounts of data.

The influence of information technology has also been keenly felt in the financial sector of the economy. Perhaps the most significant innovation has been the development of financial instruments that enable risk to be reallocated to the parties most willing and able to bear that risk. Many of the new financial products that have been created, with financial derivatives being the

most notable, contribute economic value by unbundling risks and shifting them in a highly calibrated manner. Although these instruments cannot reduce the risk inherent in real assets, they can redistribute it in a way that induces more investment in real assets and, hence, engenders higher productivity and standards of living. Information technology has made possible the creation, valuation, and exchange of these complex financial products on a global basis.

Many argue that the pace of innovation will continue to quicken in the next few years, as companies exploit the still largely untapped potential for e-commerce, especially in the business-to-business arena, where most observers expect the fastest growth. An electronic market that would automatically solicit bids from suppliers has the potential for substantially reducing search and transaction costs for individual firms and for the economy as a whole. This reduction would mean less unproductive search and fewer workhours more generally embodied in each unit of output, enhancing output per hour. Already, major efforts have been announced in the auto industry to move purchasing operations to the Internet. Similar developments are planned or in operation in many other industries as well. It appears to be only a matter of time before the Internet becomes the prime venue for the trillions of dollars of business-to-business commerce conducted every year.

In sum, indications that the extent of the application of existing technology is still far from complete, plus potential benefits derived from continuing synergies, support a distinct possibility that total productivity growth rates will remain high or even increase further. Despite the fact that there exists uncertainty about the pace of productivity growth in the years to come, knowledge is

essentially irreversible, so much--if not most--of the recent gains in productivity appear permanent.

An important aspect of the acceleration of productivity is that cost increases have been held in check. Despite the surge in demand, unit labor costs over the past year have barely budged, and pricing power has remained well contained. Apparently, firms hesitate to raise prices for fear that their competitors will be able to wrest market share from them by employing new investments to produce at lower costs.

Indeed, the increasing availability of labor-saving equipment and software, at declining relative prices and with improving delivery lead times, is arguably at the root of the loss of business pricing power in recent years. To be sure, marked increases in available global capacity and the deregulation of key industries have removed bottlenecks and increased the competitive supply response of many economies, especially ours, and these developments have been influential in suppressing price increases.

It would be an exaggeration to imply that, whenever a potential cost increase emerges on the horizon, a capital investment is available to quell it. Yet the veritable explosion of spending on high-tech equipment and software, which has raised the growth of the capital stock dramatically over the past five years, could hardly have occurred without a large increase in the pool of profitable projects available to business planners.

As our experience over the past century and more attests, such surges in prospective investment profitability carry with them consequences for interest rates, which ultimately are part of the normal process that balances saving and investment in a noninflationary economy. In these

circumstances, rising credit demand is naturally reflected in an increase in corporate borrowing costs and that has, indeed, been our recent experience, especially in longer-dated issues. Real interest rates on corporate bonds have risen more than a percentage point in the past couple of years. Home mortgage rates have risen comparably. Given the persistent strength of private credit demands, market interest rates would have risen even more were it not for the emergence of a sizable unified budget surplus following a long period of chronic deficits. More recently, the Administration and the Congress have wisely chosen to wall off the social security trust fund surplus and to allow it to pay down Treasury debt to the public. This action will surely contribute to sustaining the rapid private capital formation we have experienced in recent years.

The Federal Reserve has responded to the balance of market forces by gradually raising the federal funds rate over the past year. Certainly, to have done otherwise--to have held the federal funds rate at last year's level even as credit demands and market interest rates rose--would have required an inappropriately inflationary expansion of liquidity.

We need to be careful to keep inflationary pressures contained: The evidence that inflation inhibits economic growth and job creation is too credible to ignore. Consequently, maintaining an environment of low and stable inflation provides the greatest opportunity for the dramatic increases in structural productivity to show through fully into higher standards of living.

Finally, let me point out a major consequence of rapid economic and technological change that needs to be addressed: growing worker insecurity -- the result, I suspect, of fear of potential job skill obsolescence. Despite the tightest labor markets in a generation, more workers report in a prominent survey that they are fearful of losing their jobs than similar surveys found in 1991 at

the bottom of the last recession. The marked move of capital from failing technologies to those at the cutting edge has quickened the pace at which job skills become obsolete. The completion of high school used to equip the average worker with sufficient knowledge and skills to last a lifetime. That is no longer true, as evidenced by community colleges being inundated with workers returning to school to acquire new skills and on-the-job training being expanded and upgraded by a large proportion of American business.

Not unexpectedly, greater worker insecurities are creating political pressures to reduce the fierce global competition that has emerged in the wake of our 1990s technology boom. Protectionist measures, I have no doubt, could temporarily reduce some worker anxieties by inhibiting these competitive forces. However, over the longer run such actions would slow innovation and impede the rise in living standards. They could not alter the eventual shifts in production that owe to enormous changes in relative prices across the economy. Protectionism might enable a worker in a declining industry to hold onto his job longer. But would it not be better for that worker to seek a new career in a more viable industry at age 35 than hang on until age 50, when job opportunities would be far scarcer and when the lifetime benefits of additional education and training would be necessarily smaller? To be sure, assisting those who are already close to retirement in failing industries is an imperative. But that can be readily accomplished without distorting necessary capital flows to newer technologies through protectionist measures. More generally, we must ensure that our whole population receives an education that will allow full participation in this dynamic period of American economic history.

Thank you again for the opportunity to speak to you today. My best wishes for a most interesting and productive meeting.