VIRGINIA'S CENTER FOR INNOVATIVE TECHNOLOGY
Accelerating Virginia's Return on Innovation

October 29, 2004

The Honorable Mark R. Warner
Governor of Virginia
State Capitol, Third Floor
Richmond, Virginia 23219

The Honorable John H. Chichester
Chairman, Senate Finance Committee
P.O. Box 904
Fredericksburg, Virginia 22404

The Honorable Vince F. Callahan, Jr.
Chairman, House Appropriations Committee
P.O. Box 1173
McLean, Virginia 22101

Dear Gentlemen:

Please find enclosed Virginia's Center for Innovative Technology's report on the status and progress of three Technology Innovation Centers established in 1999. This report is required by Item 462, Paragraph E.3 of the 2004 Acts of Assembly. Also enclosed is the report for the Technology Awards Program and Technology Growth Fund, as specified in Item 462, Section E.2 of the 2004 Acts of Assembly.

Sincerely,

Peter Jobse
President

Enclosures

c: The Honorable John M. Bennett, Secretary of Finance
The Honorable Eugene J. Huang, Secretary of Technology

2214 ROCK HILL ROAD • SUITE 600 • HERNDON • VIRGINIA • 20170-4228
TEL 703-689-3000 • TOLL FREE 800-3-TECHVA • FAX 703-689-3041
www.cit.org

Virginia's Center for Innovative Technology

Status & Progress of Technology Innovation Centers

Prepared for the Governor
and the Chairmen of the House Appropriations
and Senate Finance Committees

As Required by the 2004 Acts of Assembly

November 2004

Executive Summary

In order to advance technology development and commercialization in Virginia, in 1998 Virginia's Center for Innovative Technology (CIT) seed funded three Technology Innovation Centers:

- Center for Plasma and Photon Processing (CP3)
- Internet Technology Innovation Center (ITIC)
- Virginia Manufacturing Innovation Center (VMIC)

The Centers were selected, following a rigorous competitive process, to serve the Commonwealth's small, medium, and large businesses.

Between FY 99 and FY 04, CIT invested a total of $3,575,000 in the Centers. This investment is unchanged from the amount cited in the November 2003 report.

Two of the three Centers received funding from CIT in FY 04 through "no cost extensions" and are discussed in this report. The third center, VMIC, expended all CIT funds in FY 03 and provided its final report at that time. As a result, VMIC's FY 04 activity is not detailed in this report, but the Center's performance is reflected in the leverage and investment summaries.

The Technology Innovation Centers generated a total of $54,540,804, for a return of $15.26 for each CIT dollar invested. The table below summarizes CIT's investments and the return, excluding general funds, generated by each Center. This report also contains a detailed table describing leverage and a map that depicts where CIT has disbursed funds.

FY1999 - FY2004

Center	CIT Funding Support	Leverage (less General Funds)	Return on Investment
Center for Plasma and Photon Processing	$1.550 M	$19.09 M	12.8
Internet Technology Innovation Center	$1.450 M	$34.28 M	17.06
Virginia Manufacturing Innovation Center	$.575 M	$1.16 M	2.02
Total	$3.575 M	$54.54 M	15.26

Each TIC will continue with a mission that reflects the goals of its current and future funding sources.

Overview

This report is prepared for the Governor and the Chairmen of the Senate Finance and House Appropriations Committees, as required by Item 462, Paragraph E.3, of the 2004 Budget. In support of the Governor's goals and in fulfilling its mission, Virginia's Center for Innovative Technology (CIT), the operating arm of the Innovative Technology Authority (ITA), directs its focus toward Virginia's next generation of technology and technology companies. This emphasis is reflected in CIT's mission, which remains unchanged from FY 04: "CIT accelerates Virginia's next generation of technology and technology companies."

CIT's FY 05 strategic goals are:

1. Create new nanotechnology and life sciences industry clusters in Virginia
2. Solve national and regional technology challenges through world-class R&D programs
3. Make Virginia a global leader in the development of entrepreneurial technology ventures
4. Advance Virginia's technology commissions and policy initiatives

The creation, development, and support of Technology Innovation Centers (TICs) were among programs to contribute to CIT's mission. The TICs have directly supported CIT goals by bringing federal research and other funding into Virginia and by accelerating opportunities for Virginia's businesses. This continues to be accomplished through the TICs' interdisciplinary and multi-institutional collaborations with companies in advanced, application-oriented research and in adopting, developing, and commercializing technology.

The TICs are broad-based technology centers that incorporate multi-university, cross-disciplinary efforts. The forerunners of the TICs, the Technology Development Centers (TDCs), involved only a single public university and in each case were focused on specific technologies, such as fiber optic sensors. The TICs emphasize research to create new technologies and to provide assistance to companies that are developing new technology products and adopting new technologies in their businesses. CIT's funding of the TICs for FY 03 focused on three broad areas: Internet Applications, Plasma and Photon Processing, and Advanced Manufacturing. CIT declared its intent to fund the TICs for a period of five years. This funding was subject to the availability of funds and was renewable annually. The VMIC concluded its CIT funding in FY 03; the ITIC and CP3 concluded their CIT funding in FY 04.

The TICs leverage state funding by securing federal grants to the Centers, as well as private company investment in specific technical projects. Excluding General and other state funds, these Centers generated $12,001,869 in FY 04. Including General Funds, such as the Commonwealth Technology Research Fund, grants and contracts securing by these Centers totaled $13,189,250 in FY 04.

Internet TIC

The Internet TIC (ITIC) is comprised of six member universities: Christopher Newport University, George Mason University, Old Dominion University, University of Virginia, Virginia Commonwealth University, and Virginia Tech. Nine core faculty members serve as the Board of Directors, and each of these faculty heads up a research center, laboratory, or other major activity. In addition to research expertise, the faculty has substantial experience with commercial partnerships. The fields of expertise include Internet 2, information security, wireless technologies, digital libraries, software development, knowledge management, infrastructure assessment and development, and other web-based specialties. Several members have lengthy experience with assisting information technology (IT) development in the rural areas of the Commonwealth.

Summary of Internet TIC Grant and Training Activities

Faculty from the Internet TIC engages in two different types of grant development. One type is conventional grant proposals made to federal agencies, foundations, and private companies. Contract proposals based on a 'fee for service' arrangement are the second type; these proposals usually involve consulting or technical services. During FY 04, ITIC members submitted 160 proposals with a total value of $37,890,186. Of these, 110 proposals were funded for a total value of $4,119,287.

ITIC also conducted numerous training seminars in Internet-related topics. In Southwest Virginia, VECTEC conducted 13 seminars with 134 participants; four seminars with 257 participants were held in the Hampton Roads area. Virginia Tech conducted a successful international symposium on digital libraries in Northern Virginia with ITIC support.

A portion of the FY 03 funds were dedicated to VECTEC for the purpose of developing electronic business villages (EBV's) in the Commonwealth. Two villages are now operating in the Coalfield Region of the Commonwealth where more than 60 small businesses have been assisted with electronic commerce technologies.

Funding Overview for FY 04

No CIT funding was awarded to the Internet TIC for FY 04. However, a portion of the CIT funds from FY 03, $107,918, were carried forward into FY 04 under a no cost extension. The award was closed as of June 30, 2004.

Administrative Activity

The Board of Directors of the Internet TIC met once each quarter to discuss joint proposals, receive reports on current grant projects, and to discuss strategies for continuing the ITIC during the coming years. No operational problems were encountered during the year. One member of the Board resigned because of a transfer, and another from the same university resigned because of a temporary assignment with NSF which posed a conflict of interest.

Currently, there are no plans to replace these members because several other members from that University remain very active on the Board.

Future Activity

The Board of Directors of the ITIC has decided that they will continue indefinitely as an informal organization. The Board members have forged close working relationships, and will continue to share ideas on grant proposals on a multi-university basis. Operating expenses will be borne by the individual members until other sources of support can be identified.

During FY 05, the faculty of the Internet TIC plan to focus on writing proposals in the digital libraries, homeland security, local government Internet applications, as well as other areas to be determined.

Center for Plasma and Photon Processing

The Center for Plasma and Photon Processing (CP3) at the Applied Research Center (ARC) advances processing technologies to create materials, structures, and devices. Light and plasma processing play an increasingly important role for aerospace, automotive, electronics and marine manufacturing. These methods are critical for high value-added manufacturing of computer and communications equipment, physical and chemical sensors, biomedical instruments and treatments, semiconductors, thin films, photovoltaics, electronic components, and optical instruments. Although basic innovation known as "technology push" is important to advanced materials development, the dominating driver today is primarily application-driven or "market pull," i.e., the end user's demand for a product with a competitive advantage. Because CP3 can access multi-disciplinary expertise and equipment from five universities (Christopher Newport University, the College of William & Mary, Virginia Tech, Norfolk State University, and Old Dominion University) and a federal lab (Thomas Jefferson National Accelerator Facility), it is able to offer a competitive advantage to small and large businesses. CP3 provides a full array of advanced materials processing methods and tools, along with access to the world's most powerful tunable laser.

CP3 was the first major center within the Applied Research Center (ARC). It has acted as a catalyst to the formation of three additional major centers: The National Science Foundation Industry/University Cooperative Research Center for Lasers and Plasmas for Advanced Manufacturing, the Office of Naval Research Center for Piezoelectrics By Design, and the Office of Naval Research High Brightness Electron Source program.

CP3 received a five-year, $2 million technology innovation award from CIT in September 1998. Initial year funding was $250,000, with following years funded at $500,000, $465,000, and $335,000, respectively. Since expenditures were not as high as expected and an extension was sufficient to ensure operating funds for FY 03, no new commitments were made for FY 03. CP3's no cost extension for FY04 permitted them $254,939 in operating funds. Total funds committed to CP3 were $1,550,000.

CP3 Leverage

For FY 04, CP3's portfolio of projects included technical alliances, rapid responses, analytical and business services, short courses and federal grants valued at $9,069,963.

For FY 03, the Center had a portfolio of projects that included five technical alliance contracts lasting 6 months or more valued at $3,138,926; responding to 15 business assistance / economic development requests; providing analytical services to nine universities and one federal lab in exchange for other services; conducting four technical and business courses, and workshops; submitting 13 proposals to federal agencies and receiving seven awards valued at $5,913,037; generating five intellectual property disclosures; filing for four patents; and acquiring equipment and software valued at over $1,049,255.

Sunset of CIT Funding

Since its inception, CIT's programs have been designed to build the Commonwealth's research capacity. In this regard, CIT has seed funded centers that enhance academia's research capabilities in areas that align with industries critical to Virginia. The centers increased the Commonwealth's technological and economic development.

