2004 Annual Report *of the* Advanced Technology Program Advisory Committee

research & development

U.S. Department of Commerce
Technology Administration
National Institute of Standards and Technology
Advanced Technology Program

May 2005

Advanced Technology Program

2004 Annual Report

Prepared for:
Advanced Technology Program
National Institute of Standards and Technology
Gaithersburg, MD

By:
Committee Chair and Members
ATP Advisory Committee

May 2005

U.S. DEPARTMENT OF COMMERCE
Carlos M. Gutierrez, Secretary

TECHNOLOGY ADMINISTRATION
Phillip J. Bond, Under Secretary of Commerce for Technology

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY
Hratch Semerjian, Acting Director

For information regarding the Advanced Technology Program Advisory Committee, contact:

Marc G. Stanley, Director
Advanced Technology Program
National Institute of Standards and Technology
100 Bureau Drive, Mail Stop 4700
Gaithersburg, MD 20899-4700

Telephone: 301-975-2162
E-mail: *atp@nist.gov*

Table of Contents

Members of the ATP Advisory Committee iii

I. Introduction 1

II Findings and Recommendations 3

III. Summary of Committee Meetings in 2004 5

1. May 13, 2004 5
2. November 30, 2004 11

Appendix 1: Economic Evaluation Report for the Period 2003-2004 17

Appendix 2: List of ATP Awards, Calendar Years 2003 and 2004 19

Appendix 3: Competition Statistics 27

Members of the ATP Advisory Committee

[*from left to right*]

Mr. F. M. Ross Armbrecht, Jr.
President
Industrial Research Institute
Washington, DC
(*Term expires 12/31/2005*)

Mr. Michael G. Borrus
Managing Director
Petkevich and Partners
San Francisco, CA
(*Term expires 12/31/2005*)

Dr. Gail H. Cassell
Vice President, Scientific Affairs and
Distinguished Lilly Research
Scholar for Infectious Diseases
Eli Lilly and Company
Lilly Corporate Center
Indianapolis, IN 46285
(*Term expires 12/31/05*)

Dr. Howard Frank
Dean, Robert H. Smith School of Business
University of Maryland
College Park, MD
(*Term expires 12/31/2005*)

Mr. Eric Haseltine
Associate Director, Research
National Security Agency
Odenton, MD
(*Term expires 12/31/2007*)

Dr. Joseph D. Lichtenhan
President
Hybrid Plastics
Fountain Valley, CA
(*Term expired 12/31/2004*)

Ms. Linda Powers
Managing Director
Toucan Capital Corporation
Bethesda, MD
(*Term expires 12/31/2007*)

Ms. Marsha R. B. Schachtel
(Committee Chair)
Senior Fellow
Institute for Policy Studies
Johns Hopkins University
Baltimore, MD
(*Term expires 12/31/2005*)

Ms. Maria Thompson
President
T/J Technologies
Ann Arbor, MI
(*Term expires 12/31/2006*)

I. Introduction

The ATP Advisory Committee is comprised of prestigious individuals from industry, academia, and non-profit organizations with an interest in and knowledge of issues related to advanced technology and economic development. Its charter can be found on ATP's website at:

www.atp.nist.gov/adv_com/intro.htm

The Committee acts in the public interest to:

- Provide advice on ATP programs, plans and policies.
- Review and critique ATP evaluation efforts.
- Assess the degree of success of ATP in achieving its legislatively mandated mission.
- Function solely as an advisory body, in accordance with the provisions of the Federal Advisory Committee Act.

This annual report includes two calendar year 2004 Committee meetings:

- May 13, 2004
- November 30, 2004

Each meeting consisted of public sessions during which ATP personnel briefed the Committee on plans, accomplishments, concerns, and issues. In addition, as noted in this report, the Advisory Committee often heard from outside experts in science and technology policy. Panel discussions helped to highlight important issues affecting ATP.

The meetings also included brief closed sessions during which budget and personnel issues were discussed and the Committee's recommendations were formulated. Following each meeting, minutes were prepared and posted on the ATP website. During and at the conclusion of each meeting the Committee provided feedback and advice to ATP and NIST management.

The Committee has found the Advisory Committee meetings to be intellectually stimulating. NIST and ATP are receptive to advice, and the Committee members feel that they have been able to contribute to further improving an already excellent program.

The section that follows (Section II) documents the Committee's findings and recommendations. Section III summarizes the two meetings that have taken place during this reporting period.

The Appendices provide information on ATP evaluation reports published since the last annual report, as well as information about recently awarded projects.

II. Findings and Recommendations

Findings:

1. The Committee was deeply disturbed to learn that the Advanced Technology Program will have no funding for new awards in fiscal year 2005. We believe ATP deserves to have its funding continued because of clear evidence that the economic benefits that have resulted from the Program greatly outweigh its costs. To date, over $2 billion have been invested by ATP, with a comparable amount of industry cost sharing. Comprehensive economic analysis shows that the combined net economic benefits to the nation are nearly $18 billion. That is a truly impressive aggregate return on public investment.

2. ATP continues to respond to an important need by encouraging companies to undertake high-risk R&D that holds promise for significant benefits to the U.S. economy. National priorities have shifted since ATP began, but in key areas of national concern today, e.g., new technology to lower the cost of healthcare, technology for homeland security, and nanotechnology, ATP remains a superb way for the Federal government to accelerate innovation and get new technologies critical to the nation's well-being into the market sooner. ATP bridges the chasm between basic research and new products. Through ATP, the Federal government increases the probability that our citizens will benefit from the nation's huge investment in basic research. ATP invested in areas that have since become "hot areas" of technology before they became fashionable, for example, nano-technology and DNA diagnostics technology. Thus ATP can and does stimulate the development of whole new technical areas that later prove to be important to the nation.

3. ATP's program management has been exemplary. ATP's reputation for fairness and objectivity in proposal selection is unblemished. ATP successfully strives for continuous process improvement. For example, ATP has made it easier for applicants to submit proposals electronically. This year for the first time applicants received feedback at the "Gate 1" stage on their abbreviated business plans as well as on their technical plans. This change was much appreciated by applicants.

4. The Committee continues to be impressed with the comprehensiveness of ATP's economic analysis. An ATP report on the methods and tools of program evaluation using ATP studies as examples won a national award this year. ATP's economic assessment program is recognized as a model for other Federal R&D agencies. Even venture capitalists rarely analyze their results and learn from their experiences to the extent that ATP does.

5. Science and technology policy makers in other countries monitor ATP carefully, and a number of countries have implemented or are implementing programs modeled after ATP, reflecting their assessment that ATP is a highly successful program deserving of emulation.

6. ATP's efforts to coordinate its activities with state technology programs are beneficial, and should be continued and expanded. Because state programs tend to wax and wane as state administrations and key personnel and their economic situations change, ATP must continually renew these efforts.

7. The Committee believes that continuing efforts are needed to improve understanding by policymakers and the public of the Program's underlying philosophy, its track record, and the assessments completed to date. The Committee continues to be concerned that there is a lack of awareness about what ATP does and how it operates.

Recommendations:

1. The Committee urges the Administration and the Congress to seek ways to provide

continuing ATP funding, not only for ongoing projects, but also for future competitions. ATP's budget is a tiny fraction of the total R&D budget of the Federal government, but it leverages the other expenditures, especially the Federal government's basic research budget.

2. Because certain areas such as healthcare and homeland security continue to be high priorities for the United States, ATP should continue to seek opportunities to do more in these topical areas. ATP has the legislative authority to run competitions and manage projects for other Federal agencies, and there appear to be cases where this would be prudent for the nation.

3. Because no funds for new awards have been appropriated for the coming year, ATP should use this period to concentrate on management of ongoing projects to maximize their effectiveness and on efforts to better explain the program to key decision makers. ATP might also work with other Federal agencies and other organizations to hold conferences to explore critical technology policy issues for the nation. An example of such an area to consider is technology for the aging U.S. baby boomer population, about which the Committee heard at the November meeting.

4. While large companies can have a critical role in creating a path to market for technologies created by new small companies, the involvement of large firms in ATP has been a subject of controversy. Former Commerce Secretary Evans had proposed restructuring the Program to address these concerns, but new legislation required to implement these changes was not forthcoming. ATP is encouraged to discuss this issue with the new Secretary of Commerce.

5. It is apparent that many high-level policy makers still do not understand what ATP does and how it operates, and are not familiar with the impressive results from ATP's extensive assessment efforts. While ATP has worked diligently to inform such decision-makers, a continuing effort to educate is needed.

III. Summary of Committee Meetings in 2004

1. May 13, 2004 Meeting

A new Committee member was introduced at this meeting—Dr. Gail Cassell of Eli Lilly.

Report from the ATP Economic Assessment Office (EAO), Lorel Wisniewski and Connie Chang (ATP)

ATP has collected project data systematically since the Program began. A 2001 preliminary survey of ATP joint ventures by Dyer and Powell produced a wealth of data that both summarizes previously funded joint ventures and provides new insights into the factors that lead to successful JVs. Using the preliminary survey as the basis, EAO (working with Westat, a survey organization) designed and conducted a survey in 2003 of all ATP joint ventures. There were 397 for-profit JV participants who responded to the 2003 Joint Venture Survey—a gratifying 81 percent response rate.

