

**HIGH-TECH: FUTURE OVER THE NEXT DECADE IN  
WESTERN PENNSYLVANIA**

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### What Is High-Tech?

- . "Any industry that is going to create jobs in the 1980s and 1990s."
- . "Any industry using technologies with a high rate of change."
- . "Or, I know it when I see it."
- . Basically, industries with R and D expenditures and the percentage of technical employees significantly higher than the national average. These include:
  - . Drug manufacturing
  - . Computers
  - . Electronic components
  - . Aircraft
  - . Laboratory equipment
  - . Much of the chemical industry
  - . Printing
  - . Medical equipment

### National Future

Projections vary, but nationally over the next decade, high-tech industries will generate one million jobs—most of these in traditional occupations and not the technical ones. High-tech industries employ about 3% to 6% of the workforce nationally, depending how they are defined. This will grow by another percentage point by the 1990s.

High-tech will cause significant growth in jobs in industries that build products with high-tech components. Not many jobs will be created by core industries like electronics but many will be created down the line. For instance, high-tech companies will add less than 30,000 computer programmers and systems analysts over the next decade, but other industries will add 225,000.

### Local Trends

#### **What does this mean locally?**

In Western Pennsylvania, the structure of the economic base has changed significantly in recent decades. A region which was once heavily manufacturing-oriented has shifted to one in which trade, services and finance predominate.

In 1960, manufacturing accounted for 36% of total employment; in 1980, 26%; today, about 20%.

During the period 1960-1980, manufacturing employment declined by 50,000. Since 1980, an additional 90,000 jobs have been lost, and half of these were in steel and steel-related industries. Talk about a dislocated worker problem!

Despite the restructuring, the manufacturing sector is still critical to our employment base, currently employing about 180,000 people. However, the steel industry is no longer the dominant employer in our region. Today, it accounts for only about 5% of total employment, down from 15% two decades ago.

The changes in the structure of the region's economic base have affected both people and places. The effects of declining manufacturing industries have been disproportionately borne by the municipalities and

individuals heavily dependent upon steel and steel-related industries.

### People

Blue collar employment has been on the decline for over 20 years, and its decline will certainly continue. As a result, many individuals who have been displaced from manufacturing industries have found that they lack the skills and perhaps even the education to find employment within the growing service sector and the emerging high technology industries. This has created a displaced worker problem which is estimated to be two or three times as severe as that nationally. Many of those who have been displaced from manufacturing jobs will not find comparable employment in this region in the near future.

The region's unemployment rate is about 60 percent above the national average. It has risen in recent months--whereas the national rate has declined--to the point where there are fewer people employed now than a year ago. Given the severity of the unemployment situation in this region, training and retraining programs will not significantly help most of those who are unemployed--the jobs simply are not there. The major need in the region is job creation--this is essential if those who have been displaced are to be reemployed and those who are new entrants into the labor force are to be successful in gaining employment.

### Places

The shifts in population and jobs which have occurred in the last decade have adversely affected the fiscal condition of many local governments in the region. This had led to the curtailment of public services in many instances and near bankruptcy for a few municipalities and school districts, Clairton being the most recent example.

The fiscal condition of the municipalities that lost population in the 1970s has deteriorated. The assessed value for these municipalities has shrunk significantly in real terms during the past decade, providing local government with a shrinking tax base from which to raise revenues. Local governments experiencing the greatest shrinkage in their tax base have responded by raising taxes at a faster rate than the others. This has compounded their problems in adjusting to a declining economic base. Their tax rates are the highest in the region, thereby providing a disincentive for businesses to remain, let alone to be attracted into these communities. The situation in which these municipalities find themselves is difficult to reverse. A declining tax base requires higher taxes to raise the revenues to provide service and to maintain the infrastructure, but higher taxes chase businesses away and thereby further erode the tax base. Clearly, these municipalities are in the midst of a fiscal "Catch 22."

The solution to the adverse impacts of economic change is job creation and job retention. And those twin objectives should be the top priorities for this region.

