

Georgia Tech's Strategy for Research and Economic Development

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INTRODUCTION

This white paper provides a brief overview of Georgia Tech and its strategy for leveraging research and innovation into economic development impact. Examples are given of recent innovation initiatives. Four recommendations are made on how the State can better support its research universities to realize more economic development impact.

The Georgia Institute of Technology (Georgia Tech) was created in 1885 during the “New South” movement to develop an educated cadre of technical leaders to support industry and economic development in Georgia. In 1934, through an act of the General Assembly, the Engineering Experiment Station (now the Georgia Tech Research Institute, GTRI) was created to focus on research and transition to industry. Three years later, through another legislative act, Georgia Tech created an affiliated non-profit company, the Georgia Tech Research Corporation (GTRC), to hold and license intellectual property (IP) and to manage research contracts from government and industry. In 1996, the Enterprise Innovation Institute was spun out of GTRI to provide a more visible and dedicated focus for economic development in Georgia.

Today, Georgia Tech is recognized as one of the top research universities in the world as evidenced by its recent top ten listing by Thomas Reuters.¹ Its six exceptional colleges include the largest engineering college in the United States. It provides direct support to industry in Georgia through federally sponsored programs managed on behalf of the State of Georgia including the Manufacturing Extension Partnership (MEP)² and the Occupational Health and Safety Program (OSHA).³ It ranks as the #3 producer of patents in Georgia,⁴ behind AT&T and Kimberly Clark, and #8 in the country among research universities in economic development impact.⁵ Its incubator has launched more than 75 companies in the past 10 years. Specific data related to Georgia Tech's technology transition activities are shown Table 1.

Since 2006, Georgia Tech's research awards have increased by 60 percent. The Huron Group is currently updating its 2006 report, and while their analysis is not yet completed, their preliminary finding indicates that Georgia Tech's impact is at least 60,000 jobs - through direct and indirect employment, and at businesses founded, attracted or supported around the state by Tech people, technology and programs. Remarkably, Georgia Tech's investment into economic development activities leverages external funding in a ratio of 26:1 to state funding (both state appropriations for economic development support and state funded competitively selected awards).

	FY2011	FY2010
Research expenditures	\$641 million	\$603 million
Disclosures	383	407
Patents	78	58
Technologies transferred	127	85
Research contracts with industry	980	843
Licenses	83	90
New incubated companies	17	16
Investment into incubated companies	\$100 million	\$61 million
Jobs created by new incubated companies	513	483

Table 1: Indicators of Georgia Tech's economic development impact

Increasingly, Georgia Tech is recognized for its thought leadership in research, innovation, and the transformation of research results into direct economic development impact. The president of Georgia Tech serves on a White House steering committee on advanced manufacturing and a Department of Commerce advisory committee on innovation. Many Georgia Tech faculty serve in influential advisory board positions at the federal and State level. For example, a Georgia Tech vice president, who also serves as the director of GTRC, is the current president of the University-Industry Demonstration Partnership (UIDP),⁷ a body of leading universities and companies that advise the federal government on competitiveness issues related to transitioning research results into direct economic impact. Georgia Tech's partnering with the State and public-private partnerships (e.g., Technology Association of Georgia, Metro Atlanta Chamber of Commerce) to attract high tech companies to Georgia are well documented.⁸

Georgia Tech intends to do much more as described in its recently published 25 year strategic vision and plan, *Designing the Future*.⁹

TRANSFORMING RESEARCH RESULTS INTO ECONOMIC DEVELOPMENT IMPACT

The Georgia Tech strategic vision and plan was published in September 2010. Innovation is an integral part of this blueprint for the future including innovation in educating the technological leaders of the world, innovation in research, innovation in its business practices, and innovation in innovation itself. Research is critical to fostering innovation and economic development.

As part of the strategic vision and plan, Georgia Tech defined an industry facing research strategy focused both on leading-edge research and economic development. While most universities pursue a linear, sequential flow of discovery-based research to occasional declaration of intellectual property followed by licensing or company formation/spin-out; Georgia Tech pursues a **concurrent strategy** focused on **12 strategic theme areas** as illustrated in Table 2.