The survey of ATP joint ventures results showed that:

- *ATP creates R&D collaborations that would not otherwise have occurred.* Ninety-two percent of the respondents reported that the JV would not have formed without ATP.
- *ATP projects represent new R&D directions.* Seventy-seven percent reported that the ATP project reflected a new direction for the company, and 83 percent claimed the project represented a new R&D direction for the industry.
- *University involvement is common*. Sixty-eight percent reported that the project was based on university research, and 63 percent reported some university involvement.
- *ATP JVs involve a greater technical challenge than typical R&D projects.* Eighty-two percent reported that the ATP JV project was more ambitious than typical R&D projects in their industry.
- *Significant commercialization results from ATP joint ventures.* Eighty percent of projects involve additional investment beyond the ATP cost share and 56 percent reported commercial success. Additional commercialization may occur further out in time.

ATP will continue to analyze data on joint venture projects (as well as on single-applicant projects). Publications and presentations to the economic assessment community not only inform that community of the findings of ATP's assessment research, but also advance the state of the art regarding how best to assess the success or failure of industry-government partnership programs.

ATP has found that a significant amount of useful information can be derived from studying patent citations and co-citations. Two questions motivated a study initiated by ATP in 2002:

- How can the Program better understand the regional impact of funded projects as well as the value that ATP delivers to the taxpayer?
- How can the Program more effectively organize outreach, given limited resources?

A tool called "hot-spot cluster analysis" is potentially powerful for addressing these two questions. CHI Research, Inc., a premier patent citation consulting firm of Haddon Heights, New Jersey, contracted to work with ATP on this project. Hot spot cluster analysis can extract clusters of patents that are highly cited by recently issued patents, and identify a subset of these clusters that are developing early stage technologies most relevant to ATP. These clusters can then be analyzed by their regional, organizational, and collaborative characteristics.

By identifying key patents in "hot areas" and tallying how many other companies cite those patents, trends driving technological innovation can be detected. The regional impact of

new technologies can be discerned by studying the location of clusters of companies generating important new patents in a particular field of technology. Such studies can also help ATP determine which parts of the country might benefit most from more outreach. For example, most people recognize that areas such as Silicon Valley in California, Route 128 near Boston, the I-270 corridor in Metro DC, and Research Triangle Park in North Carolina are "hotbeds" of technological innovation. But there are other regions that may be less obvious as emerging centers of technological importance, and ATP needs to be aware of them. Also, patents resulting from ATP projects can be compared to other patents with respect to how frequently they are cited, and the comparisons can be revealing.

Out of the thousands of patents that are granted each year, CHI Research has developed the ability to select those most likely to impact future technologies. The hot-spot analysis tool focuses on the 20 percent of recent patents likely to have future impact. Without some means of filtering out patents of little value out of the 300,000 plus recently issued patents, the task would be unwieldy. A filter is also necessary because early stage, high-risk technologies are difficult to identify. "Hot-spot" patents are those having more than ten recent citations. "Next generation" patents are current patents that build on "hot spot" technologies. To test the robustness of the tool, hot-spot patents, next generation patents, and next generation clusters were examined for two time periods–2002 and 1998. In analyzing the results, only 20 percent of all patents (the 300,000 recently issued ones) make it to the next generation cluster, but 47 percent of ATP-related patents were found in the 2002 next generation, and 44 percent of ATP-related patents were found in the 1998 next generation. ATP patents tend to have high citation numbers, suggesting that patents resulting from ATP projects are more important to the technical community than the average patent.

Other conclusions of the study:

- Next generation clusters with ATP patents have a high degree of public sector participation (universities and federal labs), suggesting that ATP projects are more likely to involve high-risk, early-stage research.

- Next generation clusters involving ATP patents have twice as many science links (citations to the scientific literature) as other patent groups, also suggesting that ATP projects are more likely to involve high-risk, early-stage research as opposed to incremental improvements or "a better mousetrap."

- Next generation clusters with ATP patents have a high degree of multiple "prior art" references, which suggests that ATP projects involve broadly enabling research.

The Committee was particularly intrigued by a chart showing the top 50 metropolitan areas in terms of next generation clusters, and ATP applications and awards for each area. One would expect that a region such as Silicon Valley would show a high concentration of next generation patents, and that is certainly the case. But, there were some other geographic areas that had unexpectedly large numbers of such patents, for example, Boise, Idaho. Micron Technologies and Hewlett-Packard both have large facilities in that area, which may account for this observation. There is generally a strong correlation between hot-spot regions and ATP applications and awards. For example, the San Francisco/Oakland/San Jose region ranked first in hot-spot patents, first in next generation clusters, and also ranked first in ATP applications and in ATP awards.

Some metropolitan areas have done much better than average in competing for ATP awards. Thirty percent of ATP applicants in the Albany/Schenectady/Troy, New York, region have won awards–a much higher percentage than the average for all ATP applicants, suggesting that this region has a significant concentration of innovative companies performing the kind of high-risk research emphasized by ATP.

This study of patent clusters suggests that ATP is funding projects closely linked to high-impact technology. With a higher than expected participation of ATP-related patents in

next generation clusters, ATP dollars are likely to have a broad impact beyond individual award recipients.

Committee Discussion:

The Committee deemed these results proof that ATP's selection criteria are working. ATP funds high-risk projects with the potential for significantly advancing the state of the art, and the study results definitely are consistent with that.

ATP can have an important impact in fostering new industries, and when that occurs, hot-spot clusters are likely to result. In the case of ATP's Tools for DNA Diagnostics focused program, at least one industry expert has claimed that ATP is "the father of DNA diagnostics," having funded key projects that led to a number of innovative new products and helped to establish leading companies in this new industry.

The Committee engaged in a discussion of how various states have fared in fostering technology companies. Michigan has a reputation for doing well in this regard. The Committee speculated that this may be because there is a cadre of respected technology entrepreneurs who encourage partnering, who are knowledgeable about Federal funding, who have good rapport with universities, and who freely share their expertise and advice. This network may be a major factor in Michigan's success in high technology.

EAO is currently striving to better integrate data gathered within ATP's Business Reporting System with the results of special studies such as the Joint Venture Survey conducted in 2003. As ATP matures, the amount of data gathered becomes increasingly large, so managing the data and utilizing the information effectively becomes more of a challenge.

Another area of current research emphasis is university spin-offs. Questions being investigated include:

- To what extent do public policies and institutions contribute to the creation of entrepreneurship capital?
- To what extent do regional factors shape the formation and direction of entrepreneur centers?

The Committee expressed concern that the trend for universities to team with companies may lead to undue skewing of university research from basic towards applied research, and that the nation could suffer if basic research is increasingly de-emphasized. If Federal and state funds for universities are reduced, then corporate funding may be the only alternative for professors.

There are new data showing the important relationship between science and engineering research and economic development. Around the world, countries are seeking ways to better develop that connection. Japan recently passed intellectual property legislation analogous to the U.S. Bayh-Dole Act. Research cities are being constructed there that include on-site buildings for venture capitalists. Other nations are trying to replicate the U.S. research and technology culture. The Committee agreed that today there is more emphasis on universities teaming with industry, which can have both positive and negative impacts. The Council of Scientific Society Presidents has noted the shift towards emphasis on commercialization by leading university scientists. If the Federal government reduces support for basic research, no one else will fill the gap.

Former Commerce Secretary Evans had proposed changes in the ATP legislation permitting universities to lead a joint venture as long as at least two separately-owned, for-profit-companies were partners, but no new legislation resulted.

Competition Report, Bettijoyce Lide (ATP)

In May 2004 an additional 27 awards were announced from batch three of the FY 2002 competition (four joint ventures and 23 single applicants). 467 proposals were received in that batch, amounting to a commitment of $75 million in ATP funds. There was substantial university involvement in these projects. The success rate in this competition was 12.5 percent, comparable to previous competitions.

The FY 2004 competition was announced in February 2004. Proposers' conferences were held in ten cities across the United States. Total attendance was the highest ever (more than 1750 attendees). Proposals were due in April. A total of 870 proposals were received—the most ever for a competition. (This demonstrates that industry interest in ATP is at an all-time high.) Approximately fifty percent of these proposals were received electronically. Processing so many proposals in such a short time period required a high level of dedication on the part of ATP staff. ATP published a revised, more user-friendly proposal preparation kit, available in hard copy, CD-ROM, and on the ATP website. This year for the first time applicants received feedback at the Gate 1 stage on their abbreviated business plans, as well as on their technical plans.

This year ATP pre-arranged with the NIST laboratories, pools of technical reviewers, and established time periods during which reviews were requested, which helped to ensure that reviews were obtained in a timely fashion. ATP provided to applicants more explicit lists of items that disqualify proposals. No doubt this reduced the number of proposals that would not have met ATP requirements.

Given the huge number of proposals received this year, ensuring that each proposal received appropriate consideration was a challenge, but one that ATP met.

Panel Discussion - State Technology Development Activities

There is potential mutual benefit when ATP coordinates effectively with state technology programs. The Committee was delighted that technology development experts from three different states agreed to attend this meeting and brief the Committee on recent developments.

