

Testimony of
Louis Graziano, Ph.D.
Director, University R&D Strategy
Sustainable Technologies and Innovation Sourcing
The Dow Chemical Company
Before the
Subcommittee on Research and Science Education
Of the Committee on Science, Space and Technology
“The Relationship between Business and Research Universities: Collaborations
Fueling American Innovation and Job Creation”

August 1, 2012

Dow is pleased to offer the following testimony to the Subcommittee on the important topic of Industry-university collaboration.

About Dow and Innovation

Dow was founded in Michigan in 1897 and is one of the world's leading manufacturers of chemicals, plastics and advanced materials. We supply more than 3,300 products to customers in approximately 160 countries, connecting chemistry and innovation with the principles of sustainability to help provide everything from fresh water, food, and pharmaceuticals to insulation, paints, packaging, and personal care products. About 21,000 of Dow's 46,000 employees are in the US, and Dow helps provide health benefits to more than 34,000 retirees in the U.S.

Dow is committed to sustainability. We have improved our environmental performance (including on greenhouse gas emissions), and we are committed to do even better in the future. Our ambitious 2015 sustainability goals (<http://www.dow.com/sustainability/>) underscore this commitment.

Dow has a 110-year history of product and technical innovation that rivals business leaders in any industry – now with strategic focus on four “Mega” markets: Energy, Health & Nutrition, Transportation & Infrastructure and Consumerism. By harnessing the power of innovation, Dow has continued to reduce its global footprint, provide solutions for the world's most pressing challenges and fuel business success.

Dow believes that manufacturing is the lifeblood of U.S. economic growth. While in the early stages of a renaissance in the U.S., there is still the need for a sustained effort to reverse the decline manufacturing has experienced over the recent decades. A reinvigorated US manufacturing sector has the potential to positively address each of these challenges. The Advanced Manufacturing agenda we advocate includes a broad suite of policy recommendations. In addition to energy, trade, and tax policy changes, we strongly advocate for a keen focus on education and innovation.

Dow partners with universities, government institutions and members of the scientific community around the world to inspire and accelerate new ideas and technologies that address world challenges. The company invests over \$1.6 billion annually on R&D, a figure greater than the budgets of all the chemistry programs in all American universities combined. The Company employs over 5,500 people in the R&D organization – recruiting the best and brightest candidates from strategic universities to create an R&D culture where highly intelligent and educated people in a variety of disciplines can pursue profound discoveries and lucrative careers.

A measure of the success of our innovation culture is that approximately one-third of Dow's annual revenue comes from products introduced in the past five years.

The U.S. faces a critical workforce shortage in STEM-related fields. To make matters worse, the World Economic Forum ranks the U.S. 51st in the quality of its math and science education. We advocate for improvements to the quality of STEM education at all levels – preschool through post-secondary. Our vision is to advance interest in, access to, and quality of STEM education to develop an innovative and competitive workforce and create a knowledgeable society that values science and technology.

Dow has four main principles in education:

- **Learning** – Engaging, hands-on learning as a model to build, support and grow the STEM pipeline
- **Teaching** – Improving teachers’ skills through mentoring and formal training
- **Working** – Using key partnerships to create the workforce of the future
- **Advocacy** – We will advocate for high-performing teachers, and hands-on, STEM- based curricula through partnerships

Following are Dow’s responses to the specific questions posed by the Subcommittee:

Based on your experience, what is the role of industry in the future of U.S. research universities, and why is this role important?

Dow believes that our relationship with our academic partners is critical to our success, and to the success of the institutions with whom we partner. We are always refining those relationships to ensure all parties are maximizing their return on the investment in intellectual and financial resources that are needed to achieve strong results. A vibrant collaborative environment ensures that the greatest minds of industry and academia come together to solve the technological challenges that face society today and in the future.

At Dow we believe that the most effective way to have a successful university partnership program is to concentrate our resources at a limited number of academic partners. This philosophy allows the partnership to achieve a depth of understanding that results in a stronger understanding of each others’ strategy and needs, and thus allows us to grow together in ways that could not be realized with a less committed relationship. To this end Dow has increased its investment in programs with leading U.S. universities with a \$25 million/year commitment over ten years. The investment is being distributed among 11 U.S. institutions. We believe it is important that Dow take this step to strengthen research in traditional scientific fields important to the future of Dow, and to the future of our nation.

Why does Dow work with U.S. research universities? How do these arrangements take shape and progress?

