



Discovery

STARTS HERE

A Message from the President

From my perspective, 2011 was a very productive year for research from each of what is now four research entities: GRC, FCRP, NRI and — the newest — Energy Research Initiative (ERI). In addition to the high quality, relevant research made available to our members, student participation in SRC programs is at an all-time high. Of the many achievements in 2011, several are mentioned here that should be of interest.

An example in GRC is the launch of an SRC partnership with a new SRC participant, Abu Dhabi's Advanced Technology Investment Corporation (ATIC), to create new university research efforts to accelerate semiconductor infrastructure development in Abu Dhabi. It is important to note that these research efforts will be relevant to all SRC member needs and can involve participation of international universities including those in the U.S.

Another significant activity has been the creation of a benchmarking effort in NRI. This was done to evaluate the potential of the emerging devices that could possibly extend performance beyond CMOS for classical information processing applications. In FCRP, the formation of cross-disciplinary centers to holistically address key technology areas has been valuable. In GRC, partnering with SEMATECH in 3D research results in a new member base to work with on significant 3D research challenges.

SRC has created an extremely agile, high quality research laboratory; but it is virtual and, at any given time, consists of the best university researchers in areas that are being funded by SRC. These areas are defined by the research needs of its members. We want to focus on describing the impact of this approach in our 30th year of operation.

We are committed to continue our efforts to better enable our members in developing an unsurpassed technical infrastructure that use research results from our programs, as well as students who participated in producing the research results.

Sincerely,



Larry Sumney, *President & CEO*

SRC MEMBERSHIP

ABB, Inc. • **ERI**
Advanced Micro Devices, Inc. • **GRC**
Advanced Technology Investment Company (ATIC) • **GRC**
Applied Materials, Inc. • **GRC, FCRP, ERI**
First Solar, Inc. • **ERI**
Freescale Semiconductor, Inc. • **GRC**
GLOBALFOUNDRIES • **GRC, FCRP, NRI**
IBM Corporation • **GRC, FCRP, NRI, ERI**
Intel Corporation • **GRC, FCRP, NRI**
Mentor Graphics Corporation • **GRC**
Micron Technology, Inc. • **FCRP, NRI**
NEC Corporation • **ERI**
Nexans • **ERI**
Novellus Systems, Inc. • **GRC, FCRP**
ON Semiconductor • **ERI**
Raytheon Company • **FCRP**
Research Triangle Institute • **GRC**
Robert Bosch, LLC • **ERI**
Texas Instruments, Inc. • **GRC, FCRP, NRI**
The MITRE Corporation • **GRC**
Tokyo Electron Limited (TEL) • **GRC, ERI**
United Technologies • **FCRP**
Xilinx, Inc. • **FCRP**

GOVERNMENT PARTICIPATION

DARPA • **FCRP**
NIST • **GRC, NRI**
NSF • **GRC, NRI**
Oregon Nanoscience & Microtechnologies Institute • **NRI**
Project Future — South Bend, Indiana • **NRI**
SPAWAR Systems Center • **FCRP**
State of Arizona • **GRC**
State of California • **NRI**
State of Georgia • **GRC**
State of Indiana • **NRI**
State of New York • **GRC, NRI**
State of Texas • **GRC, NRI**
Commonwealth of Virginia • **NRI**
Engineering & Physical Sciences Research Council • **GRC**

STRATEGIC PARTNERS

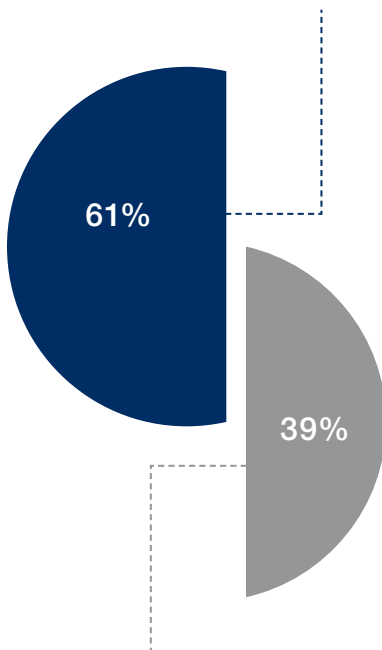
SEMATECH • **GRC**
SEMI • **GRC, FCRP**
SIA • **GRC, FCRP, NRI**