Mr. Chris Foster, Deputy Secretary of the Maryland Department of Business and Economic Development, reported that a major concern for many states today (including Maryland) is pending military base closures. He emphasized the importance of coordination among Federal agencies and state agencies. Military base closures may adversely affect agencies other than just the Department of Defense.

The global situation today is such that for a state (or a country) to succeed, three things are necessary: effective intellectual property protection, availability of capital, and strong leadership.

The Technology Council of Maryland was established to foster economic growth in the state, and plays a catalyst role. The State of Maryland is involved in venture funds to encourage investments in technology deemed strategic for the state.

The Department of Business and Economic Development strives to encourage investment in Maryland not only by Maryland investors, but also by investors anywhere in the world.

Industrial research organizations such as Xerox PARC that once did high-risk research are no longer doing such research. In the current environment, it is particularly important that states and the Federal government partner.

The second panel member to speak was Robert Kispert, Director of Federal Programs for the Massachusetts Technology Collaborative.

Mr. Kispert felt that his state appreciates the importance of Federal funding more than some other states. The Massachusetts Technology Collaborative (MTC) is about ten years old. Its budget is small, but it has had a positive impact. Massachusetts has a significant biotech industry, and so adequate funding for NIH is important to the state. MTC has worked to increase understanding within Massachusetts of how Federal policies and funding affect state economic development. Kispert discovered that while the amount of Federal funding to Massachusetts has increased, Massachusetts' percentage share of total Federal research funds has decreased in recent years.

Some parts of the state have had less economic growth than other parts, and deserve special attention. One initiative called "The Pipeline Fund" is directed at getting children interested in science and engineering.

Kispert believes that ATP has changed the culture for the better within the technology community by encouraging partnerships. He

liked the idea of regional growth initiatives, and encouraged ATP to consider its possible role in such initiatives.

The state legislature established the Massachusetts Renewable Energy Trust (which MTC administers) several years ago to "move the needle" on production and consumption of energy produced from renewable resources and to foster the growth of a renewable energy industry in the state. The Trust is funded through an on-going service benefits charge, providing impressive resources to bring to bear on commercialization, cluster, and market development. This allows the state to complement other investments (e.g., Federal R&D investments) to bring about real change in the economy.

The Committee noted that major corporations are now establishing research facilities on college campuses, e.g., Merck on the Harvard campus. This seems to be a positive development. Massachusetts would like to replicate it elsewhere.

The third panelist to speak was Rohit Shukla, President and CEO of the Los Angeles-based organization, Larta. Larta's innovation enabling program involves three elements:

- An economic research unit
- A training program to help people exploit university research
- An effort to convince industry to work with universities.

California does not have a systematic statewide plan for economic development. One difficulty is that the state is sharply split politically, with some believing that government intervention in economic development is inappropriate, whereas others have a strong belief that government must play a robust role. A $6 million innovation fund was available annually between 1994 and 2002, which provided matching funds to companies with federal sponsorship of their technology. (The state fund was a commercialization fund.) That funding served as a catalyst, with a return of approximately eight times the investment. Larta was the state's commercialization agent in that fund in Southern California. ATP was one of the federal funding sources targeted, and has been a catalyst in stimulating high tech development in California, especially in high-risk high-impact areas in manufacturing, computing, and life sciences.

Like Mr. Foster, Mr. Shukla is concerned about military base closures and their adverse impact on the economy.
Shukla felt that California universities are not doing as well as they might with regard to technology transfer. Larta has organized a network of universities in Southern California, under the name "Network" (for technology transfer), to serve as a manager of collaborative projects involving two or more of its members, to serve as a point of reference for federal program managers and larger companies interested in technologies developed in the universities, and to serve as a manager of pooled intellectual property from the constituents of the network. Larta is also working with the Kauffman Foundation to foster technology transfer.

Pooling intellectual property is one key to Larta's success. A central point of contact with industry with an awareness of available IP can help ensure that industry is able to utilize new developments in technology.

Mr. Shukla also feels that with enhanced communication, it is possible to have virtual centers of excellence, with awards made across regions, and he favors such an approach.

The panel noted that Singapore is aggressively pursuing technology development. Most venture capital in Singapore is invested within 100 miles of the venture capital firm, but that may be changing. Investors in Singapore are seeking partners elsewhere. Singapore is ahead of the U.S. in stem cell research. It does appear possible to bring new investment to the U.S. from Singapore.

The California consortium called Pharmastart (involving universities such as UCSB, USSF, and Stanford) could prove to be a model for other consortia although it is still too early to tell how successful it might be.

Committee Discussion:

The Committee noted that ATP's economic assessment has been very successful. The National Academy of Sciences report on partnerships recommended that ATP work

more closely with states. Hence, assisting states with economic analysis is one possible opportunity, but limited resources within ATP and uncertainty over ATP's future have affected how much can be accomplished. The Committee also felt that the SBIR program could benefit from more rigorous analysis like that carried out by ATP. But, typically there is inadequate funding for administering the SBIR program or other programs designed to stimulate technology development. (A $35 million allocation in Massachusetts for one-time funds for technology development included no funds for assessment, and that is typical.) It is wise to invest in analysis to guide future investments and the Committee believes ATP does that well. It gathers information to facilitate planning for the future.

The Committee noted that the U.S. probably under-estimates the value of knowledge arising from university research. Our society has not found adequate ways to match that knowledge to the niches than can utilize it. Our nation needs to assess national problems, study critical paths, and bring appropriate technology to bear. Too often the U.S. does the research but other nations with lower labor costs manufacture the resulting products. (Actually, while the U.S. has lost millions of manufacturing jobs, China has lost even more in recent years as manual labor there is replaced by automation.) Manufacturing jobs began to leave the U.S. decades ago. Research jobs could migrate offshore also.

There has been considerable publicity lately about visa problems for foreign scientists and foreign graduate students. Important colloquia have had to be canceled because key foreign participants have not been able to secure visas in a timely fashion. The U.S. cannot foster innovation by keeping world-class scientists out of the U.S. Top-notch scientists may wish to locate in other nations if it is too difficult to get into the U.S. Terrorists will win their battle if this situation continues. Another concern is that inadequate numbers of U.S. young people are interested in careers in science and technology.

2. November 30, 2004 Meeting

Two new committee members were announced at this meeting: Dr. Alan J. Russell, Director of the McGowan Institute for Regenerative Medicine and Mr. John Byrd, President of the Association for Manufacturing Technology. (Mr. Byrd was unable to attend the November meeting.)

ATP did not receive funds in the Fiscal Year 2005 budget for new awards, only funds to continue ongoing activities. This was a shock to the Committee, and a matter of grave concern. It is ironic, in view of the fact that a number of other nations have been so impressed with the success of ATP, that they are establishing ATP-like programs of their own. Given the lack of funds for new awards, the Committee recommended that the Program utilize the coming year to further fine-tune the program operation and to maximize the results of the ongoing projects.

Competition Report, Bettijoyce Lide (ATP)

The Committee was updated on the most recent competition. The bulk of the proposals this year were from small businesses. Of the 32 project awards announced on 28 September, 24 were led by small businesses, two by medium-sized businesses, five by large companies, and one by an independent research organization. There were 82 joint venture proposals of which seven won an award. Abstracts of the winning projects are listed in Appendix 2.

ATP has formed competition "lessons learned" teams to study what went well and what did not, with an eye to continuous improvement in ATP operations. During an offsite retreat earlier this year, ATP analyzed competition model options for expanding or contracting the evaluation process depending on the number of future proposals.

ATP strives to have at least one non-NIST person serve on each proposal evaluation panel. Agencies such as NOAA, DOE, DHS, NIH, and the Army have provided senior level technical people for this function. In addition, scientists and engineers from other Federal agencies often provide technical reviews on individual proposals to supplement NIST laboratory personnel.

Committee Discussion:

The ratio of single applicant to joint venture proposals this year was similar to that in previous competitions but there may have been slightly more joint venture proposals this year than in past competitions. Joint venture proposals take longer to prepare than single applicant proposals. Five or six of the 32 awardees had received previous awards. The remainder were all first-time awardees.

The electronic submission process went smoothly. ATP had people staffing the phones as the deadline approached to answer questions and help anyone having trouble submitting electronically. In the long run, ATP would like to have all proposals submitted electronically.

Economic Evaluation Update, Stephanie Shipp (ATP)

Ms. Shipp, Director of the Economic Assessment Office, briefed the Committee on ATP's efforts to learn from project management experience to learn from *unsuccessful* projects as well as from successful ones.

ATP has developed a performance rating "star" system somewhat akin to hotel ratings in travel guides to provide a quick indication of which projects have been successful and which have not. For a project to be successful, not only must the technical goals have been accomplished, but also the technology must have been commercialized. Components of success include scientific and technical knowledge creation, technology development, commercialization, and diffusion of benefits. Unlike private sector R&D funding where the principal success criterion is whether the company ultimately makes money with the new technology for an ATP project to be judged successful, substantial benefits must accrue to others beyond the company performing the research.

Because ATP funds projects characterized by high technical risk, one cannot expect all projects to be "4-star" projects. Some fail because of insurmountable technical problems, but there are other projects where the technical problems are solved, and for a variety of marketplace reasons, commercialization does not take place. (For example, a key partner in a joint venture may be involved

in a corporate merger in which the new management decides to emphasize other product lines.) By studying unsuccessful projects, ATP can learn how better to select projects likely to achieve commercialization, and how to help project participants overcome problems that adversely affect commercialization. ATP collects data on metrics such as products or processes in the marketplace, business and technical awards to the company, capital attraction, collaborations, patents, and publications and presentations.