Concurrency means that teams of faculty, graduate students, application and economic development experts, and professional staff work together to define and pursue grand challenges, foster early engagement with industry, and accelerate the maturation and transition of technology to the marketplace. It should be noted that to accomplish, this balance is required between high risks, discovery focused research, and economic development activities. Not every research task is successful. As Charles Kettering once said, "One fails forward toward success." Research is an experimental pursuit where new insights and fundamental learning come from failure. The balance sought is to engender and support a culture that blends high risk, discovery-focused research with early identification of commercialization potential.

The value to industry, besides access to know-how and technology, is that research universities, through their innovation processes, provide a venue for exploring and realizing disruptive innovations outside the constraining and often bureaucratic confines of their profit/loss units. A disruptive innovation is a true game changer (e.g., electronic copiers replacing carbon paper, calculators replacing slide rules). Results during the past two years have been striking as illustrated previously in Table 1.

This concurrent strategy is based on three objectives: to *create transformative opportunities*, to *strengthen collaborative partnerships*, and to *maximize economic and societal impact*.

Create transformative opportunities: The first objective means that members of the faculty pursue high-risk research grounded in grand challenges facing our society. The results of this kind of research when it solves those kinds of challenges will engender significant economic as well as societal impact. Members of the faculty are encouraged to provide thought leadership at the national and international levels. Recent examples include the creation of a national robotics roadmap,¹⁰ the definition of a health information exchange and focus on state-wide use of electronic patient records,¹¹ leadership in information security and logistics on behalf of the World Economic Forum,¹² and innovative new ideas

“Big Data” – <i>information security, high performance computing, ...</i>
Biomedicine and Biotechnology – <i>devices, vaccine delivery, ...</i>
Electronics and Nanotechnology
Manufacturing, Trade, and Logistics
Materials – <i>composites, polymers, graphene, bio-inspired materials, ...</i>
National Security
Paper Science and Technology
People and Technology
Public Service, Leadership, and Policy
Robotics
Sustainable Infrastructure – <i>energy, transportation, smart buildings, water, ...</i>
Systems – <i>aerospace, electrical, mechanical</i>

Table 2: Georgia Tech strategic theme areas for research and economic development

related to next generation materials and their manufacture.¹³ These and other initiatives are pursued in ways where the Georgia Tech campus, and even the State, provide the infrastructure (commonly called test bed or pilot plant) for conducting the scalable and relevant research in the real world.

Strengthen collaborative partnerships: Clearly, the problems addressed through this research agenda are so massive that they cannot be accomplished by Georgia Tech alone. Partnering with other State universities and technical colleges, national and international universities, major corporations, local nonprofits, and State agencies is key. The Georgia Research Alliance (GRA) has been a key partner of Georgia Tech, and other research intensive universities in Georgia, helping us to attract top talent, and to pursue critical issues to society and to the State’s economic vitality. Partnerships with the Georgia Department of Economic Development, Children’s Healthcare of Atlanta, Emory University, IBM, Boeing, NCR, and Kimberly Clark are but a few of the key strategic partnerships that Georgia Tech has sought to strengthen in the past year with promising outcomes.

Maximize economic and societal impact: The third objective means that research success is not measured by papers published or other standard measures of faculty achievement, as important as they are to the academy. Success is predicated on research results having demonstrable impact beyond the laboratory and classroom in the real world. A few measures have already been presented in Table 1 and other equally important, though perhaps qualitative measures are dependent on the value Georgia Tech’s strategic partners put on the work conducted under this strategy (e.g., increased support from the State of Georgia for Georgia Tech’s economic development support activities to reverse a five year decline).