Education Alliance Student Programs

SRC GRADUATES REMAIN LOYAL

- 6% Continuing Education
- 7% Universities
- 47% Members
- 1% Government

61% SRC Community



39% Other

- 9% Unreported
- 25% Industry-related Hires
- 5% Other Industry

PRODUCING LEADERS | MAKING A DIFFERENCE

Since its inception in 1982, SRC Student Programs have offered various opportunities for young men and women to pursue their personal educational and professional goals, while making a profound difference in technology industries — and in our world's future.

SRC has recognized academic research — and the students undertaking that research — as integral to the success of its innovative structure. In addition to the students' value toward the end goal of pre-competitive research results, SRC also embraces a vision for the students themselves.

The mission of SRC's Student Programs clearly conveys this sentiment: To attract and educate students of science and engineering through use-inspired research and industry connections, and promote their transition into careers that make a difference.

And the results are impressive. Over the past three decades, more than 9000 students have significantly contributed to the SRC research portfolio and the dissemination of its results through their participation in national conferences, invention disclosures, technical awards and publications. Currently, SRC supports about 1500 advanced degree students each year through industry-guided research contracts.

Fellowships and Scholarships: SRC Student Programs offer competitive Doctoral Fellowships related to semiconductors, as well as Master's Degree Scholarships targeting under-represented populations.

Undergraduate Research Opportunities: With goals of growing the STEM pipeline, retaining a diverse students population, and encouraging them to pursue an advanced degree, this program supports hands-on research and mentoring of over 300 undergraduates at over 14 universities.

TECHCON Annual Conference: TECHCON, SRC's annual technical conference, showcases the quality of the SRC research portfolio, the excellence of SRC students and faculty, and the magnitude of the collaborative research investment made by the semiconductor industry through SRC. On average, TECHCON attracts 450 technical experts from the SRC academic, industry and government communities.

Alumni: Our alumni have become industry leaders and renowned faculty researchers. SRC works to keep alumni connected to each other and to SRC. Alumni that stay connected have a unique opportunity to network, give back and make a difference in tomorrow's industry leaders.

Global Research Collaboration

“Our motivation is to fund the most relevant and critical research for international companies, so we go where the best university talent is—around the globe.”

~ Steve Hillenius, GRC Executive Director

INDUSTRY ENGAGEMENT, VALUABLE RESULTS

Global Research Collaboration (GRC) programs address the critical challenges on the International Technology Roadmap for Semiconductors (ITRS), delivering the solutions that drive the industry’s growth. GRC funds global pre-competitive research at the university level to produce the next-generation technology for industry and develop the future leaders in science, engineering and technology. Synergy among researchers and the industry members is the cornerstone of GRC. And, ultimately, this exceptional collaboration not only impacts the global economy, but also creates immense value for each student and member.

Within all GRC programs the operational model involves intense industry engagement in formulating, shaping and executing the research agenda, thereby ensuring that the programs meet individual member company needs with high-leverage, compelling return-on-investment research.

OUR MEMBERS ARE REVOLUTIONIZING THE WORLD

GRC manages high-priority research for member organizations, involving them in the research planning phase and ensuring communication with university researchers throughout the process. When members serve as industry liaisons and student mentors, or participate in strategic planning and research reviews, technology transfer is even more efficient and return on investment is increased.

The benefits of GRC membership are many; the following represent some key highlights:

- Effective research management, developing specific goals to guide, focus and rank research efforts, and providing a basis for measuring progress and obtaining the needed results;
- Providing leveraged results through cooperation between researchers at multiple universities and institutions;
- Direct involvement with, and access to, relevantly educated university graduate students;
- Timely and efficient transfer of relevant, world-class research results and technology; and
- Web access providing an easy method of investigating the GRC-funded research tasks, accessing the many research publications, searching for current student resumes, and reviewing GRC-related patents.