ATP projects deemed successful generally will score well with regard to several or all of these metrics. Small company-led projects tend to be more successful than others. Joint venture projects are difficult to manage, and sometimes unravel due to that difficulty. While JV projects are more likely to be terminated than single applicant projects, when they *do* succeed, the benefits tend to be much larger than for single applicant projects. Approximately ten percent of ATP projects are terminated before the end of the project.

ATP regularly carries out benefit-cost studies of projects. These studies focus on benefits to the nation, not just the firms doing the R&D. Such studies determine net present values, internal rates of return, and benefit-cost ratios. While such studies often examine individual projects, ATP has also carried out analyses for clusters of projects, for example, cluster studies for composite materials and high definition television (HDTV). In both cases, the benefits were significant. In the composites cluster (predominately affecting the auto industry and the offshore oil industry) the benefit-to-cost ratios on ATP's investment ranged from 83:1 to 92:1. The net present value of ATP's investment was approximately $900 million, and the public rate of return was approximately 45 percent.

ATP's HDTV projects reduced the cost of TV station conversion from analog conventional television to digital HDTV, and accelerated the adoption of new digital studio technology. Net present value to the nation was estimated to be in the range of $126 to $205 million. Benefit-to-cost ratio estimates ranged from 3.5 to 5. The social rate of return was estimated to be 25 to 32 percent.

An in-depth retrospective analysis of ATP's "2 millimeter" project was recently completed. This project, funded very early in ATP's existence, helped the auto industry improve dimensional variation in auto assembly and allowed U.S. automakers to catch up with Japanese firms. A conservative estimate is that this project generated nearly $200 million in GDP for the United States.

When aggregate results are examined for all projects studied, the benefits of the successful projects exceeded the entire cost of ATP by 9 to 1.

To encourage companies to seek funds to continue to pursue their projects after ATP funding ends, ATP's Economic Assessment Office has conducted networking events and sessions for ATP awardees on how to make effective presentations to investors. Networking and "*Art of Telling Your Story*" events have been held in Pittsburgh, Pennsylvania, and Ann Arbor, Michigan, in September. Another event was held in College Park, Maryland, in December.

Committee Discussion:

The Committee feels that ATP has done a much better job of assessing results than other Federal agencies, including assessment of the SBIR program.

The number of four-star projects may be increasing. Of course ATP funds high-risk projects, so a certain number of failures are to be expected. About half of the zero- and one-star projects did achieve their technical goals, but for a variety of reasons were unsuccessful in commercializing the technology. With each passing year ATP gains increased appreciation for the difficulties inherent in commercializing new technology.

ATP has compared funded projects to unfunded projects (by surveying all applicants) to assess the importance of ATP funding. One survey showed that about 40 percent of unfunded applicants do not pursue the project at all without ATP funding. Of the remainder, most pursue the project much less aggressively than they would have with ATP cost sharing. One of the essential criteria for selection is the extent to which the project would be pursued without ATP funding. Projects that seem likely to go forward without ATP funding will not be funded. In those cases where there are unfunded projects that went

forward without ATP funding, it is clear that ATP made the right decision by not funding them.

ATP has investigated the reasons why some joint ventures fail. Intellectual property (IP) rights can be a source of friction in joint ventures. IP attorneys for large corporations are often highly protective. Sometimes joint ventures function for a time before the IP lawyers begin to express reservations about the arrangements. Today ATP is more careful to grill JV applicants on whether their lawyers are comfortable with the IP provisions.

In addition, a number of joint ventures have faltered because a large company partner dropped out. Accordingly, ATP now scrutinizes the "company commitment" section of joint venture proposals with particular care.

Small technology companies are more likely to succeed in ATP projects because they are driven. Often they are "betting the store" on the ATP project and its success is frequently a matter of life or death, whereas large companies can pull the plug on a single R&D project without major impact on their bottom line.

The distribution of successful and unsuccessful ATP projects is similar to that of venture capitalists; however, venture capitalists (VC) seek projects with much lower technical risk and shorter-term payoff than ATP, which makes ATP's results more impressive. VC's generally fund projects only after technical proof of concept. VC's prefer to select projects that are close to producing a revenue stream.

The Committee believes that ATP fills an important niche for the nation. There is a role for VC's and a different role for ATP. At one point a leader of the venture capital community testified to Congress regarding the unique role of ATP. ATP funds important projects for the nation that are too risky for the VC community. Once the technical risks are overcome, then the VC community can finish the job. The Federal government spends a tremendous amount of money on basic research, but if those discoveries are not commercialized, that investment is wasted. ATP fills that gap, and the commercialization of new technologies affects and improves people's lives.

Before they became fashionable, ATP invested in areas that have since become "hot areas" of technology, such as nano-technology and DNA diagnostics technology. This demonstrates conclusively that ATP can stimulate the development of whole new technical areas that later prove to be important to the nation.

Over the life of ATP just over $2 billion of ATP funds have been invested, with a comparable amount of industry cost sharing, and the studies to date show that the combined net economic benefits are nearly $18 billion.

Given the high aggregate of benefits from ATP's projects, the Committee believes it is important for ATP to step up its efforts to communicate results to key policy makers. ATP's aggregate data are more credible because ATP examines *all* projects, not just successful ones.

Guest Speakers on Healthcare Issues

At previous meetings the Committee had suggested that the role of ATP in the healthcare arena might present particularly important opportunities for the nation. Accordingly, ATP invited two distinguished guest speakers to address that topic. They were:

- Jonathan Cohen, President and CEO of 20/20 GeneSystems, Inc.

and

- Russell Bodoff, Executive Director, Center for Aging Services Technologies (CAST)

Mr. Cohen spoke on the topic of personalized medicine in the 21st century.

Cohen's company works in the field of diagnostics to enable individualized therapy. If suitable diagnostic tools existed so that an individual's personal biochemistry were known, then therapies could be tailored to that particular individual, which could increase the effectiveness of treatment and avoid adverse side effects. This individualized approach to medicine promises significant improvements in healthcare.

The example of Vioxx was cited to illustrate the need for personal diagnostics. This drug is highly effective for most patients, but a

few people are at increased risk of heart problems and strokes, and this is why Merck recently withdrew the drug. If effective genetic tests had been available to determine in advance which individuals would react badly to the drug, then Merck might not have had to withdraw it.

An FDA report states:

> "The emerging techniques of pharmacogenomics and proteomics show great promise for contributing biomarkers to target responders, monitor clinical response, and serve as biomarkers of drug effectiveness."

The report noted that much developmental work is needed before these diagnostics techniques can be easily and widely used.

Cohen stated that "21st century drugs are prescribed using 19th century diagnostics." For example, tumors are characterized by their physical appearance rather than biochemical factors that determine whether or not a particular therapy will be effective. Therapies have outpaced diagnostics.

Cohen made a strong case that venture capitalists are unlikely to provide funding for genetic diagnostic tools and platform technologies because funding the development of potential blockbuster drugs is more attractive. NIH funds university basic research related to diagnostics, but rarely, if ever, funds companies to overcome technical barriers to commercialization. That is why programs such as ATP are important. FDA fast-track review can speed the time it takes to develop and bring to market new technologies of the type pursued by 20/20, but it is clear that without more Federal encouragement, developments will proceed at a much slower pace than justified by the importance of the potential outcomes of the R&D. ATP's mission is to foster economic growth by accelerating important new technologies. Genetic diagnostics tools have the potential to reduce healthcare costs; hence there is a clear rationale for ATP to cost-share research in that field.

Mr. Bodoff's center is studying the challenges associated with the aging baby boomers, who will, by their sheer numbers, ultimately strain if not bankrupt our existing healthcare system unless we change the way medical care is provided to people who need assistance with daily living. Without new approaches, the costs could eventually amount to fifty percent of our economy. New technology can help to meet these needs by making it possible for people to stay in their homes independently longer.

CAST has seven task groups addressing various aspects of the problem and its solution:

1. Business and economic model
2. Evangelizing vision task group
3. Electronic health & wellness records
4. Funding aging services technologies
5. Web communications
6. Needs research
7. Smart campus standards task group

The conventional approach to delivering heath services is to wait until an individual becomes seriously ill. Then he or she goes to a hospital or clinic, which administers expensive procedures and treatments, followed often by the prescribing of expensive drugs, with the patient sent home to fend for himself or herself. Too often elderly people living alone have difficulty taking their multiple prescriptions at the right times and in the right doses.

Bodoff provided examples of how technology can address these needs. He showed a short video clip illustrating new assistive technologies. CAST organized a highly successful demonstration for the U.S. Senate to increase awareness of the issues. Both commercial companies and universities participated in the demonstration. Here are three examples of assistive technologies:

- Object tracking system to help patients take prescriptions as prescribed.
- System to help Alzheimer's patients recall names and faces of friends and family.
- Smart chair that monitors breathing and heart rate.