In FY2011, Georgia Tech expended \$610 million on research and economic development activities. More than \$550 million was from industry and federal support that provided a significant 27:1 amplification to the \$23 million in State of Georgia appropriations that support economic development activities. Figure 1 illustrates the breakdown of research investment by the state, the federal government, industry, the Georgia Research Alliance (GRA), and the Georgia Tech Foundation (GTF). Interestingly, Georgia Tech is starting to track foreign

investment as part of its overall research and economic development impact. Significantly more than 90 percent of Tech’s research and economic development funding come into the State from external sources and directly support the employment of more than 6,000 faculty, graduate students, and support professionals.

Central to the results cited is a technology transition model illustrated in Figure 2. As already discussed, Georgia Tech seeks early commercialization opportunities via its concurrent strategy. Valuation of these commercialization opportunities can be operationalized through the creation of spin-out companies, technology licensing, or continued investment in further development of the technology.

RECENT INNOVATION INITIATIVES

Innovation is at the core of how Georgia Tech pursues research and integrates that research into both its educational offerings and its economic development efforts.

Georgia Tech defines innovation as *invention plus insight plus implementation*. This very definition underscores the concurrent strategy described in the previous section. As part of its strategic planning activities, in July 2010 Georgia Tech convened an innovation task force to assess the current state of innovation across its enterprise and to propose new initiatives. The goal was to accelerate promising research results into use and to fundamentally address the state of practice in innovation by applying the precepts of the new research strategy to the field of innovation itself. Numerous new stories about the economic development impact of Georgia Tech’s research and innovation work have been published in the past year.¹⁴ Several examples are presented here.

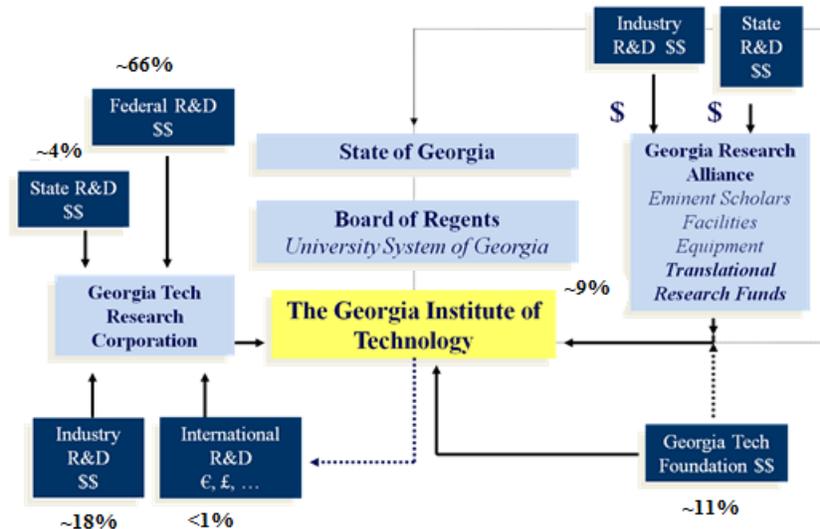


Figure 1: Approximate breakdown of Georgia Tech’s research expenditures by source of funds

Georgia Tech Integrated Programs for Start-ups (GT:IPS)¹⁵ – This new program supports faculty who wish to create a spin-out company. After participating in a training course where the basics of business planning, fundraising, and regulatory and policy issues related to company formation are discussed, faculty receive a “right of use” license for Georgia Tech held IP. An innovative aspect of this program was the development of a template and streamlined licensing document. This document was vetted by four local law firms that have represented start-up companies and sought to license Georgia Tech IP over the years. The Georgia Tech Office of Technology Licensing and staff at the Enterprise Innovation Institute worked with these local law firms to

develop this streamlined licensing process. The reviews have been generally favorable since it was announced in the summer of 2011.