Focus Center Research Program

**“Our research,
conducted by
leading academic
minds and supported
by unprecedented
levels of collaboration
across the universities,
continues to create
new pathways for
our industry and
government sponsors’
internal R&D programs
and emerging
applications.”**

~ Betsy Weitzman, FCRP Executive Director

FREEDOM TO CREATE NEW IDEAS

The Focus Center Research Program (FCRP) was launched in 1998 as a set of virtual research centers to support focused research efforts for CMOS technologies approaching the limits of device scaling. To help stimulate creative thinking, FCRP was structured to be managed by faculty while guided by sponsors. SRC entered into partnership with the Department of Defense (through DARPA) to support this program, along with industry sponsors. FCRP consists of six research centers, involving 36 top U.S. universities across 16 states, 248 faculty and 452 graduate students. The FCRP program has been one of DARPA’s longest running research programs.

TRANSFORMING GREAT IDEAS INTO RESULTS

Guided by a Science Advisory Board made up of technical experts from sponsoring organizations, and through the outstanding leadership of the academic Center Directors, collaboration and progress on research topics has been significant and highly innovative, spanning the broad range of FCRP center disciplines, including nanomaterials, devices, connectivity, circuits, systems and software, and multi-scaled systems. Several crosscut topics have special focus, including Carbon-based Electronics, Memory, 3D and Wireless.

Researchers in FENA, the nanomaterials center, have developed advanced battery technology based on CNT electrodes that significantly enhances storage-per-unit area needed to power wireless sensor networks. Researchers in MSD, the device center, have verified that Resonant Body Transistors show promise as compact high Q resonators for use in on-chip filters. Research within IFC, the connectivity center, will have a big impact on the design and realization of a wide range of wireless sensor network products, leading to reduced size, weight and cost. The circuits center, C2S2, has created circuits for extremely power-efficient links, highly important to wireless applications, targeting only 10 picojoules per bit. The GSRC systems and software center has developed efficient tools and methodology to design, verify and program wireless applications. Researchers within MuSyC, the multi-platform systems center, have created innovative technologies to help enable ultra-low energy sensor technology to be ubiquitously distributed for smart environments. These six centers continue to make great progress in these and other research areas.

Nanoelectronics Research Initiative

“NRI is looking for the next technology to propel information processing beyond its current limits.”

~ Jeffrey J. Welser, NRI Director

GOAL-ORIENTED, BASIC-SCIENCE RESEARCH

The Nanoelectronics Research Initiative (NRI) is a consortium of companies in the Semiconductor Industry Association seeking to find a device that can scale computer technology beyond the ultimate limits of current CMOS transistors. This university-based research, cooperatively funded by industry and federal and state governments, is looking for innovations to impact nanoelectronics beyond 2020 — further out than anyone else. With a goal of discovering the next switch, a new mechanism for computing that goes beyond simply improving today’s transistor, NRI engages the most talented students at U.S. universities to become the innovators and leaders of tomorrow’s technology industry.

Groundbreaking NRI research is conducted at over 40 universities in 19 states. Organized into multi-university centers, jointly funded with the National Institute of Standards and Technology (NIST) and several states (CA, IN, NY, TX and VA), and in joint projects with the National Science Foundation (NSF), NRI research receives an impressive amount of additional funding to leverage the industry investment. And given the exploratory nature and potential long-term benefits of the research, it’s particularly significant that industry, government and academia are working together to rapidly identify and develop emerging research paths that show potential to extend the historical IT cost and performance trends.

MAKING THE PHENOMENAL PRACTICAL

One of the primary challenges for NRI is to foster strong connections between the physicists and chemists making basic science breakthroughs (often in emerging fields where new discoveries come at a rapid pace), and the engineering researchers who must figure out how these phenomena could revolutionize our computing technology. The scientist discovers how to control an electron “spin” with very low power, and the engineer figures out how to build a device and circuit to use that spin for manipulating data. The result of this connection: radically shortening the time from lab to fab for completely new technologies.

And to ensure this connection is as direct as possible, NRI companies have full-time assignees working with the universities, in addition to having open access to all of the powerful SRC technology management and value transfer mechanisms for research results and student interaction. These assignees not only provide daily feedback to the university researchers from the practical industry perspective, they also have immediate access to intermediate results — and student talent — that can often impact technology today...long before NRI reaches its final goal of finding the next nanoelectronic switch.

Energy Research Initiative

“ERI focuses the world’s best researchers on a key challenge of the 21st century—clean, affordable and reliable energy.”