I am cautiously optimistic about the ability of our region to successfully adapt to these changing circumstances and position itself for future growth.

#### Industries Gaining Employment

Despite the overall decline within the manufacturing sector, there have been positive employment trends within manufacturing. Prior to the recession of the early '80s, a number of manufacturing industries not only grew, but gained employment at rates greater than their national counterparts. These included advanced technology companies in the broad categories of:

- . plastic products
- . surgical appliances and supplies
- . precision dies and tools
- . electronic computing equipment
- . metal forgings and stampings
- . and others.

Currently within the region, we have about 200 high-tech companies employing almost 35,000 people, and these are growing at the rate of 20 percent per year. This provides a base upon which our region can build. But, we currently lack a critical mass.

#### Future Trends

I believe we will be able to attain that critical mass, and this is essential for sustaining the generation of new ideas, giving birth to new companies, and becoming an ongoing source of new job creation. Our region has all of the prerequisites for growth in high technology fields. Among our assets are:

- . Two major research universities
- . A large number of corporate research laboratories
- . A highly skilled workforce
- . Available financing, including a growing venture capital community
- . An evolving support structure for entrepreneurs and small companies
- . Partnership efforts among the public-private-nonprofit sectors regarding job creation in high technology fields.

- . A large number of experienced economic development agencies.

### The Ben Franklin Partnership

Furthermore, the Commonwealth of Pennsylvania has created the Ben Franklin Partnership Program—a true partnership of industry-government-academia—as part of its strategy to revitalize Pennsylvania's economy. The primary objective of this program is to create new jobs through the rebuilding of Pennsylvania's manufacturing base. This will be accomplished through the birth of new industry and the revitalization of existing industry. A complementary objective is to assist those who are unemployed to acquire the level of education and skills necessary for employment in growth occupations. The program has adopted a strategy which focuses upon a limited number of advanced technology industries, and it hopes to achieve its objectives by forging effective partnerships between industry and institutions of higher education.

In March 1983, the Ben Franklin Partnership Board funded four advanced technology centers. These include Lehigh University, Penn State, the University City Science Center and its consortium of educational institutions in the Philadelphia area, and the Western Pennsylvania Advanced Technology Center, co-sponsored by the University of Pittsburgh and Carnegie-Mellon University. Our Center is advised by a Consortium Council whose members include representatives from colleges and universities, industry, labor, local government, economic development agencies, and venture capitalists.

The Commonwealth of Pennsylvania, through the Ben Franklin Partnership, provided \$1 million in seed money to fund the start-up of the centers during the period March-August, 1983. A \$10 million appropriation

was committed by the State for the first full year of operation, which commenced September 1, 1983, and this funding level was increased to \$18.5 million for the current fiscal year.

Last year, our Center operated a \$10 million program with implementation occurring through 48 projects. We received \$3.35 million from the Ben Franklin Partnership Board, with the remainder coming from a variety of sources, primarily industry. This year we received \$4.7 million from the Ben Franklin Partnership Board and our total program has grown to a level of \$16 million, funding 65 projects. We are working with 76 companies and more than a third have less than 50 employees.

### Strategy

Our Center has taken an integrative approach to job creation. This involves three distinct components:

- Research and development. This is carried out by sponsoring joint industry-university R and D projects in the advanced technology areas of robotics, biological and biomedical engineering, and high technology materials, processes and devices, including a number of projects in the metals area.
- Assistance to entrepreneurs, small businesses and regional industries. The objective of this component is to augment the ability of small businesses and entrepreneurs to start new businesses, raise venture capital, expand existing operations, or adapt their production facilities to new technologies.

- Education, training and retraining. The aim of this element is to ensure the availability of high quality education, training and retraining programs to meet the labor force needs of our region.

Although every activity of the Center will not involve all of these elements, the development of this infrastructure of management assistance, venture capital-raising, and training-retraining is critical. This support structure is necessary to ensure that once the technologies are developed, they will be successfully commercialized, thereby creating jobs.

