



Overview and Summary of Recent Initiatives

To enhance state-funded biomedical research in the Commonwealth of Virginia, newly elected Governor Tim Kaine and former Governor Mark Warner jointly proposed a **\$520 million investment package** for the state's major research universities. The multitargeted initiative is designed to boost basic research funding and recruit top scholars in the leading fields of biomedical science, biomaterials engineering, nanotechnology, and modeling and simulation. The initiative also calls for new state-of-the-art research facilities such as

- A bioscience research building and a biodefense laboratory facility at **George Mason University (GMU)**;
- A medical research building at **Virginia Commonwealth University (VCU)** and additional funding for the **Massey Cancer Center** addition;
- Investments in a new clinical cancer center at the **University of Virginia**; and,
- Construction of a critical technology building and an infectious disease laboratory at **Virginia Polytechnic Institute and State University (Virginia Tech)**.

These initiatives follow recommendations made by the **Governor's Commission on Biotechnology**, a "blue ribbon" panel first launched in 2002 by former Governor Warner. The commission made key recommendations to increase the availability of seed and pre-seed capital, attract the best and brightest faculty to Virginia's universities, build specialized research facilities, assist bioscience companies with facilities financing, and accelerate the movement of intellectual property from the state's laboratories and universities into the marketplace.

Building Bioscience R&D Capacity

Recent state investments in facilities

The **Janelia Farm Research Campus (JFRC)** of the **Howard Hughes Medical Institute (HHMI)** will open in the third quarter of 2006. Located on a 689-acre property in northern Virginia, the biomedical research complex represents a \$500 million investment by HHMI. The campus includes 760,000 square feet of laboratory space, in addition to facilities to support collaborations with scientists from around the world. Recruitment of the interdisciplinary scientific staff is underway. When fully operational in 2009, JFRC will house 300 scientists. JFRC will emphasize collaborative, technology-driven research in two

broad areas: understanding how neuronal circuits process information, and developing new imaging technologies and computational methods for image analysis.

The **University of Virginia** has broken ground on the new \$70.7 million **Carter-Harrison Research Building**, which will house 60 research teams comprising 240 scientists and laboratory personnel.

The new **Innovation Center for Biotechnology-based Economic Development**, managed by **Virginia Tech's College of Agriculture and Life Sciences**, is located in southern Virginia. The center is funded by a \$890,000 grant from the Virginia Tobacco Commission to focus on plant or microbe R&D for new bio-based products. Future phases will integrate the center's research into high school science curricula, develop joint research projects with targeted private sector companies, and assist in the development and diversification of the region's existing businesses.

Research programs

Virginia offers the **Commonwealth Technology Research Fund**, a \$26 million initiative designed to leverage federal and private sector research investment in Virginia universities. The program was launched in 2000 and has funded numerous projects, such as the Virginia Bioinformatics Consortium, the relocation of the Institute for Computational Genomics to the College of William and Mary, research in cancer genomics, and research partnerships with private sector biotech firms in mucosal therapies of infectious and autoimmune diseases.

Encouraging Academic/Industrial Interaction

Virginia's **Center for Innovative Technology (CIT)** works to accelerate Virginia's next generation of technology and technology companies. CIT encourages and facilitates discussions among the state's research institutions, federal and state laboratories and government officials, and life science-related industries and has focused recent efforts to develop a unified statewide vision called "SmartBio" in the arena of information technology applied to living systems.

Moving Technology into the Marketplace

Commercializing university technology

Carilion Biomedical Institute (CBI), founded with a \$20 million grant from Carilion Health System and headquartered in Roanoke, is a partnership between the Health System, Virginia Tech, and the University of Virginia. Its mission is to foster collaborative research among the partners and enhance regional economic infrastructure through investing in very early-stage companies with disruptive technologies. CBI, Virginia Tech, and the University of Virginia currently have nine funded collaborative research projects in the areas of applied biomechanics, healthy aging, infectious disease, and rural health. CBI also has 10 portfolio companies, with plans to add at least five more every year.