Most recently, CIT funded three Technology Innovation Centers in 1998 and has provided ongoing funding to allow each center to become firmly established. As with other centers seed funded by CIT, funding from CIT sunsets and successful centers become self-sufficient. Because CIT's management and financial support has terminated for all centers, CIT submitted a request in Fall 2004 to remove budget language calling for CIT to provide an annual report on the status and progress of all centers.

Directors of each TIC plan to continue their Center's work within parameters of available funding. Their technology areas of focus will resemble the FY 04 emphases reported above for CP3 and ITIC and the FY 03 emphasis report for VMIC.

Because of budgetary constraints, in FY 05 CIT cannot provide new funding to the TICs, nor can CIT establish or financially support research centers in the manner that it has in the past.

Hopefully, in the FY 06 biennium, additional funds will be allocated to the Commonwealth Technology Research Fund (CTRF). Additional funding for FY 06 and beyond reinstates a mechanism to establish research and economic advantages in targeted areas. The Commonwealth Technology Research Fund was created in 2000 to attract increased public and private research funding for Virginia's public institutions of higher education. The goal of the fund is to increase technological and economic development in Virginia.

Appendices

Annual reports describing each Center's activities and accomplishments are attached as appendices to this report. Center Directors and staff prepared the annual reports.

Technology Innovation Centers
2004 Annual Report
Leverage

		Leveraged Dollars							
Center	**CIT Allocation**	**Private**	**Federal**	**Other**	**Total**	**General Funds**	**Total (less General Funds)**	**Total Return on Investment**	**Return on Investment (less General Funds)**
FY 04									
CP3*	$0	$56,817	$7,925,950	$1,087,196	$9,069,963	$1,087,196	**$7,982,767**		
ITIC**	$0	$652,749	$3,366,353	$100,185	$4,119,287	$100,185	**$4,019,102**		
VMIC***									
Total	**$0**	**$709,566**	**$11,292,303**	**$1,187,381**	**$13,189,250**	**$1,187,381**	**$12,001,869**		
FY99-03									
CP3	$1,550,000	$2,307,215	$8,807,060	$2,171,006	**$13,285,281**	$2,171,006	**$11,114,275**		
ITIC	$1,450,000	$5,852,358	$24,358,129	$188,786	**$30,399,273**	$137,960	**$30,261,313**		
VMIC	$574,999	$728,000	$436,000	$1,248,836	**$2,412,836**	$1,202,836	**$1,164,000**		
Total	**$3,574,999**	**$8,887,573**	**$33,601,189**	**$3,608,628**	**$46,097,390**	**$3,511,802**	**$42,539,588**	**12.89**	**11.90**
Activity Since Inception									
CP3	$1,550,000	$2,364,032	$16,733,010	$3,258,202	**$22,355,244**	$3,258,202	**$19,097,042**	14.42	**12.32**
ITIC	$1,450,000	$5,952,543	$27,724,482	$288,971	**$34,518,560**	$238,145	**$34,280,415**	23.81	**23.64**
VMIC	$574,999	$728,000	$436,000	$1,248,836	**$2,412,836**	$1,202,836	**$1,164,000**	4.20	**2.02**
Total	**$3,574,999**	**$9,044,575**	**$44,893,492**	**$4,796,009**	**$59,286,640**	**$4,699,183**	**$54,541,457**	**16.58**	**15.26**
	* CP3: Operated off residual funds in FY 04								
	* ITIC: Operated off residual funds in FY 04								
	***VMIC: A report on FY 04 performance was not required, as VMIC received no new or continuation funding from CIT in FY 04								

CIT Funding of Technology Innovation Centers FY1999-FY2004

CP3 — **$1.55M**

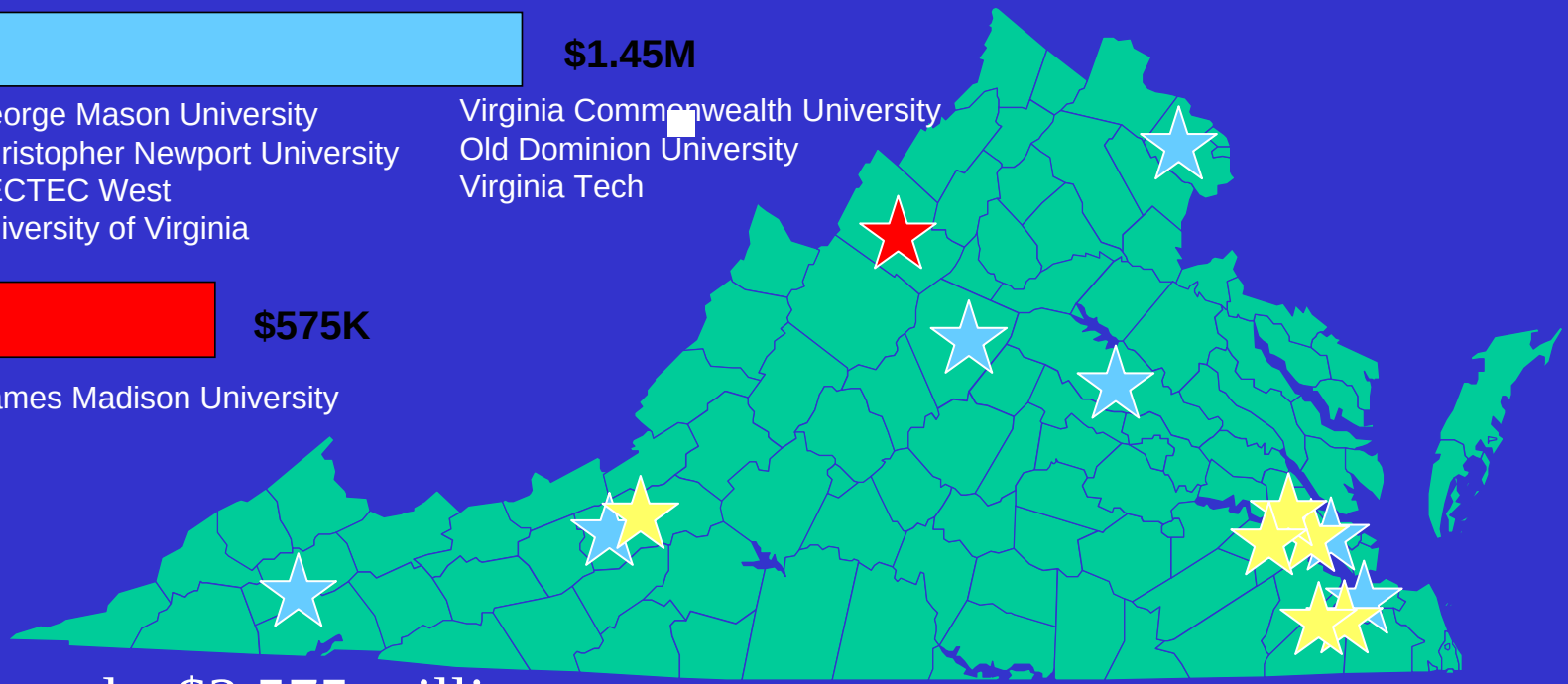
Christopher Newport University
College of William and Mary
Old Dominion University
Jefferson Lab
Virginia Tech
Norfolk State

ITIC — **$1.45M**

George Mason University
Christopher Newport University
VECTEC West
University of Virginia
Virginia Commonwealth University
Old Dominion University
Virginia Tech

VMIC — **$575K**

James Madison University



Total Awards: $3.575 million

CP3 and ITIC operated off residual funding in FY2004. VMIC concluded its funding in FY2003.
Technology Innovation Centers serve clients throughout Virginia, and thus the economic value also resides in other regions of the state.

Technology Innovation Centers

ITIC

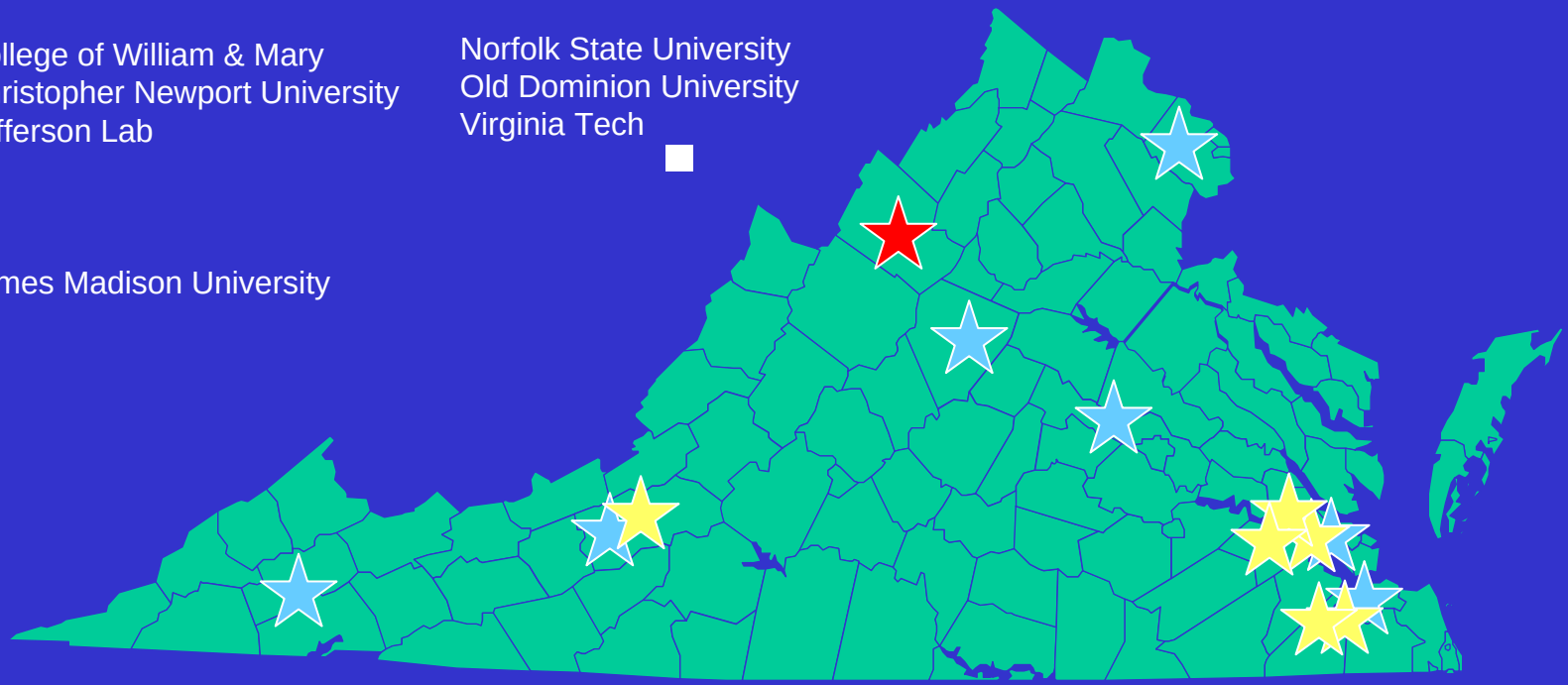
Christopher Newport University
George Mason University
Old Dominion University
Virginia Commonwealth University
VECTEC West
Virginia Tech
University of Virginia

CP3

College of William & Mary
Christopher Newport University
Jefferson Lab
Norfolk State University
Old Dominion University
Virginia Tech

VMIC

James Madison University



CP3 and ITIC operated off residual funding in FY2004.
VMIC concluded its funding in FY2003.
Technology Innovation Centers serve clients throughout Virginia, and thus the economic value also resides in other regions of the state.