CAST presented its positions to a meeting of the National Governors' Association, and this led to a White House forum that further increased visibility for this important effort. More such activities are planned for the future. Up to now government, the insurance

industry, and the medical establishment have not devoted adequate attention to this problem, but that may change as more people begin to appreciate the seriousness of this challenge.

Bodoff reviewed CAST's policy objectives for 2005. They include championing such things as removing barriers to wireless adoption in facilities, promoting broadband internet access for seniors, revising Federal label and definition of "assistive technologies" to include in-home monitoring and other independent living technologies, and seeking funding for pilot projects across the continuum of aging.

Committee Discussion:

The Committee found these presentations to be highly informative.

Some states may act more quickly than others to respond to these needs. A state such as Florida, which has a disproportionate number of elderly people, certainly should have a keen interest.

The private sector and the venture capital community do not appear eager to fund this area of research in spite of what might seem to be business opportunities because there is a timing and risk issue. Historically, with only a few exceptions, large rewards have not come to companies engaged in platform technology development. Ultimately funding will probably flow into this field, but not as quickly as the patients need the technology.

Of course, there are privacy issues associated with genetic testing of individuals. For example, insurance companies may raise premiums or deny coverage to individuals known to have genes that make them susceptible to diseases. But as we move away from "one size fits all" medicine, healthcare outcomes will improve. The number of errors and lawsuits can be reduced. The Human Genome Program at NIH is very concerned with these issues and is recommending new privacy laws.

The Committee considered this discussion a good illustration of cross-disciplinary technologies where ATP can make a difference and accelerate the development of new tools. Venture capitalists rarely fund diagnostic tools. Resulting products tend to sell for low prices. There are regulatory hurdles. Clinical trials for therapies for Alzheimer's or other slowly developing chronic diseases can take ten years because these diseases tend to progress slowly. The medical field is often slow to adopt new diagnostic tools. Getting consumer electronic companies involved in assistive technology devices for the elderly could speed their development. Getting insurance companies involved in research issues could also help.

The Committee agreed that the issue of assistive technology for our aging population is important. It is not clear that the Federal government has geared up to address it. NIH funds and carries out the basic research but NIH and NSF are not interested in applications of technology.

China, with its expanding population, will have needs for assistive technology, and China could be a *huge* market for U.S. products. This opportunity could form a rationale for stepped up Federal R&D support. Interdisciplinary areas of technology are especially well suited for ATP. There was agreement that technology for aging Americans could be a fruitful area for ATP to pursue.

Appendix 1
Economic Evaluation Reports for the Period FY 2003-2004

Economic Reports and Studies (7)
in reverse chronological order:

Evaluation of ATP's Intramural Research Awards Program. NIST GCR 04-866. December 2004, (Economic Study), Albert N. Link

Measuring ATP Impact, 2004 Report of Economic Progress. (drawn from EAO's multifaceted evaluation portfolio) September 2004, by ATP/EAO staff

Closing the Competitive Gap: A Retrospective Analysis of the ATP 2mm Project, Karen Polenske and Nicolas Rockler, NIST GCR-03-856, July 2004

Composite Manufacturing Technologies, Applications in Automotive, Petroleum, and Civil Infrastructure Industries, Thomas M. Pelsoci, NIST GCR 04-863, June 2004

Joint Ventures, Universities, and Success in the Advanced Technology Program, *Contemporary Economic Policy*, Vol. 22, No. 2, April 2004, 145-161, Michael Darby, Lynne G Zucker, and Andrew Wang

ATP Eligibility Criteria for US Subsidiaries of Foreign-Owned Companies: Legislation, Implementation, and Results, Connie K.N. Chang, NISTIR 6099a, March 2004

Economic Impact of the Advanced Technology Program's HDTV Joint Venture, William White and Alan O'Connor, NIST GCR-03-859, January 2004

ATP Working Papers: (1)

Catalyzing the Genomics Revolution: ATP's Tools for DNA Diagnostics Focused Program. Chemistry and Life Sciences Office. ATP Working Paper 04-01. July 2004.

Status Reports (26)
http://statusreports-atp.nist.gov/basic_form.asp

Twenty six new status reports are now completed for a total of 126 Status Reports. Status Reports are available on a searchable website or by going to www.atp.nist.gov and looking under Products and Services.

Factsheets (6)
http://www.atp.nist.gov/eao/eao_pubs.htm

Six new factsheets from Survey of Applicants 2002 that address customer satisfaction will be published in early 2005 as:
GCR # 05-873 ***Customer Satisfaction Findings from the Advanced Technology Program's Survey of ATP Applicants 2002.***

The 6 factsheets are:

- Applicant Perceptions of the ATP Proposal Process
- Applicant Views of the Proposal Preparation Kit and Electronic Submission System
- Applicant Views of the Usefulness of ATP Information Sources
- Applicant Satisfaction with ATP Staff
- ATP Proposal Debriefing: Nonawardee Views
- Time and Cost for ATP Proposal Preparation

Conference Papers in 2004 (8)

A Toolkit for Evaluating Public Research and Development Investment, a panel discussion with Rosalie Ruegg, Irwin Feller, and Connie Chang, American Evaluation Association, November 2004

Meeting an Evaluation Challenge: Establishing Effective Program Feedback Loops for Improved Program Management, with Rosalie Ruegg and Connie Chang, American Evaluation Association, November 2004

The Advanced Technology Program: Evaluation Best Practices and Results, Stephanie Shipp, Connie Chang, and Lorel Wisniewski, Joint Statistical Meetings, August 2004, and the American Evaluation Association, November 2004

The Determinants of Success in R&D Alliances, Andrew Wang, Jeffrey Dyer, Benjamin C. Powell, and Mariko Sakakibara, International Society for New Institutional Economics (ISNIE) in Tucson, AZ, September 2004

The Role of Small Firms in the US R&D and Innovation System: Evidence from the Advanced Technology Program, Gary Anderson, Joint Statistical Meetings, August 2004

Federal R&D Funding – Outcomes from Award Competition in the Advanced Technology Program, Stephen Campbell and Andrew Wang, Joint Statistical Meetings, August 2004

Industry R&D Collaboration – Project Outcomes from Research Joint Ventures in the Advanced Technology Program, Stephen Campbell and Andrew Wang, Joint Statistical Meetings, August 2004

Comparison of Web, Mail, and Mixed-Mode Data Collection Methods in a Survey of Advanced Technology Program Applicants, Jeffrey Kerwin, Pat Dean Brick, Kerry Levin, Jennifer O'Brien, and David Cantor, Westat and Andrew Wang, Steve Campbell, and Stephanie Shipp, National Institute of Standards and Technology, Advanced Technology Program, Joint Statistical Meetings, August 2004

ATP Best Practices in Public R&D Program Evaluation: Ealuation Principles, Challenges, and Recommendations for AIST, Connie Chang, Symposium on Full Research and Its Evaluation, Evaluation Department, National Institute of Advanced Industrial Science and Technology, Tokyo, Japan, July 2004

Appendix 2
List of ATP Awards, Calendar Years 2003 and 2004

AWARDEE/ PARTICIPANTS	CONTACT/ PHONE	TOTAL ATP AWARD	PROJECT TOTAL	YEAR
3DGeo Development Santa Clara, CA	Dimitri Bevc (408) 450-7840 x102	$1,930,000	$2,555,000	9/1/2004
Automated Wave-Equation Imaging for Oil and Gas Exploration Develop and demonstrate a next-generation seismic imaging technology that includes an automated solution to modeling the acoustic propagation velocity for seismic waves, yielding faster and more accurate images to guide oil and gas exploration				
Advanced Digital Imaging Research, LLC League City, TX	Kenneth R. Castleman (281) 535-1889 x427	$1,981,989	$3,189,536	5/1/2004
3-D Face Recognition for Security Screening Develop and test a real-time, three-dimensional facial recognition system that combines the advantages of both 3D and 2D imaging for use at airport security checkpoints.				
Advanced Interfaces, Inc. State College, PA	Priya Baboo (814) 867-8977	$1,988,720	$2,485,901	9/1/2004
Enabling Personalized Multimodal Access for People with Severe Communication/Motor Disabilities Develop a touch-free, personalized, trainable multimodal interface to enable effective communication for individuals affected by severe communication/motor disabilities.				
Aether Wire & Location, Inc. Nicasio, CA	Vincent Coli (408) 400-0785	$1,985,240	$2,925,692	5/1/2004
Instant Networks Using Coin-sized Ultrawideband (UWB) Localizers Develop and test coin-sized components for a low-cost wireless network offering highly accurate three-dimensional positioning and radio-frequency communications.				
AureoGen Biosciences, Inc. Kalamazoo, MI	Ake P. Elhammer, Ph.D (269) 372-3517	$1,450,508	$2,242,542	9/1/2004
A Genetic Engineering Technology Platform for Production of Novel Cyclic Peptide-Based Drugs Develop methodologies and tools to enable simple, efficient genetic engineering of biosynthesis complexes to produce cyclic peptides for use as antifungal, antibacterial and anticancer drugs.				
Cabot Superior MicroPowders Albuquerque, NM	James Caruso (505) 342 1492 x21	$2,000,000	$3,944,469	5/1/2004
Enhancing the Performance of Polymer Electrolyte Membrane Fuel Cells Develop and test a new family of surface-modified carbon support materials for platinum catalysts that will double the power density of polymer electrolyte membrane fuel cells.				
Carbon Nanotechnologies, Inc. Houston, TX *Other participants*: ▪ Johnson Matthey Fuel Cells, Inc. Tempe, AZ ▪ Motorola, Inc. West Chester, PA	T.J. Wainerdi (281) 492-5719	$3,616,054	$7,379,707	9/1/2004
Free Standing Single-Wall Carbon-Nanotube Fuel Cell Electrode Develop a novel, free-standing single-wall carbon nanotube electrode assembly containing an immobilized noble-metal catalyst to enable compact proton exchange membrane fuel cells with superior performance and longer lifetimes while simplifying manufacturing.				
Carnegie Speech Company Pittsburgh, PA	Maxine Eskenazi (412) 268-3858	$1,909,982	$2,308,787	5/1/2004
F***ocused Individualized Realistic Student Tutoring (FIRST)*** Develop a software architecture for creating individually focused tutoring programs in language learning and basic mathematics that can pinpoint the learner's errors in real time, offer targeted correction, and judge when to switch focus to maximize learner progress.				

