



Northeastern University

CenSSIS Annual Reports

Bernard M. Gordon Center for Subsurface Sensing
and Imaging Systems (CenSSIS)

January 01, 2008

Year Eight Annual Report : 2008

Bernard M. Gordon Center for Subsurface Sensing and Imaging Systems (Gordon-CenSSIS)

Recommended Citation

Bernard M. Gordon Center for Subsurface Sensing and Imaging Systems (Gordon-CenSSIS), "Year Eight Annual Report : 2008" (2008). *CenSSIS Annual Reports*. Paper 5. <http://hdl.handle.net/2047/d10015929>

This work is available open access, hosted by Northeastern University.



Section 7D Industrial/Practitioner Collaboration and Technology Transfer

1. Introduction

The Gordon-CenSSIS Industrial Partners, Government Partners and Strategic Affiliates represent important assets of our ERC. They provide financial support and opportunities for students at their facilities, as well as access to R&D leaders, real system-level applications, state-of-the-art hardware and software, willing partners for technology transfer, and team members for proposals for additional funding and sustainability.

The Center's university partners provide talented professors, post-docs, graduate students, undergraduate students, and innovative research. This is augmented by software toolboxes, testbeds for real-time application investigations, inter-partner networking, and opportunities for joint proposals to both government and industry.

Together, the industrial, government and academic collaboration provides each community with assets to make them more productive. It is a "win-win-win" situation, both in the near-term and for the extended future beyond the NSF ten-year ERC funding period.

One important vehicle for this collaboration is the Industrial Advisory Board (IAB), which consists of representatives of the Industrial and Government Partners. The IAB is chaired jointly by Emel Bulat, Director of Emerging Technology at Textron Systems, and John Pearson, Manager of Government Programs at Siemens Corporate Research. The IAB meets several times a year, and one of the Board's important responsibilities is to conduct an annual Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis of the Gordon-CenSSIS long-range strategic plan and its research and education programs. This analysis is presented to the Center's Executive Committee and Board of Directors (BOD), as well as to the NSF Site Visit team in a closed meeting.

To further facilitate industrial participation, the Center has three levels of membership: **Strategic Partner, Corporate Partner, and Small Business Partner.**

Each Industrial and Government Partner signs an Industrial Partnership Agreement with Gordon-CenSSIS. This defines the terms, support, and the mutual responsibilities between the Center and the external partner. This agreement is contained in Appendix II. For sponsored research projects, a separate agreement is created between the partner and the participating Center parties.

Strategic Partners sit on both the IAB and the Gordon-CenSSIS Board of Directors (BOD), along with deans from each of the four university partners. The IAB Chairs are also a member of this body. The BOD is chaired by Dean David Luzzi of NU. (See Section 7E for a more complete description of the BOD).

2. Primary Goals

Our goals remain consistent with our initial NSF proposal. They are:

- Initiate technology transfer programs that will impact system-level applications;
- Seek out opportunities for joint proposals between academic and industrial/ government partners;
- Increase the annual industrial/government partner support level to \$5 million (including joint proposal efforts);
- Continue to increase the number of industrial and government members each year;
- Increase the diversity of industry core market sectors to include biomedical products and environmental applications, such as civil infrastructure and ground water pollution assessment;

Good progress has been made on these initiatives but challenges remain as will be detailed in the following sections.

3. Industry Support and Partner Benefits

Interaction with the Center can involve four components (Figure 7D-1):

- Core research funding
- In-kind (equipment, software, people)
- Sponsored research project funding
- Joint Proposals

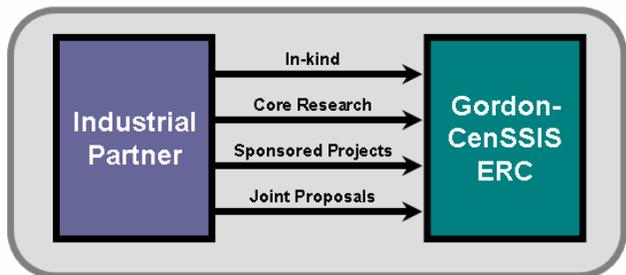


Figure 7D-1. Support Components.

An industrial or government partner has to make a membership commitment to Gordon-CenSSIS. There are three different levels of engagement.