YEAR 6 FINAL REPORT

PROJECT TITLE: Center For Plasma and Photon Processing

CIT AWARD NUMBER: TIC-00-001

TERM OF PROJECT: Sept. 15, 1998 – June 30, 2004

REPORT PERIOD: July 1, 2003 – June 30, 2004

CIT PROJECT DIRECTOR: Nancy Vorona

Submitted September 29, 2004 By:

Dennis M. Manos
College of William and Mary

The Technology Innovation Center for Plasma and Photon Processing at the Applied Research Center
TIC-01-002

Reporting Period: July 1, 2003 – June 30, 2004

Executive Summary

The Technology Innovation Center for Plasma and Photon Processing (CP3) at the Applied Research Center (ARC) advances processing technologies to create materials, structures and devices. Light and plasma processing play an increasingly important role for aerospace, automotive, electronics, and marine manufacturing. These methods are critical for high value-added manufacturing of computer and communications equipment, physical and chemical sensors, biomedical instruments and applications, semiconductors, thin films, photovoltaics, electronic components, and optical instruments. Although basic innovation ("technology push") is important to advanced materials development, the dominating driver today is primarily application-driven ("market pull") that is the end user's demand for a product with a competitive advantage (for example better, faster, lighter, cheaper) or simply the need to satisfy the functional requirements of the application. Because CP3 can access multi-disciplinary expertise and equipment from five universities and a federal lab, it can offer a competitive advantage to small and large businesses. CP3 provides a full-complement of advanced materials processing methods and tools along with access to the world's most powerful tunable laser. CP3 as the first major center within the ARC has been the catalyst to forming three other major centers including the NSF Industry/University Cooperative Research Center For Lasers and Plasmas for Advanced Manufacturing, the Office of Naval Research Center For Piezoelectrics By Design, and the Office of Naval Research High Brightness Electron Source Program. CP3 is lead by Dr. Dennis M. Manos, College of William and Mary and Dr. Mool C. Gupta, Old Dominion University. They are supported by their partners Dr. H. Fred Dylla, Thomas Jefferson National Accelerator Facility, Dr. Martin Broncristiani, Christopher Newport University, and Dr. Kang Seo, Norfolk State University.

CP3 received a five-year $2 million technology innovation award from the Virginia Center for Innovative Technology in September of 1998. Total Commonwealth funds committed to CP3 through June 30, 2004 was $1,550,000. For this period, July 1, 2003 – June 30, 2004 (Table 1), CP3 has a portfolio of projects including technical alliances, rapid responses, analytical services, business services, short courses state and federal grants valued at $9,069,963 exceeding our goal for

year 6 of $1,023,000. CP3 activities and its associated spin-off centers are currently attracting approximately $7,982,767 in federal and private funds or $23.83 for every $1.00 invested this year ($335,000) by Virginia's Center for Innovative Technology TIC program. This clearly demonstrates the return on investment that can be accomplished when a long term commitment is made to a university(s) lead research program particularly with respect to attracting federally sponsored research. More specifically during year 4 (Table 1), CP3 has

- assisted 6 Virginia companies;
- developed 5 technical alliance contracts lasting 6 months or longer valued at $3,138,926;
- provided analytical services to 9 universities and 1 federal lab in exchange for other services;
- responded to 15 business assistance/economic development requests;
- conducted 4 technical & business short courses, and workshops;
- submitted 13 proposals to federal agencies receiving 6 awards (2 proposals are pending) valued at $5,931,037;
- generated 5 intellectual property disclosure;
- filed for 4 patents; and
- acquired equipment and software valued at over $1,049,255.

Federal and State Grants Proposed/Awarded In Year 6

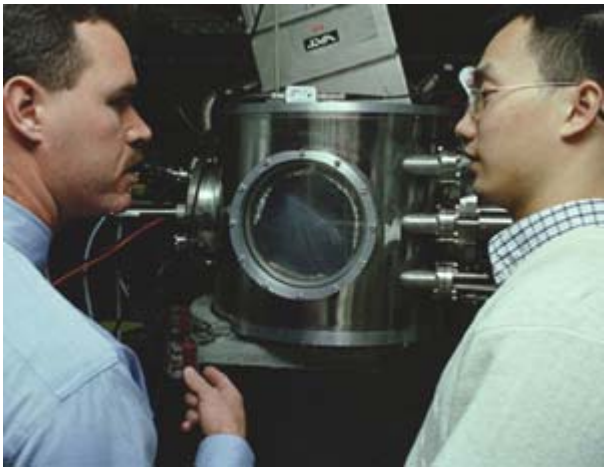
CTRF Industry Inducement Program Grant

This project now represents an expanded partnership since its inception to include the College of William and Mary, INCOGEN, the Virginia Bioinformatics Institute at Virginia Tech, and the Eastern Virginia Medical School. The purpose of the partnership was to attract INCOGEN located in Clemson, South Carolina to Williamsburg, Virginia, and then to leverage the partners' considerable bioinformatics capabilities to strengthen the Commonwealth's bioinformatics infrastructure.

CP3/W&M at the ARC provides a variety of imaging and molecular analysis tools for the pursuit of "soft materials" including biopolymer proteins and lipids. These tools, and others in the planning stage, extend the use of the Jefferson Lab Free Electron Laser (FEL) for biological applications. An upgrade to the FEL will soon render it the world's most powerful widely-tunable, ultraviolet laser, broadening its capabilities for studying molecular behavior of living tissue *in vivo*. A proposed superconducting synchrotron will link its pulses to the pulses of the FEL further broadening the capabilities for soft material experiments (see proposed Virginia Photonics Facility). The total project cost over three years is approximately $7 million, including $3.25 million from CTRF. During year 3 of the grant, the following proposals were awarded and/or submitted:

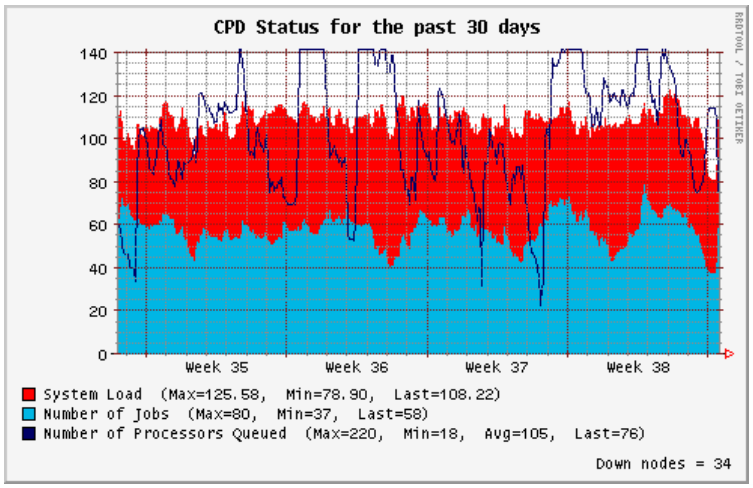
1) NIH SBIR Phase II, "Proteomics Software for Cancer Diagnostics," $1.6 million awarded to INCOGEN in April 2004.
2) NIH Early Detection Research Network renewal for lead EVMS now including participation by W&M and INCOGEN awarded July 2004 for $2,788,912.
3) NIH Bioengineering Partnership Program, "Integrated Analysis Environment for Cancer Diagnostics," for $9,987.471 first submitted July 2003 by INCOGEN, but not awarded. Proposal revised and resubmitted July 2004.
4) NIH R21 Technology Development For Biomedical Applications Program, " LDI-TOF Detector To Discover Disease Biomarkers," first submitted October 2003 by W&M, but not awarded. Proposal revised and resubmitted June 2004 for $520,000.

High Brightness Electron Source Development



Brian Holloway and Dennis Manos at the College of William and Mary with the International Technology Center and the University of Florida have received $4.4 million from the Office of Naval Research to develop high brightness electron sources. High current electron sources are required in a number of technologies that are of strategic importance to the Department of Defense (DOD) community and in many dual-use applications. The research may help to increase the power of radar, sonar, and x-ray equipment by a factor of 100 or more. Since a myriad of today's technologies depend on electromagnet radiation including radar, sonar, and communications systems integral to military operations; television, radio and cellular signals enjoyed by civilians everyday; and x-ray, CAT scan and other diagnostic technologies used by doctors – the research's potential applications are almost innumerable. The most pressing application of the research, especially in the context of the current war against terrorism, is it potential to revolutionize the way soldiers and pilots communicate with one another, monitor the enemy and conduct electronic warfare. The Department of Defense currently uses 170,000 microwave tubes in more than 260 field-deployed systems. Improving the efficiency of these systems will help troops do their jobs. The High Brightness Electron Source Program's potential applications all depend on an innovation invisible to the naked eye, one-tenth the width of a human hair. By manipulating the type and amount of materials used to launch electromagnetic waves, the researchers can improve their efficiency and power. It has been demonstrated that certain materials, such as carbides and nitrides, have a low work function that allows electron to be extracted more easily. By integrating these materials into the high-brightness electron device the emission current could be increased by a factor of 100 or more. The program has already generated disclosures, patent applications, several papers, and presentations at international conferences.

Center for Piezoelectics By Design



A consortium of universities and research laboratories (W&M, Carnegie Institution of Washington, University of Arkansas, University of Pennsylvania, Rutgers University, and the US Naval Research Laboratory) has established the Center for Piezoelectrics by Design lead by the College of William and Mary and based at the Applied Research Center. The Center (www.cpd.wm.edu) is funded by a five-year $6 million grant from the Office of Naval Research. Funding as of June 30, 2004 is $4.7 million. Applications of piezoelectric materials include medical ultrasound devices and naval sonar. Advances in piezoelectric materials could dramatically improve the portability and performance of these and other systems based on transducers, the general term for devices that inter-convert electrical and mechanical energy. The search for better piezoelectric materials has generally relied on costly and time consuming trial and error synthesis and testing of candidate materials. The Center will take a different approach, using computational modeling to develop new types of candidate materials and to screen them for desired properties before taking them into the laboratory. The Center is supported by a special cluster of computers and specialized software housed at the Applied Research Center. The ARC laboratory received an additional $25,000 this year from the W&M's ARC Operations budget to upgrade the HVAC system to accommodate an additional 30 HP Itanium dual CPU nodes funded by the ONR grant representing further investment of $3.8 million to the original the cluster.