Supporting bioscience entrepreneurs and emerging companies

The Virginia BioTechnology Research Park created the **Virginia Biosciences Development Center (VBDC)**, a nonprofit organization whose mission is to deliver business assistance and support services to the early-stage life science companies located in the park. The VBDC provides park tenants with one-on-one business counseling, access to resource networks and pro bono professional services, assistance with

business plan preparation, intellectual property consulting, conduits to start-up funding, educational workshops, and staff recruitment.

Making Capital Available

Pre-seed and seed capital

In December 2003, Virginia's CIT launched the **Growth Acceleration Program (GAP)** to provide pre-seed and seed capital to start-up and emerging technology companies. Companies can receive up to \$100,000. GAP is open to early-stage companies in six industry sectors, one of which is biotechnology.

Venture capital

Virginia provides an angel investor tax credit of 50 percent of up to \$50,000 to individuals who invest in technology companies. An angel investor tax credit of up to 50 percent of \$500,000 is available for technology investments in tobacco-dependent localities. A total of \$5 million is available for the credits annually. Virginia also provides 100 percent sales and use tax exemptions for company purchases used directly and exclusively in research and development and manufacturers' purchases used directly in production, including machinery, tools, spare parts, industrial fuels, and raw materials. A number of Virginia localities have elected to tax research and development tangible property at reduced rates.

Providing Space for Bioscience Companies

Incubators

The Virginia Department of Business Assistance manages the **Virginia Small Business Incubator Grant Program**, which provides grants to local governments and nonprofit economic development organizations to construct or renovate buildings to provide incubator space for start-up companies. The program also can provide support for initial incubator operations.

The **Fairfax County BioAccelerator** was established in northern Virginia in 2003. The accelerator, which can accommodate 10 to 12 early-stage bioscience or bioinformatics companies, currently houses five companies. Companies joining the BioAccelerator receive a range of customized business development services especially designed for early-stage bioscience and bioinformatics firms.

The **VBDC** is a 27,000-square-foot incubator located in the Virginia BioTechnology Research Park in Richmond. The center provides business assistance and space for bioscience companies.

Bioscience research parks

The **Virginia BioTechnology Research Park**, located on a 34-acre site in downtown Richmond, adjacent to the VCU Medical Center continues to expand with construction on its third multitenant facility scheduled for completion in early-2007. The park is home to more than 50 national and international bioscience companies; research institutes affiliated with the VCU Medical Center; major state and national medical, forensic, and public health laboratories; and organizations involved with management of the nation's organ transplantation process. After completion of the new 450,000-square-foot **Philip Morris Center for Research and Technology**, the park will be two-thirds developed. Ultimately, the park is projected to contain more than 1.5 million square feet of space and will be an employment center of more than 3,000 life science professionals.

At the **Virginia BioTechnology Research Park at Meadowville Technology Park**, Chesterfield County has designated a significant portion of its 1,300-acre campus for bioscience companies. This site provides for more than 2 million square feet of offices, laboratories, and manufacturing facilities.

In Henrico County, the **Virginia BioTechnology Research Park at White Oak Technology Park** contains approximately 2,247 acres of land, which has been master-planned to attract and support high-technology manufacturers, including those in the biosciences industry.

INNOVATION@Prince William Technology Park is a 1,600-acre technology park owned by both public and private developers in Prince William County. Biotechnology is a key component of INNOVATION, which is planned and zoned for immediate bioscience laboratory, production, testing, and development facilities. In addition to major pharmaceutical and bioscience firms located in the park, the park will also accommodate the recently announced **Virginia Department of Forensic Science Northern Virginia laboratory**; GMU's **Regional Biocontainment Laboratory**; and the **Alexandria Technology Center**, which, when fully developed, could contain up to 400,000 square feet in specialized biotechnology space.

The **University of Virginia's Fontaine Research Park** is a 54-acre research park which, when completely developed, will include nearly 400,000 square feet. The Advanced Research and Technology Building, the last building to be built in the park, is currently in the final planning stages.

The **University of Virginia Research Park at North Fork** is a 562-acre, mixed-use park that will, when completed, include facilities for laboratory research, medical, and pharmaceutical companies as well as residential, retail, and other uses. The Emerging Technology Center, a 40,000-square-foot, multitenant building, provides both wet- and dry-lab space.