#### Research and Development

Our Center stimulates R and D through the use of financial incentives. Center resources are used to match the cash and/or in-kind R and D expenditures of private companies in our specified thematic areas. We seek out innovative R and D ideas that appear to be promising from the standpoint of creating jobs by contacting advanced technology companies in the region, holding workshops on specified advanced technology topics, and bringing together faculty with research skills and companies having research interests. In short, we act as a facilitator and promoter. In order to help us evaluate the merits of specific R and D proposals, we have advisory committees of experts to review the proposals submitted to us for funding.

In the research and development area, we are also concerned about technology transfer. The marketplace is not as effective as it could be with respect to the transfer of information and technology because those in need may not be aware of its existence, or how to go about acquiring it, or how to adapt it to their particular situation. Our role in the

transference of technology is to supplement--and not to replace--the flow of information through the marketplace by increasing its availability and lowering its acquisition costs. This will be accompanied by making information about advanced technologies available to companies and by working directly with specific companies to help them incorporate technological advances into their operations.

This role is important because if companies do not keep abreast of innovations, they will not remain competitive. By working with regional companies, we will help them keep ahead of their competition, thereby enhancing employment opportunities within our region.

Each of the technological thematic areas is described below.

#### Robotics

Our growth in this area will depend upon CMU's Robotics Institute and the strength of numerous companies in this region, ranging in size from Westinghouse to Oberg Industries to American Robot. Our region will benefit from robotics technologies because manufacturing of new robots, sensors and controls will be carried out here; and because this technology will be transferred to existing companies, thereby making them more efficient and helping them expand into new product lines. Certainly some displacement of existing workers will occur, but many more employees will be added as new companies are formed and existing companies expand; and therefore, the impact on our total workforce will be overwhelmingly positive.

Our robotics projects include:

- . Designing control devices for industrial processes.
- . Transferring robotics technology and computer-aided manufacturing techniques to small manufacturing

environments.

- . Transferring robotics technology to excavation equipment used by gas utilities to repair leaks.
- . Developing and commercializing robotics for carrying out tasks in hazardous environments such as remote reconnaissance in radioactive environments.
- . Developing machines that can visually inspect printed circuit boards and other items with high levels of accuracy—automatic visual inspection systems.
- . Developing direct digital drive robots for use by automobile manufacturers, machine tool builders, and electronics companies.
- . Developing semi-autonomous transit vehicles for use in hospitals.
- . Developing electronic drive systems for tractor motors on mining machines.
- . Developing efficient technology for bent glass production.
- . Developing navigation systems and sensor interpretation systems for a mobile security robot

#### Biomedical Technology

Given the substantial strength of the University of Pittsburgh, Carnegie-Mellon University and numerous hospitals in this technological area, our region definitely has a comparative advantage for future job creation. Types of projects which are ongoing include:

- . Investigating liquid membranes for use in an artificial membrane lung.

- . Developing a prototype of a speech prosthesis device for cancer patients.
- . Refining technologies for a titanium hip prosthesis device.
- . Developing simple chemical tests for detecting enzymes in human body fluids.
- . Developing a closed catheter system to reduce the risk of instrument-related infection.
- . Developing a facility for nuclear magnetic resonance research.
- . Developing human vaccines.
- . Developing drugs for use in the treatment of Alzheimer's disease.
- . Development of fluorescent microscopic imaging techniques and optical testing systems.

#### Advanced Materials

Our region has strength in various aspects of semiconductor development, polymers, optics and something called steel—remember that industry? Projects include:

- . Development of microelectronic components to be fabricated on semiconductor wafers--giving rise to a small company to manufacture infrared detectors.
- . Development of optical filters for scientific research.
- . Development of a nonaqueous solution for coal cleaning.
- . Development of low cost, low emission coal combustion technologies.

- . Development of a high resolution ion microscope for commercial applications.
- . Development of a devolatilization process for polymer solutions.
- . Production of prototypical liquid crystal displays for thin film transistors.
- . Integration of a newly-developed powder metallurgy process into existing CAD/CAM technologies.
- . Development of a sensing device to more accurately measure the dimensions of semi-finished steel ingots.
- . Improving the metallurgical properties of hot molten metal from a blast furnace.
- . Transfer of CAD/CAM technologies to foundries and ingot makers.
- . Development of new alloying configurations to assist metal companies in the region to serve new markets.