AWARDEE/ PARTICIPANTS	CONTACT/ PHONE	TOTAL ATP AWARD	PROJECT TOTAL	YEAR
Corning Incorporated Corning, NY *Other participants*: ■ ENrG, Inc. Buffalo, NY	Monica L. Ott (607) 974-8769	$7,996,219	$16,030,864	9/1/2004
Scalable Planar Solid-Oxide Fuel Cell Technology for Beyond 200kWn Develop a thin, large area planar solid oxide fuel cell based on innovative ceramics, device design, and array architecture, for enterprise-level primary and cogeneration distributed power that can cycle repeatedly and be more easily fabricated into 200kW power units.n				
Cree, Inc. Durham, NC Other participants: ■ Nanocrystal Lighting Corporation Briarcliff Manor, NY	Cynthia Merrell (919) 313-5359	$3,383,865	$6,951,195	9/1/2004
Low Cost, High Efficiency Chip Scale LED Lamp Demonstrate a white light-emitting diode (LED) lamp package with an integrated chip approach that would more than quadruple the brightness and double the efficiency of existing LED systems and significantly reduce the cost per lumen.				
Crystal IS, Inc. Latham, NY	Dr. Keith R. Evans (518) 276 3325	$1,997,872	$3,118,722	9/1/2004
Processes for Growing Large, Single-Crystal Aluminum Nitride Develop cost-effective, high-quality, and commercially important, single-crystal aluminum nitride (AlN) substrates, which are needed for diverse and important power electronics and optoelectronics applications, by using an approach that incorporates new techniques of crystal seed growth, coupled with advanced thermal gradient control, and new crucible designs, to grow large high-quality, AlN crystal boules.				
CytImmune Sciences, Inc. Rockville, MD	Lawrence Tamarkin, Ph.D. (240) 864-2796	$1,999,972	$2,879,056	9/1/2004
The In Vitro Production of Human Monoclonal Antibodies Develop a semi-synthetic human immune system on colloidal gold nanoparticles, to make wholly human monoclonal antibodies in vitro for the treatment of rheumatoid arthritis and other diseases.				
DAFCA, Inc. Framingham, MA	Peter Levin (774) 204-0020	$1,828,050	$2,584,692	9/1/2004
Reconfigurable Infrastructure Platform for Systems-on-Chips Develop an infrastructure platform for system-on-a-chip (SoC) electronics that implements a new kind of reconfigurable embedded debug logic to detect and fix design errors after fabrication, enabling reduced design cycle time, bypassing manufacturing defects, and improving yields.				
Discera, Inc. Ann Arbor, MI	Wan-Thai Hsu (734) 528-6365	$2,000,000	$3,734,357	5/1/2004
Fully Integrated Gigahertz Receiver Front End Develop microelectromechanical systems (MEMS) devices and processing methods for making the front end for a "radio receiver on a chip" that is much smaller, cheaper, and more efficient than today's multichip receivers.				
FAST VDO LLC Columbia, MD	Dr. Pankaj Topiwala (410) 309-6066	$1,656,466	$2,762,746	5/1/2004
High-Definition Video Disc (HDVD) Develop and demonstrate compression technology for recording and playback of high-definition video content on a standard DVD using the current red-laser DVD player.				
First Genetic Trust, Inc. Rutherford, NJ	David Wholley (201) 842-2845	$2,000,000	$2,722,684	5/1/2004
Secure Genetic Repository to Enable a Nationwide Post-Marketing Drug Surveillance and Research Network Design a prototype of an anonymous clearinghouse for sensitive patient medical data that will enable large-scale studies of the genetic basis of adverse drug reactions and research into personalized medicine.				

AWARDEE/ PARTICIPANTS	CONTACT/ PHONE	TOTAL ATP AWARD	PROJECT TOTAL	YEAR
Gemini Life Sciences, Inc. Sugar City, ID	Ross H. Farmer (208) 390-0363	$1,975,002	$2,709,999	9/1/2004
Biotechnology for Conferring Apomixis (Clonal Seed Production) to Crops Develop technologies to stabilize superior crop hybrids by asexual seed production ("self-cloning") thereby improving yields of major food, feed, fiber and biomass crops and reducing hybrid seed production costs.				
Geometric Informatics, Inc. Sommerville, MA	Dr. Hugh Rutledge (617) 623-2033	$1,915,976	$2,515,976	5/1/2004
Geometric Surface Classification and Identification by Conformal Structure Develop and refine novel algorithms based on modern geometric theories for classifying, analyzing, and identifying 3D information that is independent of surface distortion, embedding, lighting, and image resolution, for use in biometrics, management of 3D geometry databases, medical imaging, and entertainment.				
Glennan Microsystems, Inc. Cleveland, OH Other participants: ■ Case Western Reserve University Cleveland, OH ■ Delavan, Inc. (d/b/a Turbine Fuel Technologies, Goodrich Corporation) West Des Moines, IA ■ Zin Technologies Brookpark, OH	Martin Kress (216) 898-6440	$3,160,000	$6,330,000	5/1/2004
Advanced Fuel and Emission Control (AFEC) System Technology DemonstratorDevelop an active combustion control system for gas turbine engines based on MEMS technology and SiC sensors that will greatly reduce polluting emissions while extending engine life and preserving fuel efficiency.				
Ingersoll Machine Tools, Inc. Rockford, IL	John Osborn (815) 987-6039	$2,000,000	$2,809,854	5/1/2004
Development of Micro- and Meso-Scale Machine Tool Technology Develop ultraprecise miniaturized machine tools for micro/meso scale commercial machining applications at a fraction of current machine costs, with a wide range of industrial applications including optics, electronics, medicine, biotechnology, communications, and avionics.				
Innovative Wireless Technologies, Inc. Forest, VA	Eric Hansen (434) 316-5230 x26	$1,999,986	$3,512,018	9/1/2004
Unified Radio Architecture - A Cognitive Radio Platform Develop a "cognitive radio" software and hardware platform based on a novel radio-frequency IC chipset that allows interoperability across different wireless protocols, multiple frequencies, and airlinks, enabling communications between public safety personnel with different equipment.				
Kent SeaTech Corporation San Diego, CA	James M. Carlberg (858) 452-5765	$1,999,380	$2,612,263	9/1/2004
Targeted Bacteriophage Therapeutics as Replacements for Conventional Antibiotics in Aquaculture Develop therapies using naturally occurring bacteriophages and phage-produced enzymes to treat and prevent major bacterial diseases that threaten commercial aquaculture.				
Kiara Networks, Inc. Albuquerque, NM	Neena Jain (505) 268-3600	$1,995,000	$2,295,890	5/1/2004
Ultracompact Low-cost Tunable Components for Reconfigurable Optical Networks and Spectroscopic Sensors Design and demonstrate a novel technology platform to enable the fabrication of low-cost and ultracompact tunable optical components for reconfigurable optical networks and spectroscopic sensors.				
Language Weaver, Inc. Marina del Ray, CA	Beth Walsh (858) 724-2500	$1,972,557	$3,344,318	9/1/2004
Syntax- and Rule-Based Decoding for Statistical Machine Translation Systems Develop an integrated, statistical phrase-based and syntactic rule approach to machine translation to improve grammaticality and accuracy of translated materials, enabling broader use of machine-based translation by national security, government and business organizations.				