The **Riverside Center for Research and Technology** in Roanoke is a 110.5-acre, city-developed research park situated just south of Roanoke's central business district. CBI, the first tenant of Riverside Center, is currently constructing an \$8 million office and laboratory complex. CBI is a partnership among Carilion Health System, the University of Virginia, and Virginia Tech.

The **Virginia Tech Corporate Research Center (CRC)**, located on 120 acres adjacent to the Virginia Tech campus, contains 16 single- and multi-tenant buildings.

Riverstone Technology Park in Halifax County is a 165-acre technology park owned and managed by the Halifax County Industrial Development Authority that is targeting biomanufacturing. A \$12 million, 67,000-square-foot, multitenant building has been constructed to attract biotechnology, R&D, and technical manufacturing.

Addressing Talent Needs

Specialized postsecondary programs

The **Virginia Community College System's (VCCS's)** Institute for Excellence in Advanced Technology adopted a biotechnology strategic plan in 2004. The plan is aimed at expanding and strengthening partnerships between industry and VCCS in biotechnology; improving the abilities of individual colleges to assess, collaborate, communicate, and deliver biotechnology training programs and services; and marketing the services and abilities of VCCS in the area of biotechnology.

Many of the state's community colleges currently offer courses, certificates, or degrees in biotechnology. Recently established programs include one focused on biotechnology manufacturing training at the **Danville Community College** and an industrial biotechnology certification program offered at **Virginia Western Community College** in Roanoke.

The Williamsburg BioProcessing Foundation (WilBio) is basing the new **WilBio Institute for BioProcess Technology at Tidewater Community College (TCC)**. TCC students and faculty will be able to use the institute's equipment and technology.

K-12 outreach programs

The Outreach Program at Virginia Tech's Fralin Biotechnology Center sponsors the "**Biotech-in-a-Box**" program that provides biotechnology equipment and materials to high school and community college classrooms across the Commonwealth at no cost. The center sponsors an annual biotechnology education conference and other professional development opportunities for high school and college biology educators. The center also helps establish teacher-scientist partnerships, collaborations designed to help high school students understand current advances in biology and biotechnology.

The **HHMI** funds a number of education initiatives in Loudoun County, the home of its new biomedical research center. These include a \$1 million donation to establish a biotechnology magnet program, college scholarships to outstanding science students graduating from all 10 Loudoun High Schools, and a summer science academy program offered to 36 middle school teachers annually.

Pending Proposals

In addition to the Governor's budget proposals described in the overview, the 2006 session of Virginia's General Assembly is considering several initiatives designed to assist biotech firms with their financing challenges. These include return guarantees for venture capital funds investing in Virginia technology firms, additional tax credits for investments in biotech companies, and allowing biotech companies to sell their unused but otherwise allowable research and development tax credits or net operating loss carryovers to another corporation taxpayer.