Flashpoint¹⁶ - Georgia Tech seeks to support others outside of the Institute in the accelerated creation of new companies. Flashpoint is a professional development program in startup acceleration; a field that Georgia Tech is helping define as a national leader. With support from an angel fund established by Imlay Investments,¹⁷ that act as the equivalent of an “investment scholarship” for Flashpoint teams, Flashpoint is currently working with 17 teams to create successful start-up companies over a three month period. Each team has a successful entrepreneur as a mentor. The program is motivated by the widely publicized y-combinator program¹⁸ in the Silicon Valley, but significantly is the first such university-based program. This program was referenced in a hearing to the SR68 State Commission in hearings held at the State Capitol on August 16, 2011.

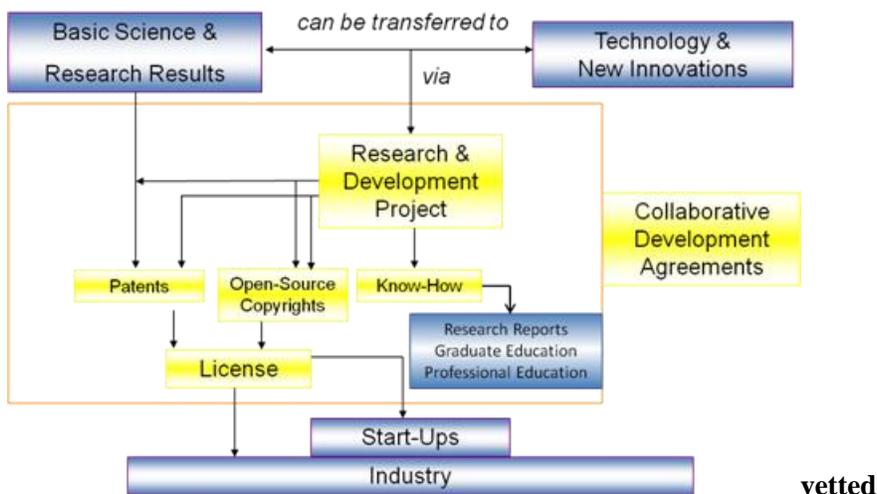


Figure 2: Georgia Tech’s technology transition model

Commercialization Impact Teams – Georgia Tech is in the process of creating professionally staffed teams of industry licensing and contracting, commercialization, communications and marketing, and business development staff around each of its 12 strategic theme areas. For example, in the area of biotechnology and biomedicine, and in partnership with the Coulter Foundation, GRA, Emory University, and Children’s Healthcare of Atlanta, Georgia Tech is hiring an executive commercialization director for life sciences. This first of its kind position will be co-located with research-intensive faculty and has authority to make quick reaction decisions about support for potentially valuable IP in areas related to the life sciences. As a result there will be earlier consideration of commercialization opportunities and coordinated support across a vast array of university and community competencies ranging from university research, to support for clinical trials, to pilot plants for FDA qualified manufacture of biomedical devices. For example, the new Global Center for Medical Innovation at Georgia Tech¹⁹, an entity made possible through investment by GRA and the US Department of Commerce will help ensure accelerated maturation and transition of research results to the market.

Internal research and innovation initiatives – Interdisciplinary research centers in manufacturing, biomedicine, and other strategic areas provide shared infrastructure and support to researchers from across Georgia Tech. Two new centers created in response to the new Georgia Tech vision and strategic plan are highlighted here.

- The *Institute for People and Technology (IPAT)*²⁰ supports the development and application of new digital media technology, along with the development and use of advanced engineering and computational methods to new kinds of enterprises that will transform health care (to patient centered approaches leveraging predictive health concepts), education, entertainment, and other humanitarian systems. IPAT hosts the

annual FutureMedia Fest,²¹ a highly acclaimed, industry-focused conference in which new product concepts are discussed and introduced. The event showcases local startup companies to a large audience of industry thought leaders, and is supported by Turner Broadcasting, Coca-Cola, Cisco, AT&T, HP, IBM, Twitter, and many other companies.