CPD is further complimented by W&M's new High Field Nuclear Magnetic Resonance (NMR) Facility currently under construction at Small Hall on the William and Mary campus. ONR and NSF have awarded nearly $2.0 million for the spectrometer and W&M has matched an equivalent amount to construct a building to house the instrument. The NMR facility will expand the capabilities of CPD by providing important quantitative results on the local structure and dynamics in these piezoelectrics and other solid materials. The CPD and NMR programs along with other activities such as HBES and the Free Electron Laser initiatives can expand to become a full scale materials by design internationally recognized competency for the Hampton Roads region.

Materials By Design

As a result of the Governor's Higher Education Research Summit held in May 2003, a nationally recognized panel of experts was convened to review Virginia's most promising academic research

programs and to identify those with the greatest potential to secure significant federal funding and develop into some of the top programs in their fields. Based on the recommendations of the panel, $8.3 million in new funding was provided in FY 2005 for selected research programs. A proposal by William and Mary for a Materials By Design initiative submitted by the Departments of Physics and Applied Science was selected to receive $324,000. This research initiative will build upon core strengths that are already present at William and Mary in the Center for Piezoelectrics by Design (CPD), the new High Field Nuclear Magnetic Resonance (NMR) facility, and the High Brightness Electron Source Program (HBES) and be expanded to become a full-scale, four-step, Materials-by-Design program. The program can be applied to a wide variety of important new classes of materials. W&M will do this by adding two new components: an extension of the design process to mesoscale materials, and development of a materials growth process, driven by the design models. The four steps of a complete Materials By Design program are: (1) calculations and simulations to design new materials; (2) design and development of the processes needed to create these materials; (3) experimental synthesis of the new material; and (4) characterization and technological applications of the new materials. Since there is already a major research effort that combines laser-based characterization and laser-based materials' growth, using high power, tunable table-top systems, and the higher power, tunable FEL at Jefferson Lab, W&M has selected photon-assisted materials synthesis as our process of choice. By integrating both predictive first-principles modeling of materials to determine properties of interest, and predictive modeling of photo-assisted materials synthesis processing in order to determine the critical parameter matrix for experiments to actually make the material, this program will establish a new, internationally unique capability in the Commonwealth.

The Proposed Laser Bioscience Center at the Jefferson Lab FEL User Facility

Efforts are underway to obtain $6 million for the design and construction of a bioscience wing at the Jefferson Lab Free Electron Laser User Facility. The new wing would provide the critical infrastructure for a Laser Bioscience Center utilizing the unique capabilities of the recently upgraded FEL for medical imaging, treatment, and diagnostic studies. The unique combination of power and tunability provided by the upgrade opens the door to numerous opportunities for applications in bioscience and biomedicine including: Photo therapy of skin disorders and photodynamic therapy of cancers at 10 times currently possible rates; Medical imaging with short pulse, tunable (non-ionizing) laser light; Protein sorting, gene expression studies with laser mass spectroscopy; and Studies of ultraviolet damage to the biological systems from DNA to mammals. Funds would be used to enlarge the User Laboratory space from 6,000 sq ft to over 16,000 sq ft at the FEL Facility. The FEL Bioscience Center is modeled after similar NIH funded laser science center at MIT and Harvard-Mass General Hospital. Key principal investigators from UVA Medical Sciences Center and the Wellman Laboratory for Photomedicine at Harvard University will solicit core funding from NIH and other agencies. Other key Virginia participants include the College of William and Mary, the Eastern Virginia Medical School, Incogen and other institutions in Hampton Roads.

Large-Scale Production of Carbon Nanotubes Using The Jefferson Lab FEL

Dr. Brian Holloway, Dr. Michael Smith, NASA LaRC, and Dr. Peter Ecklund, Penn. State continue to use the FEL to produce nanotubes. Sometimes called CNTs, nanotubes take up an extremely small space but can connect together materials with different properties, even as their own properties can be adjusted depending on formulation. The tubes' "aspect ratio" is enormous: that is, they are very long but not wide, and like an ultra-strong rope, can be extended without sacrificing strength. CNTs have potential applications in molecular and quantum computing and as components for microelectromechanical sensors, or MEMS. The tubes could also function as a "lab on a chip," with attached microelectronics and components that could detect toxins and nerve agents in vanishingly small concentrations. Nanotubes could also lead to an entirely new generation of materials: as strong or stronger than steel, but very lightweight. CNTs are amazingly damage-tolerant, generally displaying nearly total "elastic recovery," even under high-deformation conditions. If bent, buckled or creased the tubes are usually able to reassume their original shape once external stressors are removed. The collaboration has produced tubes as good if not better than those at other laboratories or in industry. The next step will be to increase quantity while holding costs down, which should be possible using Jefferson Labs's upgrade of the FEL to 10 kilowatts. Traditional manufacturing of nanotubes has been done by DC ARC, Chemical Vapor Deposition (CVD) and Pulsed Laser Deposition (PLV). Current bursts in the arc method contributes to production limitations. CVD production only produces films of fibers and not nanotube bundles. FEL-synthesized nanotube bundles have smaller diameters than arc or table-top PLV nanotubes. The advantage of the FEL is the its flexibility and power and the potential for producing large quantities and direct application. A lot of people can make nanotubes, but very few can make grams or kilograms of nanotubes on time scales less than weeks.

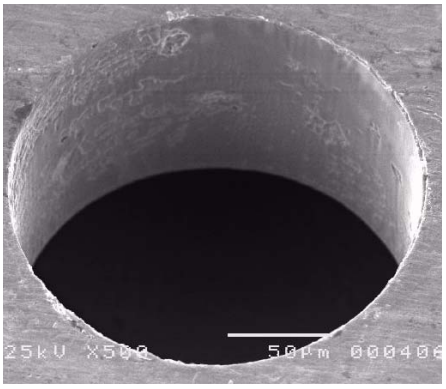
(Caption To Pictures: Brian Holloway prepares the nanotube oven, a component that helps produce nanotubes with light from JLab's Free-Electron Laser. Webs of nanotubes form on collector plates during the collaboration's FEL experiment, image not actual size.)

Surface Modification of FEL High Voltage Electrode By Large-Scale RFI PSII

Dr. Dennis Manos and Ph.D. student Nimel Theodore received and additional $39,367 from SURA/JLab to improve surface treatment of FEL cathode structures. Improving surface hardness together with proper surface finish can suppress field emission in stainless steel high voltage electrodes used in free electron lasers. Suppressing field emission will increase laser power. While the research was focused on the properties of FEL electrode structures, the novel process will find applicability in a wide variety of applications, including linear accelerators, x-ray sources, medical treatment accelerators,

electric utility switchyard gear, satellite communications, fabricating and deploying structures for aerospace application, solar cells, liquid crystal displays, flash tubes, CRT displays, heating elements and silicon wafers. Anywhere a unique high-quality surface is needed, this process may be useful. Mr. Theodore has also received a Virginia Space Grant Graduate Fellowship for this research. The completed electrode structures were delivered to Jefferson Lab in August and will be part of the FEL upgrade to be completed this year that will increase the laser's power by 10 times.

Laser Micro-machining - Siemens Automotive



The demand for ever-improving product performance has lead Siemens to seek better laser micromachining for automotive fuel injectors. Siemens explored beyond their current technology by experimenting with other laser-based micromachining systems at the ARC in university shared space that was dedicated as the Siemens Laser Laboratory. The laboratory supported state-of-the-art laser R&D through small batch manufacturing. This project demonstrated an example of an industry, multiple university, and federal lab joint venture. Siemens gained access to strategically located, high quality lab space, laser and materials researchers, highly trained students, material analysis and laser laboratories, computational modeling, university and FEL research programs, and opportunities for jointly created intellectual property. CP3 fulfilled a major purpose to help local businesses grow, gained access to state-of-the-art equipment, equipment manufacturers & Siemens suppliers, had opportunities for shared intellectual property; and a "real-life" example to attract similar arrangements with other companies.

Siemens moved the laser machining set-up from the ARC to their Newport News plant to accommodate the vast increase in laser machined sample parts that are requested by their customers. The move to the plant is consistent with their current strategy that requires customers to see the laser as a production tool rather than a R&D experimental tool. Beginning October 2004, the laser begins actual production for its first customer.

Synthesis and Characterization of Carbon Nanotubules

Dr. Tarek Abdel-Fattah, Christopher Newport University, has developed a technique for the synthesis of carbon nanotubules and, with Dr. Raouf Selim, is beginning an electronic characterization of these materials. Dr. Abdel-Fattah was the lead reviewer for proposals submitted to the Nanoscale Exploratory Research Chemistry Panel in Arlington, Virginia from March 11-12, 2002, a panel supported by the NSF which supports fundamental research in emerging areas of nanoscale science and technology by competitively awarding grants and cooperative agreements for research and education.

In addition, he is measuring concentrations of trace elements in water and soil and has trained several students to carry out these measurements. Publications on the quality of water and soil are beginning to emerge Support for this effort includes: NASA/ASEE Faculty Fellowship, Summer 2004; Nanotechnology 2002-2003 "Synthesis of Carbon Nanotubes Using Templating Technique", $53,000. Work on both of these efforts will continue.

High Temperature Superconducting Film Sensors

Dr. Raouf Selim has developing high temperature superconducting film sensors at the ARC solid state laboratory. His work at ARC involves developing super conducting sensors, a scanning system and setting up a measurement system to evaluate such sensors. This effort has produced two NASA grants on low temperature SQUID systems for non-destructive testing of materials. While Dr. Selim continues his research at a NASA laboratory, his students continue the fundamental research at the ARC. In particular, they are establishing a basic capability to characterize the electronic properties of nanostructured materials developed by Dr. Tarek Abdel-Fattah. NASA has provided $100,000 to support Dr. Selim's work. Recently the ARC lab has acquired the SQUID testbed that was at NASA Langley so that more of this research will take place at the ARC. Work on the Superconducting sensors and electronic characterization of materials will continue.

NASA-University Photonics Education and Research Consortium (NU-PERC)

Dr. Martin Buoncristiani, in cooperation with Dr. Sacharia Albin of Old Dominion University, has gained support for a NASA-University Photonics Education and Research Consortium (NU-PERC). This consortium will enhance collaborative research in nanostructured photonic band-gap crystal fibers and other semiconductor devices proposed for use as integrated sensors. Investigations under this consortium will require use of NASA facilities, namely the optical fiber draw tower, fiber measurement and characterization equipments, and the nano fabrication facilities at LaRC. A part of the work associated with materials characterization and sample preparation will be carried out at the ARC.