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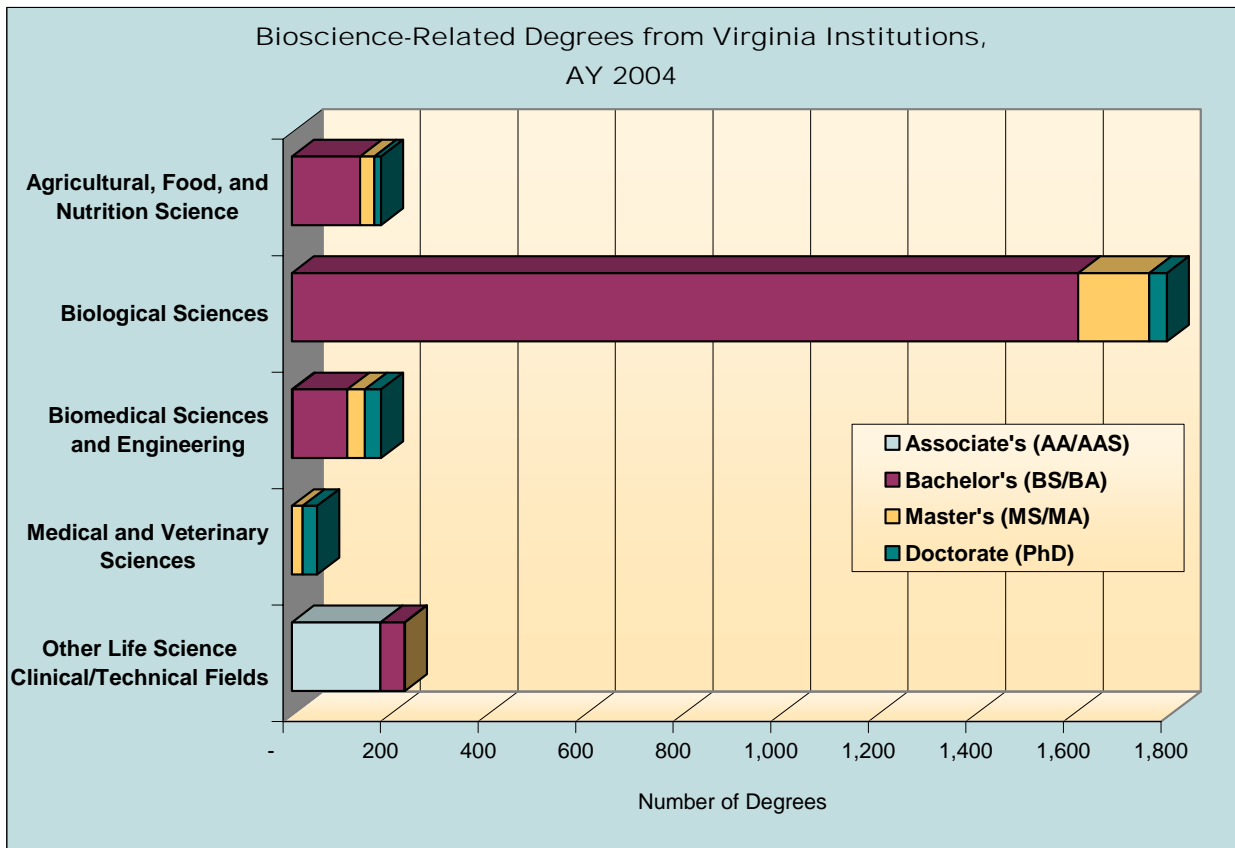
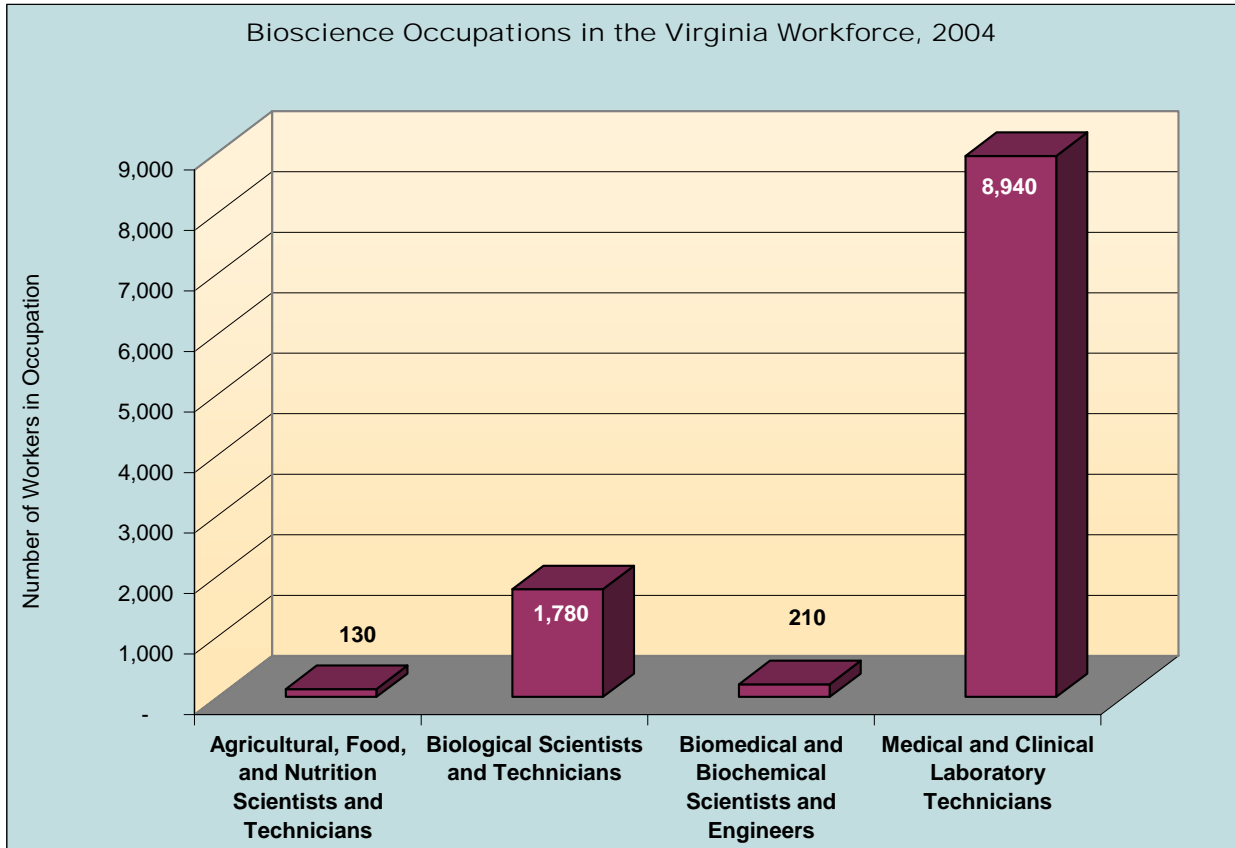
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