- The *Ivan Allen Institute for Advanced Studies (IAI-AS)* is being formed to provide an Institute-wide focus on global citizenship in light of new kinds of threats to society in the 21st century (e.g., water, energy, food safety). One particular emphasis will be how leadership predicated on social courage is crucial to transformation in urban settings. Former United States Senator Sam Nunn participates through his role as a professor in the Ivan Allen College of Liberal Arts. IAI-AS will bring a policy and social science focus to complement the vast technological capabilities Georgia Tech can bring to important societal issues. Addressing and resolving such issues is crucial to providing an environment conducive to innovation as noted in well publicized works of Tech Professor Danny Breznitz.²²

Relationship to educational offerings: There are numerous other examples of how Georgia Tech's research strategy is influencing education. Georgia Tech recently introduced a Center for 21st Century Universities (C21U) to explore and experiment with innovative concepts aimed at the transformation of higher education. This work manifests itself across the Institute through the traditional academic offerings as Tech's focus on continuing education and life-long study. In addition, problem-based learning is embedded into all undergraduate programs to provide an experiential component. For example, the Translational Research Institute in Biomedical Engineering and Science (TRIBES) supports problem-based education in biomedical engineering. Each year, advanced undergraduates participate in a two-semester course with an industry mentor to address a real-world problem. A similar program sponsored by GE Energy has fostered student involvement in real-world programs associated with intelligent power grids. Tech's Fund for Innovation in Research and Education (FIRE) provides seed funds for faculty to pursue disruptive concepts related to internal programs.²³ Such programs are now embraced across the entire curriculum resulting in many patents and student-owned IP each year. The signature event from these efforts is the InVenture Prize.

InVenture Prize: Commonly referred to with pride as "American Idol for Nerds," the InVenture Prize@Georgia Tech is a faculty-led innovation. Undergraduate students work independently or in teams to develop and present inventions judged by experts. Finals are broadcast live by Georgia Public Broadcasting.²⁴ Georgia Tech uses philanthropic gifts to invest in start-up opportunities for the winners of the competition by paying for patent costs, assigning the IP to the students, and providing a cash gift that can be used to create a spin-out company. More than twenty patents and three companies have already been formed. Graduate students are also supported through an annual conference on research and innovation.²⁵

The above are a few of the recent initiatives Georgia Tech has undertaken in response to its new strategic vision and plan. Leveraging its already highly acclaimed reputation for research and economic development, Georgia Tech seeks to drive innovative thinking into all aspects of its programs and to partner with the State of Georgia and organizations within the State to maximize economic development and societal impact. Recommendations that will help in this regard follow.

RECOMMENDATIONS

Alignment and balance of state-wide efforts: Georgia Tech takes the view that it is a necessary, but by itself not sufficient, entity to foster increased economic development impact throughout the state. Alignment across all means of support to industry in the state, along with appropriate balance, will help achieve sufficiency. Tech's mission to educate future leaders in key areas of engineering, technology, and related areas are crucial for enhanced economic development. But the desired impact in Georgia cannot be achieved in isolation. Alignment of Georgia Tech's strategic theme areas with strategic market areas defined by the Georgia Department of Economic Development is underway. For example the area of manufacturing appears to be an increased focus area for GDEcD and one in which Georgia Tech can provide great assistance. The State should

be commended for aligning GDEcD, GRA, and the existing Innovation Centers. Continued alignment between the University System of Georgia and the Technical College System of Georgia should be encouraged and supported. Recent examples include the program initiated by Suniva (a Georgia Tech renewable energy spin-out) at Gwinnett Technical College (GTC)²⁶ and the ongoing partnership between GTC and Georgia Tech in health care information technology.²⁷ Such efforts should continue between all State supported entities and NGOs such as TAG, chambers of commerce and many other state and local entities. Alignment and planning to achieve common goals along with a view to balance and recognize the importance of each partner is a crucial first step in achieving increased economic benefit. As a result, companies and investors considering Georgia will see a coordinated array of support organizations – public and private -- committed to their success.