- Strategic Partner: \$100K
- Corporate Partner: \$50K
- Small Business Partner: \$10K

The Small Business level is reserved for companies whose yearly sales are less than \$25M.

All membership levels include access to Gordon-CenSSIS core intellectual property and participation in joint proposals. In addition, the Strategic Partner level includes membership on the Gordon-CenSSIS Board of Directors.

The list of industrial and government members is shown in Figure 7D-2. We can make several observations from this figure. First, the number of members has increased steadily to a projected 17 in Year Eight. Second, we added both small companies and large firms. Third, we added new members who are focused on biomedical technologies. Although several members have gone to inactive status for a variety of reasons, very good partners have replaced them. Finally, the diversity of the market sectors and the long-range missions of our current partners will spark a number of collaborative proposals with Cen-

ter researchers. This can be better understood by examining the profiles of our partners as discussed in the following section.

Gordon-CenSSIS graduates have moved into promising careers in Sensing and Imaging Systems.

Many Gordon-CenSSIS graduates have begun successful careers with Center Industrial Partners upon graduation. For example, NU and BU students Patrick Edson, Jennifer Black, Tom Gaudette, Mariela Lopez and Wang Chen were employed at The MathWorks. Ning Liu (RPI) works at CardioMag. Omar Al-Kofahi (RPI) works at American Science & Engineering. Basak Ulker-Karbeyaz (NU) works at Analogic, as does Zhengrong Ying (BU) and Julia Pavlovich (BU). Gustavo Herrera (NU) and Jerry Colon (UPRM) work at Raytheon. Shawn Miller (NU) works at Mercury Computer. Gopi Maguluri (BU) works at Wellman Laboratories at MGH and Alex Tyrrell (RPI) works at the Edwin L. Steele Laboratory at MGH. Lei Sui (BU) is working at General Electric’s Sensing Division, Hongjun Xia (RPI) is working at General Electric’s Healthcare Division, and Alexander Ross (RPI) is working at GE as well (he was formerly at CardioMag).

This past year, Gary Peterson (NU) was hired by MSKCC, Matt Dickman (NU) was hired by NeuroLogica, Diego Rivera (NU) was hired by MSKCC, and Anthony Serino (NU) began work at Raytheon.

4. Profiles of Industry Partners, Government Partners, and Affiliates

Idaho National Laboratory (INL) has been a Center Strategic Affiliate since Year One. Besides its lead position in government environmental remediation, it is also a lead laboratory for Homeland Security protection and testing. This will be important for the new ALERT initiative.

Raytheon Company is the fourth-largest US aerospace company and has been a Strategic Partner since inception. Besides I-UROP support, the company has funded three sponsored research projects in mine detection. They

joined with BTI for a multi-million dollar Homeland Security contract to build nuclear material detection portals. This is a direct result of the partnership between BTI and Gordon-CenSSIS on the development of the basic technology for the portals. They have also teamed with the Center for BomDetec, the suicide bomber detection project.

Lockheed Martin Corporation is the largest US aerospace contractor and is a Gordon-CenSSIS founding member. The company supported a sponsored research project at its Syracuse facility involving sea-borne acoustic sensing with NU Professor Tony Devaney. The hyperspectral activities ongoing at UPRM and WHOI and the change understanding and registration work at RPI are also possible areas for technology transfer.

Textron Systems has been a steady Gordon-CenSSIS supporter even before the NSF award. The co-chair of the Industrial Advisory Board, Emel Bulat, is Textron Systems' Director of Technology and Business Strategy. Professor Eric Miller has been working with the company on sponsored research projects involving IR image segmentation and wavelet techniques, which could lead to joint government funding.

The **Air Force Office of Scientific Research (AFOSR)** joined the Center in Year 2. This agency is interested in the broad spectrum of Gordon-CenSSIS fundamental science relevant to advanced Air Force systems. An example is the research of BU Professors Bahaa Saleh, Malvin Teich and Alex Sergienko on Entangled Two Photon Microscopy.