AWARDEE/ PARTICIPANTS	CONTACT/ PHONE	TOTAL ATP AWARD	PROJECT TOTAL	YEAR
Leadscope, Inc. Columbus, OH	Glenn Myatt (614) 675-3731	$2,000,000	$2,180,466	5/1/2004
A Distributed ChemTox Platform for Predicting Chemically Induced Toxicity Develop a technology platform that will extract information from heterogeneous toxicology databases and use it to accurately predict the toxicity of compounds that might be useful as pharmaceuticals or other chemical products				
MesoFuel, Inc. Albuquerque, NM	W. Doyle Miller (505) 314-8160	$1,988,189	$,3052,623	5/1/2004
Compact Pure Hydrogen Generation Systems for PEM Fuel Cell Applications Develop and demonstrate a compact system for safely generating pure hydrogen fuel to boost the efficiency of proton exchange membrane fuel cell stacks by up to 50 percent.				
Molecular Imprints, Inc. Austin, TX Other participants: ■ Motorola, Inc., Motorola Labs Tempe, AZ ■ KLA-Tencor Corporation Milpitas, CA ■ Photronics, Inc. Brookfield, CT ■ University of Texas at Austin Austin, TX	Michael Falcon (512) 339-7760 x208	$17,623,118	$36,790,485	9/1/2004
Nano-Imprint Lithography Infrastructure for Low Cost Replication at the 65 nm Node and Beyond Design and demonstrate technology for step and flash imprint lithography (S-FIL), a novel method of transferring integrated circuit patterns to the surface of a semiconductor wafer by molding of three-dimensional features potentially as small as 20 nanometers or less.				
Multibeam Systems, Inc. Santa Clara, CA	T.S. Ravi (408) 855-8400 x104	$1,999,180	$2,707,480	9/1/2004
Development and Demonstration of a Multiple, High-Current-Density Shaped E-Beam Column With Independent Vector Beam Placement Develop a new technology for a multiple-beam, linear-array electron-beam lithography system to enable cost-effective production of low-volume application-specific integrated circuits (ASICs) through direct-write lithography.				
Nanospectra Biosciences, Inc. Houston, TX	J. Donald Payne (713) 842-2720 x201	$2,000,000	$2,551,351	9/1/2004
The Seamless Detection and Treatment of Cancer With Near-Infrared Absorbing Nanoshells Develop an integrated approach to the diagnosis and treatment of cancer allowing more accurate detection and contemporaneous, minimally invasive treatment using near-infrared absorbing nanoparticles.				
NexTech Materials, Ltd. Lewis Center, OH	Jonathon Foreman (614) 842-6606 x110	$1,999,966	$2,549,755	9/1/2004
High-Power-Density Solid Oxide Fuel Cells for Aerospace Applications Develop a lightweight solid oxide fuel cell that offers five times the power density of the current state of the art, as well as greater durability and flexibility of operation, for use in auxiliary power units for aircraft.				
Nomadics, Inc. Stillwater, OK	Bruce Cumming (405) 372-9535	$1,948,484	$2,927,702	9/1/2004
Microsphere-Based Spectroscopic Instruments Develop a highly sensitive spectroscopic detection system, based on microspheres, for the analysis of chemicals and biomolecules to allow implementation of integrated lab-on-chip nanofluidic methods, initially targeted at acceleration of drug discovery.				
OFS Fitel, LLC Murray Hill, NJ	Sherry Salyer (770) 798-4210	$2,000,000	$5,665,775	9/1/2004
Specialty Fiber for High-Power Fiber Lasers Develop a new class of components and manufacturing technologies for building high-power pulsed optical-fiber-based lasers, with applications in materials processing, and medical, industrial and scientific instrumentation.				

AWARDEE/ PARTICIPANTS	CONTACT/ PHONE	TOTAL ATP AWARD	PROJECT TOTAL	YEAR
Optical Research Associates Pasadena, CA	Laura Mickens (626) 795-9101	$1,704,957	$4,299,575	5/1/2004
Fundamental Algorithms for Direct Tolerancing and Illumination Optimization Develop innovative algorithms for the design and tolerancing of microlithography optics at 193 and 157 nanometers and algorithms for illumination source optimization in the extreme ultraviolet at 13 nanometers to improve throughput of advanced semiconductor fabrication lines through 2014.				
Precision Photonics Corporation Boulder, CO	Nick Traggis (303) 444-9948 x16	$2,000,000	$2,945,876	5/1/2004
High-Speed Optical Frequency Metrology for Spectroscopy, Interferometry, and Optical Communications Develop a femtosecond laser as a "ruler" for measuring optical frequencies much more rapidly and accurately than is now possible, to enhance optical communications, semiconductor manufacturing, medical diagnoses, and other activities.				
Quantum Dot Corporation Hayward, CA	Andy R. Watson (510) 887-877 x4106	$2,000,000	$,888,524	9/1/2004
Quantum Dots for Biomedical and Consumer Applications Develop quantum dots without the use of cadmium or other elements with extreme regulatory burdens for use in imaging-based medical diagnosis and treatment, and develop an industrial-scale flow-based process for quantum dot production at significantly increased output and reduced cost.				
Receptor Logic, Ltd. Amarillo, TX	Tony Taylor (512) 263-3232 x210	$2,000,000	$2,722,000	9/1/2004
TCR Mimics: A New Class of Antibodies Against HLA-peptide Complexes for Diagnosis and Therapy of Breast Cancer Develop a new class of breast cancer diagnostic and therapeutic antibodies unique in their ability to recognize tumor proteins presented by the body's natural antigen display systems known as HLA.				
Revivicor, Inc. Blacksburg, VA	David Ayares, PhD (540) 961-5559	$1,843,502	$2,488,727	9/1/2004
Production of Fully Human Polyclonal Antibodies in Genetically Modified Pigs Develop pigs with human genes for the production of fully human polyclonal antibodies that can be used to treat a wide range of infectious and autoimmune diseases, in cancer treatments, to address the growing threat of antibiotic resistance, and to provide potential therapeutic agents in the event of a bioterrorist attack.				
RheoGene, Inc. Norristown, PA	Lorraine Keller, Ph.D (610) 650-8734	$1,997,574	$2,496,968	9/1/2004
Novel Technologies for Adult Stem Cell Therapeutics Develop novel techniques for site-specific insertion and control of therapeutic genes in human adult neural stem cells that can be transplanted to treat incurable ocular diseases.				
Rohm and Haas Company Philadelphia, PA	Kenneth A. Gedaka (215) 641-7940	$2,000,000	$7,242,258	5/1/2004
Project Columbus: Discovering Whole New Worlds of Polar Polymers Develop a new catalysis technology platform that will enable cost-effective production of new families of high-performance acrylic polymers and copolymers.				
Sangamo BioSciences Richmond, CA	Dr. Casey C. Case (510) 970-6000 x202	$1,987,774	$2,822,639	5/1/2004
Targeted Activation of Multiple Genes in Plants Using a Single Engineered Transcription Factor Develop and test technology for introduction of a transgene for a single molecular switch into plants to activate simultaneously multiple genes involved in synthesis of commercially important products.				

AWARDEE/ PARTICIPANTS	CONTACT/ PHONE	TOTAL ATP AWARD	PROJECT TOTAL	YEAR
Sarnoff Corporation Princeton, NJ Other Participants: ■ Autoliv, Inc. Auburn Hills, MI ■ Ford Motor Company Dearborn, MI	Mr. Thomas V. Lento (609) 734-3178	$5,091,633	$10,391,125	5/1/2004
Advanced Vision-Radar Threat Detection (AVRT): A Pre-Crash Detection and Active Safety System Combine vision and radar sensor technology to create a new type of auto safety system that will detect approaching hazards, measure their rate of motion, determine if and where a collision will occur, and trigger mitigating actions, such as applying brakes, pretensioning seat belts, and firing side airbags, with a near-zero false alarm rate.				
SemiSouth Laboratories, Inc. Starksville, MS	Jeffrey B. Casady (662) 324-7607	$1,776,466	$2,538,372	9/1/2004
Silicon Carbide Smart Power Chip Develop and integrate advanced silicon carbide (SiC) power transistors and power control circuitry within a compact prototype SiC power module for potential use in commercially available hybrid electric vehicles and future low-emission electric vehicles.				
Sensametrics, Inc. Los Altos Hills, CA	Garo K. Kiremidjian (650) 941-5692	$1,641,316	$2,000,000	9/1/2004
Wireless Structural Health Monitoring System Develop a dense peer-to-peer wireless sensor network for monitoring the health of structures that has damage assessment and decision support and is able to include chemical and biological sensors.				
Siemens Westinghouse Power Corporation Orlando, FL Other Participants: ■ MesoScribe Technologies, Inc. Stony Brook, NY	Melanie Forbrick (407)736-6718	$2,653,344	$5,414,986	9/1/2004
Conformal Direct-Write-Technology-Enabled, Wireless, Smart Turbine Components Develop embedded sensors capable of withstanding harsh environments and integrate them in a wireless telemetry system to enable thermal, mechanical and wear sensing in operating gas turbines for condition-based maintenance.				
Spry Learning Company Portland, OR	Devin Williams (503) 229-0880	$1,447,290	$1,933,290	9/1/2004
Technology for Early Detection and Intervention of Cognitive Decline Develop technology to monitor, and possibly mitigate, cognitive decline in older adults by tracking user interaction with computer applications and assessing over time the rate of cognitive impairment, thus facilitating earlier intervention and treatment.				
STAR Cryoelectronics, LLC Santa Fe, NM	Robin Cantor (505) 424-6454 x101	$1,833,376	$2,762,253	9/1/2004
Next-Generation Energy Dispersive Spectrometer for X-Ray Microanalysis Develop a next-generation energy-dispersive microcalorimeter spectrometer to meet critical needs for high-resolution X-ray microanalysis in the semiconductor industry and materials research.				
Stewart Automotive Research Houston, TX	Simon Ogier (713) 675-3244	$2,000,000	$2,437,640	9/1/2004
Highly Accurate Large-Format Machining for Mold and Die Develop a large-format, high-speed finish milling machine for Class-A auto body panels to enable the design and manufacture of a complete tooling set in one-third to one-half the time now required, at significantly lower cost.				
StrataGent Life Sciences, Inc. Los Gatos, CA	Penny Smout (408) 206-8716	$2,000,000	$2,527,000	5/1/2004
Microjet Patch for Transdermal Drug Delivery Develop a novel wearable transdermal drug delivery system using programmable arrays of high-energy microjets for painless, and precisely controlled and timed administration of any drug, including injectibles.				