Support GDEcD and GRA initiatives related to economic development: The “front door” to the State of Georgia for economic development is GDEcD. Its role in supporting industry and attracting new industry to the state is crucial. Programs such as Quick Start, a national model for workforce training, have had a significant impact on companies such as Kia and NCR locating in the state. Persuading more large companies to locate not only their headquarters and R&D facilities, but also manufacturing facilities in the state is important. From Georgia Tech’s perspective, it will be easier to keep its spin-out companies in the state and to attract more venture capital funding if there is a well supported innovation eco-system focused on key strategic markets.

Support for the B Budget: The University System of Georgia has an “A” and a “B” budget. The “A” budget supports academic programs across the 35 member institutions. The “B” budget supports non-academic economic development programs at these institutions. For Georgia Tech, this is the base funding for the economic development functions in the Enterprise Innovation Institute – the Advanced Technology Development Center (ATDC) and related initiatives that provide support through 25 locations in the state as shown in Figure 3. This budget line also supports the Georgia Tech Research Institute focus on important industries (e.g., the food processing industry). In this regard, the role of pilot plants (physical infrastructure that can meet the needs of small business for access to equipment, technical colleges for training and workforce development, and accelerated maturation and transition of research results) are cited in the innovation literature as a key means to achieve economic development impact in new growth areas. CNN produced a special “Restoring the American Dream: How to Innovate” discussing this at some length earlier this year that I would highly commend to your viewing to illustrate this need far better than I have for you today.²⁸

Reduce costs incurred by duplicate audits: Georgia Tech recognizes the need for and proactively supports compliance requirements associated with every aspect of its operation. However, duplicate annual audits conducted by federal and State officials add cost to research and commercialization projects. As an example, federal auditors frequently review use of research equipment acquired under federal grants and contracts. Approximately 80 percent of the equipment in Georgia Tech research labs is acquired using federal funds. State auditors often repeat the same audits rather than reusing findings from federal audits. Cost savings could be realized both by the State and by research universities if reuse of audit findings and reports was encouraged and duplication eliminated where possible. It is also recommended that State officials advocate along with the State’s research intensive universities to federal representatives that costs associated with audits be recognized as recoverable expenses under the federal policies such as in the A-21 Circular.^{29 30} That support would be enormously beneficial to us in maximizing the impact of research grants on more economically productive activities.

CONCLUSION

Georgia Tech is recognized as one of the top research universities in the world. It ranks as the #3 producer of patents in Georgia and #8 in the country among research universities in economic development impact. Its incubator has launched over 75 companies in the past 10 years. Georgia Tech generates a 27:1 return on investment for the state based on its state appropriations for economic development support. Its overall benefits to the state economy are conservatively estimated to be nearly \$6 billion annually. Georgia Tech’s industry-facing research strategy is focused on 12 strategic theme areas and the economic development potential

therein. Georgia Tech has implemented several new innovative initiatives in the past year, including a streamlined licensing program and a spin-out accelerator, as a down payment on its future plans to generate more economic development impact for the state. Enhancing partnerships with industry and continued collaboration with GDEcD, GRA, and numerous other nonprofit industry support organizations is fundamental. Alignment across the work of these entities along with other members of the University System of Georgia and the Technical College System of Georgia is critical if the State of Georgia is to achieve greater economic development impact. Pilot plants and industry friendly infrastructure that can support small to medium enterprises, workforce development, and the acceleration and maturation of research results is viewed as an opportunity to support growth in markets and to attract more industry to the state.

I thank you for your time and attention to these important matters critical to our state, to Georgia Tech and the entire eco-system of innovation we are creating here in Georgia.