Figure 7D-2. Industrial and Government Memberships

	Partner Name	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
1	Idaho National Laboratory	√	√	√	√	√	√	---	---
2	Raytheon Company	√	√	√	√	√	√	√	√
3	Mercury Computer Systems, Inc.	√	√	√	√	√	√	√	IA
4	The MathWorks, Inc.	√	√	√	√	IA	IA	IA	IA
5	Lockheed Martin Corporation	√	√	√	√	√	√	√	√
6	Textron Systems Corporation	√	√	√	√	√	√	√	√
7	Air Force Office of Scientific Research		√	√	√	√	√	√	√
8	Advanced Research Technologies Inc.			√	√	IA	IA	IA	IA
9	MicroBrightField, Inc.			√	√	IA	IA	IA	IA
10	TransTech Systems Inc.			√	√	√	√	√	√
11	CardioMag Imaging Inc.			√	√	√	IA	IA	IA
12	Zomega Inc.			√	√	√	IA	IA	IA
13	General Electric			√	√	√	√	√	√
14	Bubble Technology Industries				√	√	√	√	IA
15	National Center for Physical Acoustics				√	√	IA	IA	IA
16	National Geospatial-Intelligence Agency				√	√	√	√	√
17	Analogic Corporation					√	√	√	√
18	American Science and Engineering					√	√	√	√
19	Digitome Corporation					√	√	IA	IA
20	Siemens Corporate Research					√	√	√	√
21	Hologic, Inc.						√	---	---
22	Geophysical Survey Systems, Inc.						√	√	√
23	Massachusetts General Hospital						√	√	√
24	Personal Protection Technologies							√	IA
25	NeuroLogica Corporation							√	√
26	DualAlign LLC							√	√
27	Boston Groundwater Trust							√	---
28	Air Force Research Laboratories								√
29	Army Night Vision Laboratory								√
30	EyeIC								√
31	Schlumberger-Doll								---
32	NVIDIA								---
33	ITT Industries								---
TOTALS		6	7	14	17	18	17	21	17
√ = Partnership in place		IA = Inactive			--- = Agreement in negotiation				

TransTech Systems is a civil engineering small business with interests in detecting faults in roads, airfields, and bridges. After joining Gordon-CenSSIS, the company teamed with the Center to win an SBIR project in the geo-technical area.

General Electric has recently rejoined Gordon-CenSSIS as a result of our work on multimodal breast imaging and radiotherapy planning.

National Geospatial – Intelligence Agency (NGA), formerly the National Imaging and Mapping Agency, is a federal agency responsible for strategic imaging. They have a strong interest in change understanding and registration.

Analogic Corporation is a major supplier of both medical and Homeland Security systems. The company collaborated with NCPA and Gordon-CenSSIS on the NIH R21 and BRP proposals. They also collaborated on the successful ALERT Homeland Security proposal.

American Science and Engineering (AS&E) has pioneered innovative x-ray techniques and is now teamed with Gordon-CenSSIS on the successful Homeland Security BomDetec contract for suicide bomber detection as well as ALERT.

Siemens is a very large global company with a wide diversity of products and innovative research and development. They are also part of the successful Homeland Security BomDetec contract for suicide bomber detection and ALERT.

Hologic (in negotiation) is a large medical device company working on innovative breast imaging systems.

Geophysical Survey Systems (GSSI) is a small business concerned with civil infrastructure assessment. They have donated a state-of-the-art ground penetrating radar system to the Center.

NeuroLogica is a small company focusing on portable CT scanning for early stroke determination.

DualAlign is a small company focusing on image registration. Please see **7D-7** for more details.

Boston Groundwater Trust (BGWT) (in negotiation) is a non-profit organization interested in location and evaluation of the pilings supporting residences in the Back Bay neighborhood of Boston, a neighborhood built on backfill in the 19th century.

The **Air Force Research Laboratories (AFRL)** lead the discovery, development and integration of affordable warfighting technologies for America's aerospace forces.

The **Army Night Vision Laboratory** is responsible for developing electro-optical technology for the Department of Defense.

EyeIC is working with Gordon-CenSSIS spin-off DualAlign for the computer-aided monitoring of glaucoma.

Schlumberger-Doll (in negotiation) is a worldwide corporation known for oil exploration employing state-of-the-art sensors and powerful algorithms.

NVIDIA (in negotiation) is the worldwide leader in programmable graphics processor technologies. It has initiated a partnership with the Center and its Strategic Affiliate MGH to further accelerate tomosynthesis reconstruction processing in the hospital's Breast Imaging Laboratory at the AVON center.