AWARDEE/ PARTICIPANTS	CONTACT/ PHONE	TOTAL ATP AWARD	PROJECT TOTAL	YEAR
Syrrx, Inc. San Diego, CA	Ken Goodwill, Ph.D. (858) 731-3564	$1,974,969	$3,495,696	5/1/2004
High-Throughput Crystallization of Membrane Proteins Using Heterogeneous Nucleants Develop nanoscale arrays and processes that improve the crystallization of medically important proteins, facilitating investigation of these proteins as possible targets for the design of new medicines.				
The Dow Chemical Company Midland, MI Other Participants: ■ Veeco Instruments, Inc. Santa Barbara, CA	Jeff Schatzer (989) 636-5017	$6,560,714	$13,389,209	9/1/2004
High-Speed AFM-Based Platform for Quantitative Nanomechanical Measurements Develop an atomic force microscopy based platform for high-speed, high-bandwidth quantitative nanomechanical measurements which provides structure-property understanding at the nanoscale in order to accelerate discovery, design, and commercialization of nanomaterials.				
The POM Group, Inc. Auburn Hills, MI Other participants: ■ Nuvonyx, Inc. Bridgeton, MO ■ Stellite Coatings Goshen, IN	Roger Parson (248) 390-6617	$6,147,055	$12,457,476	5/1/2004
Rapid, Ultraprecision Direct Metal Deposition Technology Develop direct-metal deposition and nanoscale surface-finishing technologies for an innovative high-speed process for making complex tools and dies.				
The ReJen Company Washoe Valley, NV Other Participants: ■ Alvin Lowi & Associates Rancho Palos Verdes, CA	Dr. Allan Ferrenberg (775) 849-7861	$600,000	$1,479,799	5/1/2004
High-Efficiency Regenerated Cycle Reciprocating Engine Build and test a diesel engine that will exploit the principle of thermal regeneration to increase energy efficiency from about 35 percent to 55 percent and reduce emissions.				
Tissue Regeneration Inc. Medford, MA	Sue Bohle (310) 785-0515 x223	$966,296	$2,364,118	5/1/2004
Engineered Rotator Cuff Tendon Tissue Design and develop a tissue engineering strategy for rotator cuff tendons utilizing a patient's own bone marrow cells and a novel biomaterial, to increase surgical success and reduce cost and rehabilitation time.				
United Technologies Research Center East Hartford, CT Other Participants: ■ Oculus Technologies Corporation Boston, MA	Paul J. Vitello (860) 610-7617	$5,570,804	$11,141,738	5/1/2004
Integrated Concurrent Design of High Efficiency Commercial Buildings Develop and demonstrate the ability to increase the energy efficiency of commercial buildings through the use of integrated concurrent engineering design process and software tools in the application of heating, cooling, ventilation, hot water, and combined heat and power systems.				
UOP LLC Des Plaines, IL	Michele Weber (847) 391-1319	$1,999,998	$5,000,000	9/1/2004
Selective Liquid-Phase Oxidation of Methane to Methanol Develop novel catalysts and an integrated reaction process for low-temperature, low-pressure direct conversion of methane in stranded gas fields to methanol.				

AWARDEE/ PARTICIPANTS	CONTACT/ PHONE	TOTAL ATP AWARD	PROJECT TOTAL	YEAR
Vaccinex, Inc. Rochester, NY	R. Stan Holland (585) 271-2700 x102	$1,993,619	$2,811,003	5/1/2004
Development of a Human Monoclonal Antibody Discovery Technology Develop a new library-based technology platform to select a broad array of fully human monoclonal antibodies in mammalian cells for therapeutic use in treating cancer, inflammation, and infectious diseases.				
Whoola Inc. Dallas, TX	Mr. Sidney M. Cole (214) 202-8380	$2,000,000	$2,149,300	5/1/2004
Peer-to-Peer Virtual Reality Learning Environments Develop a peer-to-peer based architecture for educational software that enables rich, immersive virtual-reality instructional projects built around "groups of groups" of learners and including individualized learner support and evaluation.				
wTe Corporation Bedford, MA	David B. Spencer (781) 275-6400 x101	$1,998,000	$2,408,000	9/1/2004
Optoelectronic Sensing of Liquid Metal Composition Develop a novel process for determining *in situ* and in real time, the chemical composition of molten pools of metals and alloys, enabling immediate adjustments to composition during melting and significantly improving the efficiency of smelting, foundry and casting operations.				
Zebra Imaging, Inc. Pflugerville, TX	Robin Curle (512) 251-5100 x114	$1,947,475	$3,174,384	5/1/2004
Rapid Full-Color Digital Hologram Recorder Develop and test a novel system, including new pulsed lasers, for recording full-color digital holograms with output up to 60 times faster than existing systems.				

Appendix 3
Competition Statistics

	Batch 3 May 2004	Batch 1 Sept 2004	TOTAL
Number of Proposals Received	467	870	1,337
Number of Participants in Submitted Proposals	524	1,022	1,546
Total ATP Funding Requested	$1,039 M	$1,739 M	$2,778 M
Total Industry Cost Share	$736 M	$2,990 M	$3,726 M
Number of Awards	**27**	**32**	**59**
■ Joint Ventures	4	7	11
■ Single Applicants	23	25	48
Number of Participants in Awarded Projects	35	43	78
Total ATP Funds Committed	**$75 M**	**$80 M**	**$155 M**
Total Industry Cost Sharing	**$58 M**	**$57 M**	**$115 M**
Award Size for Projects	$600 K - 18 M	$1.5 - 8 M	$600 K - 18 M
Average Award Size for Projects	$2.4 M	$2.5 M	$2.4 M

ATP Competition Results: FY 2003/2004

- Of the 59 awards shown above, a total of 27 different universities particpate in 22 awards as either a subcontractor or joint venture participant. Approximately $9.0 M of ATP funds support this involvement.

During FY2003/2004:

- During FY 2003, ATP awardees reported 276 new publications and 232 U.S. patents related to work underway on ATP projects.
- ATP technical and business staff provided project management oversight for over 270 active awards.
- ATP's Economic Assessment Office produced six new fact sheets on customer satisfaction, nine new program related publications, and oversaw the development of 26 new status reports for completed projects.
- Recent publications provide an overall assessment of ATP impact, an evaluation of ATP's Intramural research awards, and a retrospective study of the outcomes of the ATP 2mm project. In addition, two new benefit-cost studies on ATP composite manufacturing projects and an ATP HDTV joint project show large returns to the economy that resulted from these projects.

About the Advanced Technology Program

The Advanced Technology Program (ATP) bridges the gap between the laboratory and the market place through research partnerships with the private sector. ATP's early stage investments accelerate the innovation of new products and processes that contain enabling technologies that private investors consider too risky. ATP changes the way U.S. industries approach high-risk research by providing a mechanism for industry to extend its technological reach and push out the envelope of what can be attempted.

ATP views R&D projects from a broad perspective. In sharing the relatively high risks of developing technologies that could enable a broad range of new commercial opportunities, ATP fosters projects with a high pay-off for the nation as a whole-in addition to a direct return to the innovators.

ATP has several features that set it apart from other government R&D programs:

- For-profit companies conceive, propose, and execute ATP projects, often in alliance with other companies, academia, not-for-profit organizations, and federal labs. All industries and all fields of science and technology are eligible for funding. For-profit companies retain rights to all intellectual property developed in a project.

- ATP award is a cost-share agreement. Joint Ventures (two or more for-profit companies working together) pay at least half of all project costs. Large, *Fortune* 500 companies participating as single firms must pay at least 60 percent of total project costs. Small and medium-sized companies working on single-company ATP projects must pay a minimum of all indirect costs associated with the project.

- ATP does not fund basic research or product development.

- ATP awards are made strictly on the basis of rigorous, peer-reviewed competitions. Selection is based on scientific and technological merit, and strong potential for broad-based economic benefits to the nation. All proposals are assured a confidential, technically competent review even if they involve a broad, multi-disciplinary mix of technologies.

- ATP's support does not become a perpetual subsidy or entitlement—each project has goals, specific funding allocations, and completion dates established at the start. Projects are monitored and can be terminated for cause before completion.

More than 60% of ATP awards have gone to small businesses or to joint ventures led by a small business. Of the projects selected for awards since ATP's inception in 1990, well over half of the projects include one or more universities as either subcontractors or joint-venture members. More than 165 universities are participating in ATP projects.

For more information, or to be put on the ATP mailing list:

Hotline:	1-800-ATP-FUND (1-800-287-3863)
Email:	*atp nist.gov*
Fax:	(301) 926-9524
Web site:	*www.atp.nist.gov*
By writing:	Advanced Technology Program National Institute of Standards and Technology 100 Bureau Drive, Stop 4701 Gaithersburg, MD 20899-4701