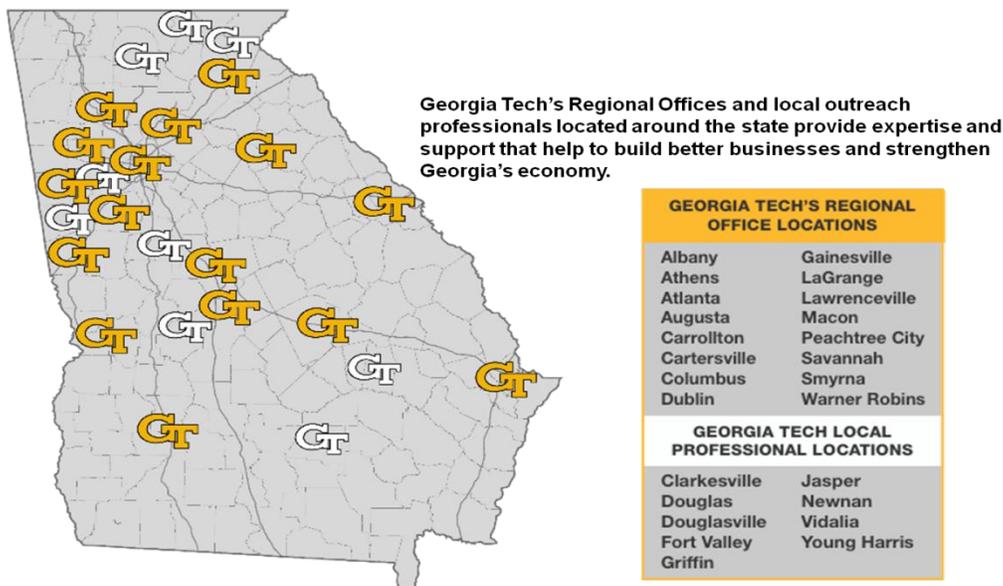


Figure 3: Georgia Tech operating locations throughout the state

Citations listed below (if supported by the General Assembly publication guidelines, please insert the following URLs as hyperlink in the published testimony)

- 1 <http://www.timeshighereducation.co.uk/world-university-rankings/2010-2011/engineering-and-IT.html>
- 2 <http://www.nist.gov/mep/about.cfm>
- 3 <http://www.oshainfo.gatech.edu/>
- 4 <http://patft.uspto.gov/>
- 5 http://www.autm.net/FY_2009_Licensing_Activity_Survey/5879
- 7 <http://sites.nationalacademies.org/pga/uidp/index.htm>
- 8 <http://www.ajc.com/news/gwinnett/georgia-welcomes-ncr-to-460184.html>
- 9 <http://www.gatech.edu/vision>
- 10 <http://robotics.gatech.edu/content/national-robotics-roadmap>
- 11 <http://gtresearchnews.gatech.edu/electronic-health-records/>
- 12 <http://www.isye.gatech.edu/news-events/news/release.php?nid=69963>
- 13 <http://www.gatech.edu/calendar/event.html?nid=709483>
- 14 <http://www.gatech.edu/newsroom/newscategories.html?fid=47297>
- 15 <http://www.industry.gatech.edu>

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- 16 <http://flashpoint.gatech.edu/things-to-know/>
- 17 <http://www.techjournalssouth.com/2011/08/georgia-tech-flashpoint-accelerator-forms-1m-investment-fund/>
- 18 <http://ycombinator.com/>
- 19 <http://www.bizjournals.com/atlanta/print-edition/2011/05/27/global-center-for-medical-innovation.html?page=all>
- 20 <http://www.ipat.gatech.edu>
- 21 <http://futuremediafest.gatech.edu/>
- 22 <http://www.amazon.com/Dan-Breznitz/e/B001JRRH6S>
- 23 <http://www.gatech.edu/newsroom/release.html?nid=65316>
- 24 <http://www.gpb.org/inventure>
- 25 <http://www.sga.gatech.edu/graduate/GTRIC>
- 26 <http://www.gwinnettech.edu/content.cfm?PageCode=news&PressReleaseID=333>
- 27 <http://www.gwinnettech.edu/content.cfm?PageCode=news&PressReleaseID=512>
- 28 <http://www.youtube.com/watch?v=UsxMxXXp-dA>
- 29 http://www.whitehouse.gov/sites/default/files/omb/.../a021/a21_2004.pdf
- 30 http://www.whitehouse.gov/sites/default/files/omb/.../a021/a21_2004.pdf