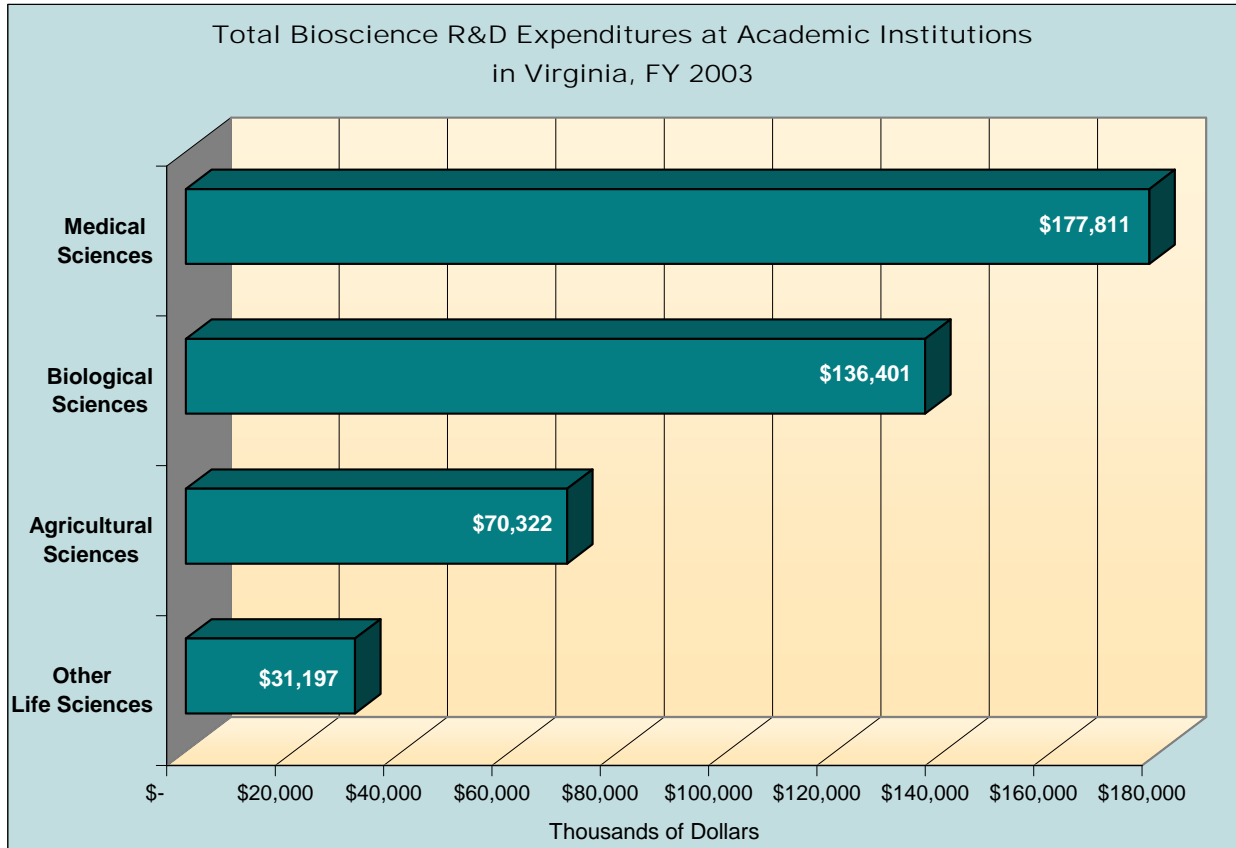
The Virginia Biotechnology Association (VaBIO), formed in 1992, is a 220-member trade association that promotes the biotechnology industry in Virginia.