#### Assistance to Entrepreneurs, Small Businesses and Regional Industries

The Western Pennsylvania Advanced Technology Center promises to create jobs not only through research and development but also by providing the institutional structure to support the launching of new companies. We are supporting 11 organizations, which form the core of a regional managerial assistance or technical assistance network. The types of assistance available through this network include business plan development, venture capital-raising, financial planning, marketing, manufacturing, and human resources development. These organizations will also attempt to help a company or an entrepreneur find other types of

assistance such as legal, accounting, or incubator space. Organizations with projects supported by our Center include:

- The Enterprise Corporation of Pittsburgh. Provides direct assistance to entrepreneurs and small companies—primarily in advanced technology fields--throughout the region.
- Southern Alleghenies Entrepreneurial Assistance Program. Provides technical expertise to small businesses, agencies and local government in the Johnstown area.
- Small Business Development Centers of the University of Pittsburgh, Duquesne University and Clarion University.
- Foundation for Applied Science and Technology. Early-stage developmental work with entrepreneurs and scientists, primarily in the biotechnology field.
- Southwestern Pennsylvania Economic Development District. Providing assistance to companies to help them bid on federal procurement contracts. Also, provides start-up services to small companies locating in its business incubator in the Mon Valley.
- Pittsburgh High Technology Council. Staff support to help this organization focus on the development of a regional high-tech lobbying and information dissemination network.
- Slippery Rock University. Funding for the development of an economic development strategy.

- Greater Pittsburgh Business Development Center.  
Support the development of a computer/communications center in an industrial park in the Braddock community of the Mon Valley.
- St. Vincent's College. Support the provision of comprehensive assistance to new businesses and the development of a business incubator serving Westmoreland County.

This network provides wide geographic coverage and enhances the region's capability to create new companies and help them grow. Our Center also has a close working relationship with other organizations in the region, such as RIDC, Penn's Southwest Association, the Allegheny Conference on Community Development, and the economic development agencies of various County governments and the City of Pittsburgh.

#### Education, Training and Retraining

A key component of our education, training and retraining role is to develop much better information about occupational trends in the region. Without a well-trained workforce—one that has the educational level and skills required for the types of jobs which are being created—our region will not be competitive in attracting new companies or retaining existing companies. Our efforts in this area are designed to provide better information about training needs to those regional institutions and agencies that provide education, training and retraining services. Our objective is to get the most bang for the training buck by making available relevant, up-to-date forecasts of occupational trends. In order to ensure that information is widely disseminated, we have developed close working

relationships with the Private Industry Council of Pittsburgh and Allegheny County. An industry-occupation forecasting system is almost complete. When finished, we will hold workshops for other Private Industry Councils and training organizations throughout the region.

We also fund training programs addressing the needs of the unemployed in the region, which are not able to be funded through the various state and federal programs. Projects currently being funded include: the training of chief executive officers and middle management personnel of training institutions and agencies; hospital equipment training for minority biomedical technicians; support for the development of a new facility for training students in word processing and computer skills; specialized technical training for dislocated workers in the Mon Valley (California University); development of a teaching-training program to address the need to integrate modern computer technology into elementary/secondary education; and the development of a system enabling nonprogrammers to create computer-based training courses.

#### Discussion

The objectives of the Ben Franklin are job creation and job retention. We hope to accomplish these goals by assisting in the development of a critical mass of advanced technology firms in Western Pennsylvania. We do not know what the magic number of firms is, but it exceeds the 200 or so which are currently located here. As the numbers grow, the spin-offs of new ideas, new technologies, and new firms will accelerate. This self-perpetuating process, which draws upon itself for continued growth, is crucial if we are to capture our share of jobs in the high growth industries of the future.