NU-PERC will secure external research funding using the NASA facilities as resources. His work is supported by NASA Prime Cooperative Agreement NCC-1 0126, of which $25,000 is for ARC activities. SURA co-sponsored an optical fiber sensor workshop May 20-21, 2003 held on the CNU Campus. A second conference was held in June 2004. Work on photonic band gap materials will continue.

Undergraduate Research Experiences, Graduate Education, Short Courses & Publications

Scott Wight is a junior at VCU who has spent the summer participating as a Virginia Microelectronics Consortium Scholar. His project for the summer dealt with various metal carbides. Transition metals, specifically metals in Groups IV to VI in the periodic table, can combine with carbon to form transition metal carbides, or more commonly called refractory carbides. These newly formed compounds have many desirable characteristics attributed to them. When implanting the metals with the carbon, the carbon occupies the octahedral interstitial sites of the atomic lattice structure of the metal. The concentration of the vacancies resulting from the metal-carbon ratio have a great effect on the mechanical, electronic, and other properties of metal carbides. Further study of the surface properties and roughness of these metals, along with the relative work functions necessary to emit the electrons from these sources, provides a hope to obtain a better understanding of these refractory metals used for field emission sources.

Michael Bagge-Hansen is a rising sophomore at William and Mary who has been working at the ARC for the past year. Over several months, Michael's research has revolved around the design, assembly and function of the MTS Kelvin Probe in a UHV environment. The Kelvin Probe is a surface sensitive technique that measures the relative work function difference between the sample and the stainless steel reference probe. In ambient, adsorbed layers, native oxides, and/or other contaminants may interfere with this measurement. In a controlled vacuum environment, these unwanted species are reduced, thereby making them less likely to influence measurements. Under ultra-high vacuum, the Kelvin Probe will more accurately and precisely measure relative work functions. He hopes to understand the relationship of the surface layers of a processed material to its work function. Ultimately, he wants to correlate these observations to field emission properties.

Short Courses

1. "REU: Physics Research Experiences for Undergraduates," National Science Foundation, Student Presentations, June –August, 2004.
2. “Labview 7 Training,” National Instruments, July 2003.
3. “Surface Characterization Techniques,” National Educators Workshop, October 2003.
4. ASM Wear and Wear Prevention Workshop, March 2004.

Publications

1. Malyarenko, D.I., Chen H., Wilkerson A.L., Tracy E.R., Cooke W.E., Manos D.M., Sasinowski, M.,Semmes O.J., GA+TOF SIMS Lineshape Analysis for Resolution Enhancement of MALDI MS Spectra of a Peptide Mixture, 2003 SIMS XIV Conf. Proc., (2004, in press).
2. D.I. Malyarenko, H. Chen, A.L Wilkerson, E.R. Tracy , W.E. Cooke, D.M. Manos, M. Sasinowski, O. J. Semmes, *Ga+ ToF SIMS Lineshape Analysis for resolution enhancement of MALDI MS spectra of a peptide mixture. Applied Surface Science,* Vol. 231-232 (2004), pp. 257-261.
3. Woerdeman, D.L., Parnas, R.S., Giunta, R.K., Wilkerson, A.L., *Dewetting of Unreacted Epoxy/Amine Mixtures on Silica. Journal of Colloid and Interface Science,* Vol. 249, No.1, pp.246-252 (2002)
4. Chisholm-Brause, C. J., C. F. Conrad, and R. Greene-Roesel. Spatial variability in the distributions of trace metals among geochemical fractions in the Elizabeth River subestuary, Virginia. Submitted 2003.
5. T.H. Wong, M.C. Gupta, B. Robbins and T. Levendusky, "Color generation in butterfly wings and fabrication of such structures", Optics Letters, Vol. 28, No. 23, 2342-2344 (2003).
6. A.A. Bugayev and M.C. Gupta, " Femtosecond holographic interferometry for studies of semiconductor ablation using vanadium dioxide film" , Opt. Lett. 28, 1463 (2003).
7. C.Y.Chien and M.C. Gupta, "Pulse width effect in ultrafast laser processing of materials", submitted to Appl. Phys.

8. H. Shen and M.C. Gupta, "Nd:YAG laser welding of copper to stainless steel", J. Laser Appl. 16, 2 (2004).
9. Bugayev, M.C. Gupta and R. payne, "Laser shock processing of inconel 600 and steel 316L" submitted to J. Laser Appl.
10. B.K. Nayak, B. Eaton, J.A.A. Selvan, J. Mcleskey, M.C. Gupta, R.Romero, and G.Ganguly , "Semi conductor laser crystallization of a-Si:H on conducting tin-oxide coated glass for solar cell and display applications", Appl. Phys. A 00, 1-4 (2003).
11. C. Dong and M. C. Gupta, "Influences of Surface Reactions on the Field Emission Carbon Nanotubes ," Apl. Phys. Letters, 83, 159 (2003).
12. M. El-Bandrawy, K. Nagarathnam, M. C. Gupta, C. Hamann and J. Horsting, "Copper Vapor Laser Micromachining of 304 Stainless Steel ," J. Laser Appl. 15, 101 (2003).

Presentations

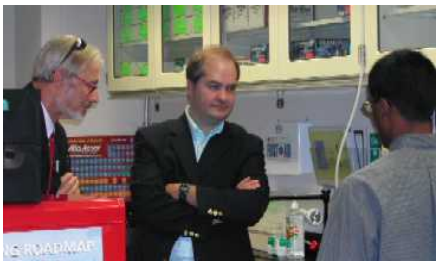
1. Wilkerson, A. L, 2003 - SIMS XIV Conference, San Diego, CA. Poster Presentation.
2. Wilkerson, A. L. 2003 - American Vacuum Society, 50th International Symposium & Exhibition, Baltimore, MD. Poster Presentation.
3. Wilkerson, A. L. 2003 - National Educators' Workshop 2003, Jefferson Lab, Newport News, VA. Workshop Presentation.

Technology Transfer & Commercialization

Disclosure and Patent Activity

There were 5 disclosures during the last 18 months resulting in two provisional patents filed and two patents filed with USTPO. The disclosures covered nanotube production, a filtering algorithm

Economic Development And Business Outreach Activities

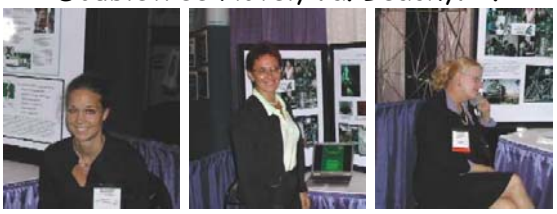





SensorsGOV Conference

September 13-15, 2004

Doubletree Hotel, Va. Beach,VA.



1. Lisa Friedersdorf, Materials Science and NanoTechnology, Advice Scientific, May 2004.
2. John Nemeth, Oak Ridge Association of Universities, March 2004
3. National Educator's Workshop, October 2003
4. Daily Press, Ronnie Mathew and Carol Capoe, August 2004
5. Civic Institute of Hampton Roads, February 2004
6. Delegation From China, February 2004
7. State Senator Marty Williams, September 2004
8. Delegate Phil Hamilton, September 2004
9. Delegate Preston Bryant, September 2004
10. City of Newport News, Planning, July 2004

Infrastructure Investments (equipment & other)

Item	*Approximate Value*
Gold Gun for TOF-SIMS	$ 40,000
HVAC Upgrade For Center for Piezoelectrics	$ 25,000
30 Itanium Dual CPU Nodes for Center for Piezoelectrics	$368,814
Tape Robot & RAID Device for Center for Piezoelectrics	$ 26,850
Portable STM	$ 11,153
FE-SEM	$261,000
Nanoindentor	$ 5,000
Confocal Microscope Upgrade	$247,415
Tape Robot For SciClone Cluster	$ 47,523
Bioanalyzer	$ 16,500
Total	$1,049,255

Table 1
Center For Plasma and Photon Processing
July 1, 2003 - June 30, 2004*

Objectives	Proposed Year 5 Number	Proposed Year 5 Value	**Actual Year 6 Number[2]**	**Actual Year 6 Value[1]**
Technical Alliances	8	$400,000	**5**	**$3,138,926**
Rapid Response	50	$12,500	**0**	**$0**
Analytical Services	50	$50,000	**10**	**$0**
Business Services	3	$10,500	**15**	**$0**
Short Courses	10	$50,000	**4**	**$0**
Total	121	$523,000	**34**	**$3,138,926**
Federal Grants		$500,000		**$5,931,037**
Patents	1			**4**
Disclosures	4			**5**
Process or Products	4			**0**
Virginia Companies Served[4]	18			**2**
Virginia Companies Created/Retained/Expand	2			**2**
$ Proposed Eligible For Match (non general funds, no CIT Innovation/Challenge)		$465,000		**$3,557,401**

[1] Total $ Value Of Project

[2] Number Of Projects, Firm May Have More Than One Project

[3] Rapid Response: Uncompensated and Compensated Consultation
(Uncompensated Value: Faculty @ $150/hr; Outside Legal @ $225/hr.)
Fee based Rapid Response and Analytical Services were included in Technical Alliances
Other Analytical Services were exchanged with JLab and VA universities for other services
Involving multiple individuals. # represents number of institutions serviced

[4] Virginia Companies In This Category Must Have A Contract With A CP3 Partner

*** CP3 was operating under a no-cost extension during this period, but challenged itself to strive for the same goals as for Year 5.**

R&D Leverage Report for Center for Plasma and Photon Processing - July 1, 2003 - June 30, 2004