Our collaborations take many shapes, and their beginnings vary. Some might suggest that it all starts with an idea. But the real genesis starts with the recognition of a problem and the articulation of that problem. It is precisely for this reason that we take a strategic approach to our university partnership model. The depth of our relationships helps us recognize the relevant problems of today together, and then combine our complimentary capabilities to build the ideas that will solve those problems. The deeper our relationship is, the better we will understand each other, and the better we understand each other and the problems that are important to us, the higher quality our collaborations are.

Dow’s investment in our strategic academic partners;

1. enables the discovery of advanced technologies that are relevant to the industrial and societal problems we face today, and will face in the future,
2. ensures that our institutions of higher learning remain strong in the disciplines that are essential to a healthy, sustainably advantaged manufacturing sector, so that the scientific and business leaders of tomorrow can secure America’s economic future, and
3. provides new avenues of support to our partners , ensuring that they benefit not just from the funding we provide, but from the collaboration of scientific minds and the advanced knowledge we

bring to the table with respect to other important issues such as safety, sustainability and intellectual property protection.

How do collaborations with research universities affect research and workforce development at Dow? How do they affect the universities and students engaged in the collaborations?

The benefits of partnership to both the industrial and academic partners are many, and go well beyond the dollar amount of the funding provided. The resource Dow expends in a typical research collaboration includes many intellectual exchanges, training seminars on a number of topics, and on-site visits. This provides the graduate researchers perspectives that cannot always be achieved in a research laboratory setting. These activities help tomorrow's workforce get a broader understanding of industrial challenges, and the scale at which industry operates. In addition, our academic partners witness firsthand our approach to portfolio analysis, project selection and prioritization, a critical learning for a successful business entity and a successful nation.

What are the major challenges facing Dow in terms of its ability to partner and collaborate with universities and the outcomes derived through these collaborations?

Intellectual property is often noted as a challenge to successfully executing collaborations. It remains a challenge today and in many cases collaborations abroad provide a more industry friendly atmosphere for partnerships. However, Dow has worked hard to overcome these barriers, and the strategic relationships and committed partnerships that we have built between Dow and academia have helped us create a more cooperative environment, and allowed us to establish strong academic programs in many areas including advanced electronics, leading edge renewable energy, new polymer technologies and energy efficient industrial separation processes. Another challenge can be maintaining the research focus and discipline once a collaboration is in place. The close interaction we expect of our own scientists who are leading the industrial side of the partnership helps us maintain that discipline. This is a significant resource expenditure at Dow, and one which we feel is essential to achieving a true collaborative environment with our partners.

In light of the release of the National Academies report, *Research Universities and the Future of America*, please comment on the strengths and weaknesses of the recommendations.

The NAS report highlights many key features of an improved research university system. Of note is the recommendation for better business/university engagement. At Dow we believe we are playing a major role in ensuring the business/university relationship creates a true peer-to-peer collaborative environment and encourage progress in this direction. In addition, many graduate students continue to come from overseas to get their training in the U.S. Many of these students benefit from a system which leads the world in critical thinking and problem solving, and we applaud the recommendations to reduce barriers to those people we train, to remain in the U.S. after their education is completed.

We are pleased to have been invited to address the important role that industry-university partnerships play in American scientific innovation, and their critical contribution to the advancement of our nation's economic growth and job creation.

Attachment I

Examples of Dow Innovation in Commercial Application

- ❖ Solutions from Dow help to make the world safer, healthier, cleaner and more sustainable. The breadth and depth of our portfolio illustrate why Dow is uniquely qualified as the ultimate “go-to” innovation partner in the industry:
 - FORMASHIELD™ Formaldehyde Abatement Technology from Dow Coating Materials empowers functional paint that helps to improve indoor air quality by trapping formaldehyde gas.
 - Dow AgroSciences’ Omega-9 Oils have removed more than 1 billion pounds of trans and saturated fat from the American diet, while Dow Wolff Cellulosics’ products are enabling the production of gluten-free and fat-reduced burgers.
 - GREAT STUFF PRO™ Window & Door Insulating Foam Sealant closes the gap between framework and rough window and door openings, helping to prevent drafts and maximize energy efficiency (25 to 40 percent of a home’s energy loss is from air infiltration through gaps and cracks).
 - PASCAL™ Technology from Dow Polyurethanes is a new polyurethane insulating system that can boost the energy efficiency of appliances as much as 10%, without impacting design or production costs.
 - Dow Electrical and Telecommunications is meeting the growing demand for more sustainable options in wiring applications with DOW ECOLIBRIUM™ Bio-Based Plasticizers. Made from renewable content, the phthalate- and lead-free plasticizers offer the same great performance while reducing greenhouse gas emissions by 40% compared with existing PVC compounds.
 - SUSTAIN™ Polyolefin Solutions from Dow Elastomers give manufacturers a fully recyclable, phthalate-free option that has the resilience and rebound to hold up to the thousands of times we open and close our refrigerator doors, avoiding waste of energy and ensuring maximum performance for refrigerators and freezers.
 - SENTRICON™ Termite Colony Elimination System from Dow AgroSciences is used to protect American national treasures, such as the White House, the Statue of Liberty and Independence Hall (Philadelphia), against termite attacks. The SENTRICON™ System is the only termite control product ever to receive the U.S. EPA’s Presidential Green Chemistry Challenge Award – a top honor awarded for innovation and environmentally responsible chemistry.