This critical mass is essential in order to attract and retain creative professionals in advanced technology fields and to generate the excitement that will put our region on the map for venture capitalists, foreign investors, existing advanced technology firms, and others who make the investment and locational decisions that will determine the future of our region.

The Ben Franklin Partnership promises to create jobs, not only by stimulating research and development, but also by providing the institutional structure to support the launching of new companies and the successful revitalization of existing companies in the region. The decisions of our Center will not countermand those of the private marketplace with respect to the merits of a particular product line or new technology. We see our role as helping to move new ideas into the marketplace that would otherwise be lost--and lost to our region--because of imperfections in the way in which the market operates.

Our program focuses not only upon the creation of new high technology companies, but it is equally concerned with the needs of existing industry. Job retention is as important an objective as is job creation. Several of our research and development projects involve the steel and casting industries. The objective of these undertakings is to tailor advanced technologies to the needs of specific companies in order to help them become more efficient and to assist them in serving new markets. We hope to enable them to become more efficient, to capture a larger share of the markets they serve, and to expand into new market areas.

Our Advanced Technology Center, by itself, cannot be expected in a short period of time to significantly reverse the direction of the economic

forces which have changed the structure of our region's economy over the past several decades and have created the displaced worker problem. However, the center can be a major factor in helping to develop a climate that is conducive to the birth of new advanced technology industries and to strengthening existing industries. The stimulus provided by the Center is a necessary starting point for addressing the major problems of our region. These include the declining manufacturing sector, the loss of blue-collar jobs, the weakening tax base of many municipalities, and the retraining needed to better prepare the existing workforce--particularly displaced workers and unemployed youth--for the jobs which require skills different from those for which many of the unemployed were previously trained.

During the current fiscal year, the Center is supporting 65 projects. The results projected for these projects for the period 1984-88 include 200 new companies created, 6,600 jobs created, and 2,200 jobs saved. To date, our Center has assisted in the development of 22 new companies and 210 jobs created or saved.

The primary problems confronting our region are the need for job creation and the mismatch between the benefits and the costs of the social and economic adjustments that have occurred and will continue in the years ahead. The economic and social gains will not benefit equally all of the people and places in the region. In particular, workers with low education and few skills will have an increasingly difficult time gaining employment in the high technology industries of the future or in existing service and manufacturing industries which are incorporating advanced technologies into their workplaces. In addition, the one-industry towns, particularly those heavily dependent on steel and steel-related industries,

will have difficulty adjusting to the loss of their manufacturing base. The benefits of future growth, mechanisms will have to be found to assist in the training and retraining of the workforce, and in the stabilizing and rebuilding of the economic base of these one- and two-industry communities. If we are not successful in these endeavors, a large percentage of our workforce will become obsolete and will fall further and further behind those who are able to make the transition; and large portions of our region will lose the fiscal capacity to maintain their infrastructure and to deliver an adequate level of services to their residents. As these problems become more intractable, we, as a region, may lose the opportunity to intervene to help these groups of people and these places successfully adjust to new economic circumstances.

In order to make the most of our opportunities and to remove impediments to progress, progressive leadership from all sectors of the region is critical. Workable partnerships among all segments of the regional community—business, labor, the clergy, local government, education, minority groups, public interest groups, and the community at large—are essential if we are to be in a position to grapple with the diverse social and economic problems facing the region. Partnerships among all of the relevant groups are the key to the implementation of programs, policies, and strategies which are designed to help the region—its people and places—successfully adapt to the impacts of economic and technological change.

Our region is in a very precarious position. We will either go forward or slide backward. We will not stay where we are today in terms of the economic health of our region and the social and emotional health

of our residents. To move ahead, committed, visionary leadership is required in all sectors, but particularly in the corporate and political segments of our community. This has been absent in recent years, most notably in terms of the corporate commitment. Without leadership committed to the long-term future of this region, we will slide backward. We are clearly at a turning point. Whether or not we succeed is up to those that have the power to mobilize people and resources. The rest of us can help—we can do what we do well and put pressure on those in power to lead us forward. ...