~ Bob Havemann, Director of ERI

SEEKING TOMORROW’S SMART ENERGY SOLUTIONS

As industries and governments around the globe seek out clean, reliable, low-cost and efficient electrical energy systems, SRC is also applying its proven model of pre-competitive collaborative research toward these vital efforts. SRC’s Energy Research Initiative (ERI) program forges a university-industry partnership designed to address the world’s need for alternative approaches to electrical energy generation, storage, distribution and infrastructure. ERI’s core mission is to enable reliable low-cost renewable energy systems and efficient energy use and distribution through an enabled and optimized smart grid.

KEY ERI OBJECTIVES

- Develop modeling/simulation tools and technologies to address the performance, cost, reliability and manufacturing challenges of photovoltaic technologies that enable grid parity.
- Develop the modeling, simulation and control tools needed to manage, optimize and secure the power grid and enable personal energy systems, thereby creating a new paradigm for the global electricity infrastructure.
- Develop new and more efficient electrical energy storage systems to support the integration of renewable energy resources and personal energy systems into an aware and enabled smart grid.

ERI research projects selected by the seven founding members were launched in October 2010 at two new Centers of Energy Research Excellence, including the Network for Photovoltaic Technology (NPT) Center at Purdue University and the Smart Grid Research Center (SGRC) based at Carnegie Mellon University. Today, with a total of 10 members and a third center being launched in Power Electronics and Energy Storage, ERI is spearheading the fundamental pre-competitive energy research that will have broad benefits as the world strives to meet its future energy needs.

ERI METRICS (End of Year 1)

2 Energy Research Centers
11 Research Tasks
23 Students Researchers
8 Faculty Researchers

18 Industry Liaisons
31 Technical Reports/Research Publications
2 Patent Applications

Semiconductor Research Corporation

AN INNOVATIVE EXPERIMENT. A PROFOUND SUCCESS.

In 1982 the United States was beginning to perilously fall behind in the global technology race. With this incentive, a handful of pioneers from the Semiconductor Industry Association (SIA) had a revolutionary thought: **What if U.S. semiconductor industry giants formed a consortium and partnered with universities to fund pre-competitive research programs? And what if those research results were then shared by all sponsoring companies in a collective effort to boost overall industry market share?**

It was a radical move. But today, three decades later, Semiconductor Research Corporation (SRC) is the world's leading technology research consortium. With member companies and university research programs now spanning the globe, SRC plays an indispensable part in the research and development (R&D) strategies of the industry's most influential entities.

But is SRC's achievement measurable, its impact palpable? In other words, is there proof of SRC's success?

TRACKING IMPACT

Each SRC member company has a different structure in which they conduct R&D and, therefore, they also differ in how they use SRC to achieve their technology goals. And although the process for determining SRC's impact is complex, there are five definitive key indicators that reveal the indisputable differences made by this essential organization.

Start-Ups

A number of start-up companies have emerged directly from SRC's research. Tracking the success of these companies demonstrates the value of SRC technologies to the industry. To date, 17 start-up companies have been identified to be a direct result of SRC research and/or students.

Students

SRC provides relevantly educated students to the semiconductor industry. Through their involvement with SRC-funded research and member companies, these students are properly trained and participate in cutting-edge research. Over 9000 students have worked on SRC research projects since inception.

Influential Publications

Identifying highly cited scientific publications is a clear statistical way to show SRC's influence. Only about 2% of IEEE publications have >100 citations. But it is this rare threshold that SRC has used to identify over 150 of its publications thus far.

Evidence of Member Usage

From SRC's influential publications, papers that contain a high percentage of industrial citations have been identified — with at least 15% coming directly from industry. Currently 61% of SRC's influential publications meet these criteria.

Contract Initiation

Identifying SRC's initial involvement in technological developments demonstrates its role in anticipating industry needs and funding these needs accordingly. To date, SRC has provided \$1.298 billion towards research funding.

2011 Office of the Chief Executive



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President & Chief Executive Officer



Betsy Weitzman
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Executive Director, FCRP



Steven Hillenius
Executive Vice President, SRC
Executive Director, GRC
Chief Operating Officer, New &
Emerging Research Initiatives

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