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Industry Subsector	Virginia	United States
Agricultural Feedstock & Chemicals		
Establishments 2004	36	2,111
2001-2004 Establishment % Change	11.6%	0.4%
Employment 2004	2,423	104,893
2001-2004 Employment % Change	-16.1%	-6.9%
Share of U.S. Employment	2.3%	100.0%
Location Quotient	0.88	n.a.
Average Annual Wage 2004	\$64,476	\$63,383
Direct-Effect Employment Multiplier	4.67	10.91
Total Employment Impact	11,310	1,212,094
Drugs & Pharmaceuticals		
Establishments 2004	26	2,589
2001-2004 Establishment % Change	0.0%	-0.6%
Employment 2004	3,836	313,207
2001-2004 Employment % Change	3.6%	2.7%
Share of U.S. Employment	1.2%	100.0%
Location Quotient	0.47	n.a.
Average Annual Wage 2004	\$65,975	\$79,303
Direct-Effect Employment Multiplier	4.92	9.51
Total Employment Impact	18,885	2,731,321
Medical Devices & Equipment		
Establishments 2004	299	15,190
2001-2004 Establishment % Change	11.2%	0.2%
Employment 2004	3,619	411,460
2001-2004 Employment % Change	-14.4%	-3.6%
Share of U.S. Employment	0.9%	100.0%
Location Quotient	0.34	n.a.
Average Annual Wage 2004	\$36,020	\$56,449
Direct-Effect Employment Multiplier	2.29	4.56
Total Employment Impact	8,300	1,817,705
Research, Testing, & Medical Laboratories		
Establishments 2004	396	20,565
2001-2004 Establishment % Change	30.0%	19.4%
Employment 2004	6,136	413,550
2001-2004 Employment % Change	7.7%	8.2%
Share of U.S. Employment	1.5%	100.0%
Location Quotient	0.57	n.a.
Average Annual Wage 2004	\$57,059	\$65,414
Direct-Effect Employment Multiplier	2.30	3.15
Total Employment Impact	14,127	1,272,936
TOTAL PRIVATE SECTOR		
Establishments 2004	198,896	8,156,137
2001-2004 Establishment % Change	4.7%	4.8%
Employment 2004	2,859,426	109,249,195
2001-2004 Employment % Change	1.1%	-0.7%
Share of U.S. Employment	2.6%	100.0%
Location Quotient	n.a.	n.a.
Average Annual Wage 2004	\$40,112	\$39,003

Source: Battelle calculations -- based on Bureau of Labor Statistics QCEW data from the Minnesota Implan Group, RIMS II Employment Multipliers from the Bureau of Economic Analysis, and the Census Bureau's Economic Census.
 Note: n.a. = metric is not applicable.





	Virginia	United States	Rank
University R&D Expenditures, FY 2003			
Total (\$ thousands)	\$773,200	\$40,104,621	16
Life Science R&D (\$ thousands)	\$419,416	\$24,062,088	17
Percent of Total R&D	54.2%	60.0%	
Life Sciences Per Capita	\$56.78	\$82.74	
Change in Life Sciences FY 1999–2003	58.3%	52.7%	
NIH Support to Institutions, FY 2004			
Total (\$ thousands)	\$450,160	\$22,556,459	13
Per Capita Expenditures	\$60.95	\$77.56	
Change in Expenditures FY 2000–2004	111.4%	53.2%	
Higher Education Degrees in Bioscience Fields, AY 2004			
	2,444	111,329	14
Bioscience Occupations in the Workforce, 2004			
	11,060	616,140	20