Proposal/Project Title	Principle Investigator (if applicable)	Client or Sponsor's Name	Referral Contact[1]	Source of Funds[2]	Amount of Sponsor Funding	Value of Donated Equipment[3]	Status[4]	Date[5]
Interagency Transfer Agreement With Commander, Operational, Test & Evaluation Force (Capt Gary Evans - Retired) 09/25/03 - 09/24/04	D. Manos - W&M	COMOPETEVFOR		Fed	$80,000		F	9/9/2003
VMEC Scholar - Donald Bitner (5/28/03 - 8/4/03)	D.Manos - W&M	VMEC		P	$7,000		F	5/28/2003
VMEC Scholar - Scott Wight (5/28/04 - 8/15/04)	D.Manos - W&M	VMEC		P	$10,450		F	5/28/2004
Proteomic Software For The Detection of Cancer - Phase II 3/1/04 - 2/28/06)	INCOGEN; D.Manos, EVMS	NIH SBIR Phase II		Fed	$1,994,913		F	4/1/2004
Surface Modifcation of FEL High Voltage Electrodes and Support Tubes by PSII/D	D. Manos - W&M	SURA/TJNAF		P	$39,367		F	4/1/2004
Early Detection Research Network (Renewal)	O.J. Semmes -EVMS, W&M, INCOGEN	NIH		Fed	$2,788,912		F	7/1/2004
Conduct high brightness electron source research. (Manos/CP3/ARC providing consultation, equipment and technical support)	B. Holloway -W&M Univ of Florida NC ITC	ONR		Fed	$2,001,000		F	5/26/2004
This partnership among the College of William and Mary, the Institute for Computational Genomics (INCOGEN), and the Virginia Bioinformatics Institute at Virginia Tech (Year 3)	D. Manos, M. Saha, R. Voigt, G. Smith (W&M), INCOGEN, B. Sobral (VBI)	CTRF - Industry Attraction		S	$1,087,196		F	11/1/2003
NASA/ASEE Faculty Fellowship, "Synthesis of Carbon Nanotubes Using Templating Technique"	Tarek Abdel-Fattah, CNU	NASA		Fed	$53,000			6/1/2004
Center For Piezoelectrics by Design (01/31/01 - 01/31/06 (Year 4 Funds)	H. Krakauer - W&M	ONR		Fed	$1,008,125		F	10/1/2003
Applied Research Center Yearly General Support for Operations and Lease- Provides Physical Infrastructure (lab, office, equipment) for CP3 (7/01/03 - 6/30/04) Approx Figures	ARC Universities	Commonwealth		S	$850,000		F	7/1/2003
High Power Terahertz User Facility (11/1/03 - 10/30/05)	G.Kreps, D. Manos W&M; G. Neil, G. Williams JLAB; Reletec	NSF-PFI		Fed	$600,000		D	
Development of a Comprehensive Resource for the Study of Infectious Disease Agents (5 Years)	INCOGEN; M.Trosset-W&M; EVMS	NIH-Pilot Program for Models of Infectious Disease		Fed	$19,625,201		D	
Hampton Roads Internship Program For Sensors	G. Kreps, W&M; HRRP Universities & Fed Labs; Luna Innovations; Oceana Sensors, Pressure Systems, Siemens VDO	NSF-PFI		Fed	$599,376		D	
Integrated Analysis Environment For Cancer Diagnosis	INCOGEN; D.Manos-W&M, EVMS, VBI	NIH Bioengineering Partnership		Fed	$9,987,471		D	Resubmitted August 2004
A New Fast Imaging Detector To Enhance Laser Desorption Ionization Time of Flight (LDI-TOF) Methods For Desease Bio-marker Discovery (07/01/04 - 06/30/07)	W&M - D. Manos, B. Cooke, G. Tracy; EVMS - John Semmes	NIH R21 Technology Development For Biomedical Applications		Fed	$518,662		D	Resubmitted July 2004

[1]If project was introduced by other than TDC/TIC staff please provide name of org. and/or person (ex., VPMEP, CIT/RD Name, Tech Council, etc); if CIT helped to fund, provide award no.

[2]Indicate if funding source is **Fed**eral; **F**oundation; **P**rivate; or **S**tate

[3]Value of equipment (incl. H/W and S/W) provided as in-kind: do not include equipment purchased with sponsor funds.

[4]Indicate if money has actually been **F**unded; if a **P**roposal has been/will be submitted; proposal was **D**eclined; or project was **C**ancelled.

[5]Date that the designated status was achieved should be filled in, e.g., notifcation that funding is comitted - not project start or completion date or date money was actually paid by sponsor.

Internet TIC

Annual Report for Fiscal Year 2004

July 1, 2003 – June 30, 2004

The Internet TIC (ITIC) is comprised of six member universities: Christopher Newport University, University of Virginia, Virginia Tech, George Mason University, Old Dominion University and Virginia Commonwealth University. Nine core faculty members serve as the Board of Directors, and each of these faculty head up a research center, laboratory, or other major activity. In addition to research expertise, the faculty have substantial experience with commercial partnerships. The fields of expertise include Internet 2, information security, wireless technologies, digital libraries, software development, knowledge management, infrastructure assessment and development, and other web-based specialties. Several members have lengthy experience with assisting IT development in the rural areas of the Commonwealth.

Summary of Internet TIC Grant and Training Activities:
Faculty from the Internet TIC engage in two different types of grant development. One type is conventional grant proposals made to federal agencies, foundations, and private companies. A second type is a contract proposal based on a 'fee for service' arrangement, usually involving consulting or technical services. During FY 04, ITIC members submitted 160 proposals with a total value of $37,890,186. Of these, 110 were funded for a total value of $4,119,287.

ITIC also conducted numerous training seminars in Internet-related topics. In Southwest Virginia, VECTEC conducted 13 seminars with 134 participants, and in the Hampton Roads area, four seminars were held with 257 participants. Virginia Tech conducted a successful international symposium on digital libraries in Northern Virginia with ITIC support.

A portion of the fy03 funds were dedicated to VECTEC for the purpose of developing electronic business villages (EBV's) in the Commonwealth. Two villages are now operating in the Coalfield Region of the Commonwealth where more than 60 small businesses have been assisted with electronic commerce technologies.

Funding Overview for FY04:
No CIT funding was awarded to the Internet TIC for fy04. However, a portion of the CIT funds from fy03 were carried forward into fy04 under a no cost extension. Some of these funds remained unexpended at the end of fy04.

Administrative Activity:
The Board of Directors of the Internet TIC met once each quarter to discuss joint proposals, receive reports on current grant projects, and to discuss strategies for continuing the ITIC during the coming years. No operational problems were encountered during the year. One member of the Board resigned because of a transfer, and another from the same university resigned because of a temporary assignment with NSF which posed a conflict of interest. Currently, there are no plans to replace these members because several other members from that University remain very active on the Board.

Future Activity:
The Board of Directors of the ITIC have decided that they will continue indefinitely as an informal organization. The Board members have forged close working relationships, and will continue to share ideas on grant proposals on a multi-university basis. Operating expenses will be borne by the individual members until other sources of support can be identified.

During fy05, the faculty of the Internet TIC plan to focus on writing proposals in the digital libraries, homeland security, local government Internet applications, and others to be determined.

Proposal/Project Title	Principle Investigator (if applicable)	Client or Sponsor's Name	Source of Funds2	Amount of Sponsor Funding		Value of Donated Equipment3	Status4	Date5
Study of User Quality Metrics	Ed Fox	Emory University to IMLS	?	$64,880			P	01/30/04
Full Development of Proof-of-Concept Course on Electronic Commerce Technologies	A. C. Weaver	National Science Foundation	F	$493,387			D	6/18/2003
ITR: Collaborative Research: Performance Analysis of Large Scale Systems Using Mixed Level Simulation	J. A. Aylor and A.C. Weaver	National Science Foundation	F	$1,520,301			D	2/12/2003
ITR collaborative research: scidl:	Ed Fox	NSF	F	$2,550,540			D	10/01/03
Real-Time, 3-D Oxymetry Image Analysis of Solid Tumors Using Cluster Computing	A. C. Weaver, Marty Humphrey and Peter G. Thomas	UVA Fund for Excellence in Science and Technology (FEST)	F	$15,000			D	4/15/2004
Improving the Detection of Multifocal and Multicentric Breast Cancer Through use of a Shuttered Display Protocol	A. C. Weaver	U. S. Army	F	$107,589			D	5/1/2004
Electronic Monitoring of Drug Regimen Compliance for an Aging Population	Alfred C. Weaver	University of Virginia Institute on Aging	F	$30,000			D	4/15/2004
Collaborative project: scribbling…	Ed Fox	NSF	F	$111,000			D	08/04/03
Denied Federal funding								
Self-Sustainable Digital Library for Evolving Communities	K. Maly (with M. Zubair)	NSF	F	$152,000			F	July, 03
Building Demand for IT Services in the Coalfield Region of Virginia*	W. Winter	Appalachian Regional Commission	F	$30,000			F	Dec., 03
Computing and information technology…	Ed Fox	NSF	F	$35,000			F	07/14/03
Extending retrieval with stepping stones…	Ed Fox	NSF	F	$124,250			F	08/21/03
SBIR: Networking Issues for Radio over IP for Project 25 Interoperability and Migration for the U.S. Department of Agriculture	Midkiff, Scott F.	Catalyst Communications Technologies (USDA)	F	$17,487			F	3/15/2004
Development of new innovative digital…	Ed Fox	National Institute of Aerospace	F	$40,000			F	01/05/04
Aggregating, Integrating, Preserving, and Enhancing the NASA Digital Information Framework	K. Maly, M. Zubair, M. Nelson, J. Bollen	NASA	F	$240,000			F	Jan., 04
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Technology Commercialization Center	F	$27,000		NA	F	3/10/2004
Collaborative Research: African-Americans in IT: Improving the Graduate Education and Workforce Pipelines	F. Belanger, W. Smith, V. Harrington (Radford), G. Kasper VCU	NSF	F	$541,875		N/A	F	5/4/2004
Computing and Information Technology Interactive …	Ed Fox	NSF	F	$800,000			F	9/17/2001
Open Archives: Distributed Services for Physicists …	Ed Fox	NSF	F	$315,259			F	3/1/2001
Intelligent collection services for and about Educators..	Ed Fox	NSF (subcontract to U. of Arizona	F	$104,773			F	11/19/2001
Collaborative Project: Enhancing Interoperability of….	Ed Fox	NSF (subcontract to U. of Florida	F	$141,631			F	5/29/2002
Extending Retrieval with Stepping Stones …	Ed Fox	NSF	F	$124,250			F	8/21/2003
Information Technology Research: Managing Complex..	Ed Fox	NSF (subcontract to CWRU)	F	$189,500			F	10/3/2003
Collaborative Project: The OCKHAM Library Network..	Ed Fox	NSF	F	$99,232			F	9/12/2003
Development of New Innovative Digital Library Nationa	Ed Fox	National Institute of Aerospace	F	$40,000			F	1/5/2004
Relief for Canine Hip Dysplasia Related Pain .	Ed Fox	Argyll Foundation	F	$8,500			F	12/9/2003
Computing and Information Technology Interactive.	Ed Fox	NSF	F	$35,000			F	7/14/2003
Collaborative project: the ockham…	Ed Fox	NSF	F	$99,232			F	09/12/03
Wireless Devices and Web Services in the CS Curriculum	A. C. Weaver	Microsoft	F	$30,000			F	10/1/2003
Enhancing Infrastructure for OAI	K. Maly, M. Zubair, M. Nelson	Andrew Mellon Foundation	F	$121,364			F	April, 04
Tools For Extracting Metadata And Structure From Dtic Technical Documents Collections Using Xml Technology	K. Maly & M. Zubair	DTIC	F	$50,000			F	Feb., 04
Federal Funded					**$3,366,353.00**			
Telesonography Using Streaming Multimedia Over the Web	M. Bassignani, S. Dwyer, A. C. Weaver	NIH	F	$733,712			P	2/1/2004
Modeling for Workflow in Diagnostic Radiology Department	Gay, Bassignani, Swyer, Phillios, A. C. Weaver, Sager	NIH	F	$765,935			P	2/1/2004
Integrating Web Services into the Undergraduate Computer Science Curriculum	A. C. Weaver, Jeffery Peden	National Science Foundation	F	$600,000			P	1/13/2004
Building the Evidence to Promote Bioterrorism and Other Public Health Emergency ..	Chen, Ing-Ray	National Institute of Health	F	$1,151,742			P	1/10/2004
Networking Issues for Radio over IP for the U.S. Department of Agriculture	Midkiff, Scott F.	Catalyst Communications Technologies (USDA)	F	$40,000			P	2/4/2004
Reformulating General Engineering and Biological…	Ed Fox	NSF	F	$996,238			P	03/10/04
Intelligent Scalable Information	Ed Fox	NSF	F	598.959.00			P	03/04/04
Dependable and Secure Grid Systems in Biomedical Computing	Andrew Grimshaw, Anita Jones, William Knaus, John C. Knight, Gabriel Robins, Alfred C. Weaver, et al.	National Science Foundation	F	$9,443,098			P	3/31/2004