ITT Industries (in negotiation) is a worldwide corporation with a wide range of communications expertise for both commercial and government applications.

5. Intellectual Property

In Year Five, a new Intellectual Property Agreement was approved (see Appendix II). It provides for equal sharing of royalties across all four academic partners. In addition it provides the 'non-center' equivalent share to all inventors and includes a return to Gordon-CenSSIS as well.

6. Joint Proposals

As indicated above and in Section **7A-4C**, the Center is actively pursuing joint proposals with

industrial partners to various government agencies. This activity has been leveraged by a proposal submitted to the Massachusetts government-funded John Adams Innovation Institute (JAII) for a “Capture Center for Massachusetts Industrial Innovation”, submitted in May 2005. This was funded and supported efforts to pursue joint proposals with Center partners (academic and industrial) focused on the Massachusetts economy through April 2007.

The Center has been successful in its joint proposal activity. The following are some examples.

ASHERD/ASP: Gordon-CenSSIS led a team with Bubble Technology Industries (BTI) to win a competitive proposal for a radiation portal for the Department of Homeland Security. This project combined the radiation science and engineering expertise of BTI with sensor fusion under development at NU. This was a 14-month, contract. The portal provides a new level of protection for the United States against threats such as dirty bombs concealed in metal containers (i.e. trucks or shipping containers). This effort now has moved into a new phase for the production of an Advanced Spectroscopic Portal system. Raytheon is the lead on this large contract.

BomDetec: Center industrial partners AS&E, Raytheon, PPT, and Siemens partnered with NU and RPI to produce a proposal for the detection of suicide bombers for the Department of Homeland Security (BAA05-03). The team was awarded a ~\$3.8M, 2-year program for a three-phase development. The BomDetec system will use Siemens’ intelligent video, Raytheon’s radar, AS&E’s backscatter x-ray, RPI’s Terahertz spectrometer, and NU’s radar and processing talents.

ALERT: In addition to the above efforts the Gordon-CenSSIS industrial partners were a key element of the successful ALERT Center of Excellence award from DHS, described in Section 7A-4B.

Additional proposals are in preparation for microscopy, pollution remediation, defense applications and medical imaging.

7. Technology Transfer

This is an important issue for the Gordon-CenSSIS industrial interface. The focus includes Intellectual Property but also includes development of open-source software toolboxes, as well as transfer to industry of research breakthroughs, testbed results and system-level application efforts.

Last year, the Center saw its first spin-off company, DualAlign LLC. Founded by RPI Professor Charles Stewart, DualAlign will use the generalized image registration algorithm developed under Gordon-CenSSIS support for commercial applications.

The joint proposal approach pioneered with BTI and continued with others such as Analogic, AS&E, RPI, Raytheon, and Siemens is an exciting opportunity for technology transfer, for system-level problem-solving, for additional funding to supplement NSF basic research. Moreover, successful proposals provide return on investment for our industrial partners and for accrual of sustaining funds that will contribute to the long-

Figure 7D-3. POC Designees	
Partner Name	Contact
Air Force Office of Scientific Research	H. Wittmann
Air Force Research Laboratories	H. Wittmann
American Science and Engineering	C. Rappaport
Analogic Corporation	P. Cheney
Army Night Vision Laboratory	H. Wittmann
Boston Groundwater Trust	C. Rappaport
DualAlign LLC	P. Cheney
EyeIC	P. Cheney
General Electric	M. Silevitch
Geophysical Survey Systems, Inc.	S. Wadia-Fascetti
Idaho National Laboratory	M. Silevitch
Lockheed Martin Corporation	M. Silevitch
Massachusetts General Hospital	D. Castañón
National Geospatial-Intelligence Agency	M. Vélez-Reyes
NeuroLogica Corporation	M. Silevitch
Raytheon Company	P. Cheney
Siemens Corporate Research	J. Beaty
Textron Systems Corporation	M. Silevitch
TransTech Systems Inc.	A. Alshawabkeh

term success of our ERC. Each partner is assigned a technical point of contact (POC) to facilitate the development of the joint proposals, as shown in Figure 7D-3. More details on technology transfer are given in Section **7E-3**.