Electronic Monitoring of Drug Regimen Compliance for an Aging Population	Alfred C. Weaver	University of Virginia Institute on Aging	F	$30,000			P	3/31/2004
Integrating Web Services into the Undergraduate Computer Science Curriculum	A. C. Weaver, Jeffery Peden	National Science Foundation	F	$599,958			P	1/13/2004
Visualizing Bioterrorism Emergency Response and Preparedness in Healthcare Systems	Dr. Ing-Ray Chen, A. C. Weaver	NIH	F	1,000,000,			P	1/8/2004
Real-Time, 3-D Oxymetry Image Analysis of Solid Tumors Using Cluster Computing	A. C. Weaver, Marty Humphrey and Peter G. Thomas	UVA Fund for Excellence in Science and Technology (FEST)	F	$15,000			P	3/16/2004
Advancing Cyber Security through Authentication, Authorization and Federation	A. C. Weaver	National Science Foundation	F	$447,339			P	3/3/2004
Evaluation of the Use of Computer Aided Diagnosis for the Detection of Multicentric and Multifocal Breast Cancer	Dr. Ellen Shaw de Paredes, A. C. Weaver, S. D. Dwyer, J. Thomas, G. Kasper	NIH	F	$5,000,000			P	Pending submission
Improving the Detection of Multifocal and Multicentric Breast Cancer Through use of a Shuttered Display Protocol	A. C. Weaver	U. S. Army	F	$107,589			P	1/21/2004
Integrating Web Services into the Undergraduate Computer Science Curriculum	A. C. Weaver	Microsoft Corporation	F	$61,206			P	3/1/2004
Study of User Quality Metrics for Metasearch…	Ed Fox	IMLS (subcontract to Emory University	F	$64,880			P	1/30/2004
Reformulating General Engineering and Biological..	Ed Fox	NSF	F	$996,238			P	3/10/2004
Intelligent Scalable Information Fusion over …	Ed Fox	NSF	F	$598,959			P	3/4/2004
Extending the selection of NSDL Educational …	Ed Fox	NSF	F	$999,999			P	4/14/2004
Generalized Citeseer Services	Ed Fox	NSF (subcontract to Penn State	F	$192,575			P	4/14/2004
Collaborative Project: Superimposed Tools for Active..	Ed Fox	NSF (subcontract Oregon Graduate Institute)	F	$107,000			P	4/14/2004
Enhancing Quality and Understanding the Use of…	Ed Fox	NSF (subcontract to U. of Arizona)	F	$154, 649			P	4/14/2004
Personalization of Content and Interaction: Bridging..	Ed Fox	NSF	F	$499,860			P	4/14/2004
Curriculum Resources for Information Courses based,,	Ed Fox	NSF	F	$74,912			P	6/17/2004
Visualizing Bioterrorism Emergency Response and ..	Ing-Ray Chen	NIH	F	$1,151,742			P	1/14/2004
Improving Radiotherapy - Live Color Electron Paramagnetic Imaging of Tumor Oxygenation Using Cluster Computing	A. C. Weaver, Marty Humphrey and Peter G. Thomas	UVA Fund for Excellence in Science and Technology (FEST) Carilion Biomedical Institute	F	$148,613			P	5/21/2004
Secure and Reliable Electronic Commerce Technology: A Modular Course Supported by Virtual Laboratories	Alfred C. Weaver	National Science Foundation	F	$499,932			P	6/17/2004
Visualizing Bioterrorism Emergency Response and Pr	Ing-Ray Chen	NIH	F	$1,151,742		N/A	P	Jan. 14, 2004
Development of new innovative digital…	Ed Fox	National Institute of Aerospace	F	$40,000			P	12/02/03
JCDL 2004	Hsinchun Chen	NSF	F	$80,998			P	11/03/03
BDEL: collecting, storing and sharing…	Ed Fox	NSF	F	$50,000			W	11/20/03
Wireless Telemedicine for Nursing Homes and Retirement Centers	Alfred C. Weaver, Karen S. Rheuban, M.D.	University of Virginia Institute on Aging	F	$30,000			D	4/15/2004
Wireless Telemedicine for Nursing Homes and Retirement Centers	Alfred C. Weaver, Karen S. Rheuban, M.D.	University of Virginia Institute on Aging	F	$30,000			P	3/31/2004
Advancing Cyber Security Using .NET	A. C. Weaver	Microsoft Corporation	F	$200,000			P	3/4/2004
Digital, enhanced library for …	Ed Fox	Villanova University	P	$227,526			D	07/11/03
Private denied								
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Abbitt Realty	P	$2,500		NA	F	7/1/2003
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Atlantic Embroidery (Marine Branch)	P	$6,000		NA	F	7/7/2003
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	C. W. Hines & Associates	P	$1,750		NA	F	7/15/2003
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Continental Realty Services	P	$1,000		NA	F	7/18/2003
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Blue Heron Realty	P	$3,500		NA	F	7/10/2003
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Donna Sample Sith	P	$1,000		NA	F	8/8/2003
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Medical Center Radiologists	P	$2,000		NA	F	8/27/2003
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Paws Applause	P	$2,500		NA	F	9/7/2003
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Instiute of Mgmt Accountants-Hpt Rds	P	$300		NA	F	9/25/2003
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Peninsula Housing & Builders Assoc (PHBA)	P	$2,000		NA	F	10/1/2003
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	VA Peninsula Chamber of Commerce	P	$1,850		NA	F	10/3/2003
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Industrial Marine Science	P	$1,250		NA	F	10/8/2003
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Jones, Blechman, Woltz & Kelly PC	P	$5,750		NA	F	10/24/2003
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Short,Short, Telstad & Kerr	P	$1,000		NA	F	10/27/2003
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Priest Electronics	P	$2,500		NA	F	10/27/2003

SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Peninsula Software	P	$3,200		NA	F	11/4/2003
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Karen's For Kids	P	$2,500		NA	F	11/8/2003
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Twenty First Century Funding	P	$300		NA	F	11/10/2003
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	The Silver Vault	P	$2,500		NA	F	11/12/2003
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Retail Alliance	P	$3,000		NA	F	11/18/2003
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Rowena's, Inc	P	$3,700		NA	F	11/26/2003
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	VA Institute of Forensic Science & Medicine	P	$1,650		NA	F	12/1/2003
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	WHRO, Inc.	P	$7,500		NA	F	12/1/2003
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Bennette Paint Mfg	P	$5,500		NA	F	12/12/2003
ITR managing complex information…	Ed Fox	Case Western Reserve U.	P	$189,499			F	10/03/03
Using Eclipse to promote reflection-in-action as students learn	Stephen Edwards	IBM: Eclipse Innovation Grants	P	$25,000			F	01/16/04
Dynamic Distributed Access Control Management System for a Federated Digital Library Based on IBM Autonomic Policy Framework	K. Maly, M Zubair, R. Mukkamala	IBM	P	$40,000			F	Mar., 04
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	BLANCO, Inc.	P	$5,500		NA	F	1/9/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Lord & Company	P	$5,000		NA	F	1/14/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Poetic Praise	P	$1,750		NA	F	1/15/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Rowenas, Inc.	P	$3,700		NA	F	1/15/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Lighting By Design	P	$2,500		NA	F	1/19/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Jean C. Moses, CPA	P	$500		NA	F	1/26/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Jones Blechman, Woltz & Kelly, PC	P	$5,750		NA	F	2/5/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Jones Blechman, Woltz & Kelly, PC Military Law Practice	P	$2,250		NA	F	2/11/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Marine Chemist Service	P	$3,500		NA	F	2/16/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Evergreen/ALS	P	$3,500		NA	F	2/23/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Smithfiied Farms	P	$2,500		NA	F	2/27/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Homeland Contracting Corp.	P	$1,000		NA	F	3/9/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Net Memories	P	$1,250		NA	F	3/22/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Lovato Electric, Inc.	P	$2,500		NA	F	3/23/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	RPC Industries, Inc.	P	$1,200		NA	F	3/29/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	L & L Macine Works	P	$500		NA	F	4/1/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Anchor Pools & Spas	P	$1,250		NA	F	4/1/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Cherry Auto, Inc.	P	$9,000		NA	F	4/1/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Williamsburg Foods (Wholesale)	P	$5,500		NA	F	4/1/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Simple Silver of VA	P	$250		NA	F	4/15/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Bay Etching & Imprinting	P	$5,500		NA	F	4/20/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Coastal Bioanalysts	P	$1,250		NA	F	4/25/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	COATS & Reliance Staffing	P	$5,000		NA	F	5/1/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	VA Finest Chocolates	P	$750		NA	F	5/1/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	VA Hydroponics	P	$1,500		NA	F	5/1/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Whitley Peanut Factory	P	$10,750		NA	F	5/1/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Marine Sonic Technology	P	$1,000		NA	F	5/9/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Smithfield Collection	P	$11,500		NA	F	5/13/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Smithfield Foods (Basse Choice)	P	$11,500		NA	F	5/13/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Williamsburg Foods (The Peanut Shop)	P	$11,500		NA	F	5/13/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Universal Laboratories	P	$3,500		NA	F	5/19/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Lamberti & Associates	P	$1,000		NA	F	6/1/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Smithfield Collection	P	$10,500		NA	F	6/1/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Smithfield Collection	P	$25,500		NA	F	6/1/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Cherry Auto/Perry Buick	P	$2,500		NA	F	6/1/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	COATS & Reliance Staffing	P	$3,750		NA	F	6/2/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	VA Food & Beverage Assoc	P	$1,000		NA	F	6/11/2004
AOL Fellowship in Information Retrieval	Ed Fox	AOL	P	$140,000			F	4/14/2004
Fox research	Ed Fox	AOL	P	$1,600			F	2/4/2003
Using Eclipse to promote reflection in-action as…	Stephen Edwards	IBM: Eclipse Innovation Grants	P	$25,000			F	1/16/2004
Private Funded					**$652,749**			
Relief for Canine Hip Dysplasia Related Pain through Reiki	Marie Suthers-McCabe	Morris Animal Foundation	P	$8,100			P	11/03/03
Using Eclipse to promote reflection-in-action as students learn	Stephen Edwards	IBM: Eclipse Innovation Grants	P	$29,999			P	11/07/03
Harnessing the dynamic data grid:…	Ed Fox	Battelle	P	$895,294			W	11/20/03
Knowledge creation and integration	Ed Fox	University of Arizona	S	$111,000			D	08/04/03
Enhancing quality and understanding…	Ed Fox	University of Arizona	S	$111,000			D	07/23/03
State denied								
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	CNU School of Business	S	$3,500		NA	F	7/30/2003

SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Inter-governmental Personnel Advisory Committee (IPAC)	S	$4,500		NA	F	7/29/2003
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Hampton Roads Clean Cities Coalition	S	$1,500		NA	F	8/8/2003
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Sister Cities of Newport News, Inc.	S	$1,000		NA	F	10/27/2003
Indo-US Workship	Ed Fox	UVA	S	$5,000			F	02/02/04
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	New Horizons Regional Education Center	S	$2,000		NA	F	1/20/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	VA Environmental Servics Network	S	$4,000		NA	F	2/6/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	VA Manufacturers Assoc	S	$4,000		NA	F	2/6/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	City of Hampton IDA	S	$30,000		NA	F	3/1/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Northampton County Capital Outlay Project	S	$6,300		NA	F	3/3/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Kiwanis Children's Council of Hampton Roads	S	$750		NA	F	3/16/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Resort Hotel Association	S	$4,000		NA	F	3/17/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Peninsula Housing & Bldrs. Assoc (PHBA) Addendum	S	$300		NA	F	3/30/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Hampton Roads Research Partnership	S	$2,500		NA	F	4/1/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Isle of Wight County	S	$5,500		NA	F	4/10/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Greater Peninsula Workforce Devel	S	$2,800		NA	F	4/12/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Nat'l Institute of Aerospace (NIA)	S	$8,500		NA	F	4/30/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	So Business Admin Accoc (SBAA)	S	$2,035		NA	F	5/2/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Hampton Bay Days	S	$2,000		NA	F	5/17/2004
SEVA - ELECTRONIC BUSINESS VILLAGE	William N. Muir	Small Busn Devel Cntr of Hpt Rds (SBDC)	S	$10,000		NA	F	5/19/2004
State funded					$100,185			
					$4,119,287			
Annotating the NSDL to support teaching…	Ed Fox	University of Arizona	S	$586,016			P	09/11/03
					100,185			
Virginia Tech					4,019,102			
Jan-Mar 04								
Virginia Tech								
				$37,890,186				

[2]Indicate if funding source is **Fed**eral; **F**oundation; **P**rivate; or **S**tate

[3]Value of equipment (incl. H/W and S/W) provided as in-kind: do not include equipment purchased with sponsor funds.

[4]Indicate if money has actually been **F**unded; if a **P**roposal has been/will be submitted; proposal was **D**eclined; or project was **C**ancelled.

[5]Date that the designated status was achieved, e.g., notification that funding is comitted -not project start or completion date or date money was actually paid by sponsor

Virginia's Center for Innovative Technology

Technology Awards Program and Technology Growth Fund

FY 2004 Status Report

November 1, 2004

Prepared for the Governor and the Chairs of the House Appropriations and Senate Finance Committees

As Required by the 2004 Acts of Assembly

Technology Awards Program and Technology Growth Fund

Preface

This report has been prepared for the Governor and the Chairs of the House Appropriations Committee and the Senate Finance Committee as specified in Item 462, Paragraph E.2 of the 2004 Acts of Assembly. Virginia's Center for Innovative Technology (CIT), as the operating arm of the Innovative Technology Authority (ITA) has as its mission, enhancement of Virginia's business competitiveness through technology innovation.

CIT's primary strategic goals for Fiscal Year 2004 (FY 04) were:

Goal 1: Expand Virginia's technology assets into world-class research hubs.

Goal 2: Make Virginia a global leader in development of entrepreneurial technology ventures.

The Technology Awards Program and the Technology Growth Fund were both originally created and positioned to support the achievement of CIT's goals. As a result of significant reductions in CIT funding, the programs that are the subject of this report have been discontinued. It is recommended that this corresponding reporting requirement also be discontinued.

Executive Summary

As reported in FY 03, a decision was made by CIT and its Board to discontinue the Technology Awards Program in FY 04 as a result of significant reductions in CIT's appropriation, which funded these programs.

During its history (1986 – 2003) the Technology Awards Program granted over 2,250 awards worth nearly $110M – a mixture of project-specific grants in support of collaborative product development efforts between companies and universities as well as support for federal proposal writing efforts and business development within CIT's high tech client base. Investments made in technology infrastructure during this period of time (Technology Innovation Centers, or TICs, for example) are included in these figures as well, however, specific information about the TICs are the subject of a separate legislative report. A map of the regional distribution of all CIT awards (Technology Awards and Infrastructure Awards combined) is attached for informational purposes.

Another sub-set of overall CIT grant activity, the Technology Growth Fund (TGF) was begun in FY 98 and ended at the close of FY 01 (i.e., there has been no budget line item for it since FY 01). During the period of time it was in existence, $467K was spent in support of the program's objectives. One such investment was the Center for Nanoscopic Engineering in the Commonwealth of Virginia, an NSF Materials Research and Science Engineering Center (MRSEC) supported by $100K of CIT/TGF matching money in FY 01 that continues to bring in $1M per year from NSF and also competes for federal dollars for VA from a variety of other Federal programs.

More detailed descriptions for both programs follow, along with FY 04 metrics information relating to CIT's impact on the state's technology business competitiveness between July 2003 and June 2004.

Technology Awards Program

The CIT Technology Awards Program was designed to bring together technology companies, universities, and federal labs in Virginia to develop products and services for eventual commercialization, leading to the creation of technology jobs and increased competitiveness for these companies. Historically, awards ranged from $2,500 to $90,000 to incentivize firms to work with the Commonwealth's intellectual resources (universities, federal labs, non-profit R&D facilities) on such development activities.

Although Technology Awards were discontinued as an official program at the end of FY 03, the same mechanisms were used during FY 04 to provide funding in support of a reduced number of CIT's initiatives, most notably broadband outreach and strengthening entrepreneurship and technology partnership resources.

Statistics for FY 04:

Initiative	Value of Awards	Number of Awards Made
Broadband Outreach	$172,668	13
Entrepreneurship Centers	$180,000	2
Manufacturing Support Partnerships	$155,000	3
Nanotechnology Partnerships	$60,000	1
Totals	**$567,668**	**19**

Because the economic impact of awards does not occur in the same year as the money is provided, there is not a direct correlation between financial commitments made in a given year and the economic impact reported by CIT's clients and partners in that same year. However, those providing feedback either received a CIT award at some point in the past, or received the benefit of other CIT services, thus the figures provided on page 5 of this report reflect in general how our ongoing efforts impacted the state in FY 04.

Commercialization Payback

The largest award offered (the Challenge Award – worth up to $90K by the time it was discontinued in FY 02) required a payback of two times CIT's investment if the technology was successfully commercialized. All other award types under this program were provided on a grant basis (no payback required).

An analysis conducted during FY 02 showed that of the $4M invested during the Challenge Award's history (1996 – 2002), $2,872 has been paid back. There were no additional payments made during FY 03 or FY 04.

The payback requirement has not been waived for those companies still in business (or otherwise not exempt from the payback clause) and efforts continue with regard to tracking and requiring repayment.

Technology Growth Fund

CIT's Technology Growth Fund was begun as a pilot program in FY 98 with three broad aims: "(1) to identify, track and attract federal and commercial technology initiatives; (2) provide matching funds to compete for federal investments that create new research centers or R&D projects; and (3) provide funds to capitalize on commercial opportunities where Virginia has existing technology assets that when leveraged with state funds, provide significant economic development activity."

The Technology Growth Fund (TGF) was not a line item in CIT's FY 04 budget – its last year of operation was FY 01. Its discontinuation was due to budget restrictions as the time, and because the intent and impact of the program was subsumed by the new Commonwealth Technology Research Fund (CTRF) implemented during the latter half of FY 01. When the program stopped, just under $467K had been spent on TGF-related projects – including some salary money for Federal & Business Development staff, matching funds for federally funded centers and money to entice a company to keep its operations in Virginia.

There were no payback provisions associated with this fund; however, an example of the "payoff" for one such investment is the Center for Nanoscopic Engineering in the Commonwealth of Virginia, an NSF Materials Research and Science Engineering Center (MRSEC) supported by $100K of CIT/TGF matching money in FY 01 that continues to bring in $1M per year from NSF and also competes for R&D dollars for Virginia from a variety of other Federal programs.

Economic Impact of CIT Programs

Every year, CIT conducts a metrics validation to measure the impact and effectiveness of its programs, and a brief synopsis of the FY04 review is provided below.

Only those results achieved in FY 04 are reported, and it should be noted that they are the consequence of a combination of CIT services, including but not limited to prior investments made through the Technology Awards Program and the Technology Growth Fund.

2004 Performance Measurement

For FY 2004, CIT changed the way it measured its performance and the resulting Commonwealth impact. Three distinct categories were identified for demonstrating return on the Commonwealth's investment:

- Cash – Revenue earned by CIT from government and private sector sources other than the Commonwealth of Virginia, and used for the Commonwealth's benefit.
- Leveraged Cash – Revenue earned by CIT, on behalf of CIT clients, and obtained from government and private sector sources other than the Commonwealth.
- Economic Value – wages and sales gains for Commonwealth entities resulting from services provided by CIT to clients

Cash

As a result of federal grants and contracts awarded to and performed by CIT, a total of $3,134,540 was received in revenue during FY 04. These awards included activities that allowed CIT to broaden it service delivery to its clients as well as facilitating research and development projects in collaboration with CIT partners.

Leveraged Cash

CIT clients reported a total of $50,710,090 in leveraged cash due to services that CIT provided to their firms. This figure is comprised of federal grants or contracts they received (e.g., SBIR, STTR and ATP awards), R&D contracts from other sources, and private investments.

Economic Value

Wages and sales gains for Commonwealth entities receiving CIT services. These gains are recorded and submitted by client companies when the gains are a result of services CIT provided to the company. For 2004, these gains are $176,353,801.

Recommendation

Because the Technology Awards Program and the Technology Growth fund are no longer funded due to CIT appropriations reductions, it is recommended that this reporting requirement be correspondingly discontinued..

A History: All CIT Awards By Region FY 1986 - 2004

All types of awards including technology infrastructure investments such as Technology Innovation Centers and Regional Technology Councils