Dow is delivering today key breakthrough technologies and innovations that are making a difference to address some of the world’s leading challenges. In 2011, we commercialized a number of game-changing technologies across our portfolio:

- REFUGE ADVANCED™ is a blend of 95 percent SMARTSTAX™ corn seed and 5 percent refuge (non-genetically modified) seed that farmers can plant across their entire field, meaning

there is no need to plant a separate, structured refuge for corn pests. REFUGE ADVANCED™ simplifies achieving higher whole-farm yield potential by providing growers maximum convenience with the first-ever opportunity to plant a single-bag refuge solution for corn.

- ENLIGHT™ Polyolefin Encapsulant Films help solar module manufacturers reduce their conversion costs and get more powerful performance from their designs, as it enables more power to be generated over the life of the solar panel. Dow's innovative encapsulant films improve cell protection, resulting in better reliability and electrical efficiency, and potentially extending the service life of photovoltaic modules.
- EVOQUE™ Pre-Composite Polymer Technology improves the particle distribution and light-scattering efficiency of titanium dioxide (TiO₂), the primary white pigment used in paint. This innovation leads to increased hiding efficiency and facilitates paint making with up to 20 percent lower TiO₂ requirement.
- ENLIST™ Weed Control System is a unique combination of chemistry and herbicide-tolerant technology in elite corn, soybean and cotton germplasm. This new technology leverages the strengths of proven 2,4-D products to manage resistant and hard-to-control weeds with exceptional efficacy and favorable environmental profile. Dow AgroSciences has also developed COLEX-D™ Technology, featured in the Enlist herbicide solutions, which represents the latest formulation science and proprietary manufacturing processes that will provide the benefits of ultra-low volatility, minimized potential for drift, decreased odor and improved handling characteristics.
- Before natural gas goes to market, it must be treated to remove acid gas contaminants. Serving the needs of the gas treating market for more than 65 years, Dow is proud to offer UCARSOL™ Shale Specialty Solvents, a series of specialty amine blends formulated specifically for the unique needs of shale gas. Since the launch in Q2 2011, the UCARSOL™ Shale-H product line has secured margins of 57% and YTD sales of \$1.2MM.
- With a commitment to "reinvent the roof" for the 21st century, Dow introduced the DOW POWERHOUSE™ Solar Shingle to U.S. markets (starting in Colorado) in October, 2011 - rolling into targeted states through 2012. The POWERHOUSE™ Solar Shingle is a revolutionary new roofing product that combines the performance and protection of a conventional asphalt roof with an integrated photovoltaic (PV) system that powers the home. It is designed to install, look and function in a way that has never been done before.



For editorial information:

Fernão Silveira
The Dow Chemical Company
+1 989-838-1008
fsilveira@dow.com

Dow Commits \$25 Million per Year to Advance Research & Development in Leading U.S. Universities

10-Years Commitment Will Accelerate Research and Stimulate Collaborative Innovation with 11 Top Universities

NEW YORK – October 4, 2011 – The Dow Chemical Company (NYSE: DOW) has increased its investment in programs with leading U.S. universities with a \$25 million per year commitment for 10 years. The investment will be distributed among 11 institutions to strengthen research in traditional scientific fields important to Dow and to the nation's future.

"As a major employer of scientific and engineering talent, Dow is committed to the development of the 21st century workforce, which will work to solve society's most pressing challenges while cultivating a more competitive U.S. marketplace. Excellence in scientific education and the development of innovative solutions go hand-in-hand," said Andrew N. Liveris, Dow's Chairman and Chief Executive Officer. "We are pleased to partner with academia to ensure that a vital pipeline of talent and research is available to fuel the discoveries and solutions of tomorrow."

Identified by their excellence in science and engineering education, research and willingness to collaborate with industry, the following 11 universities will benefit from Dow's investment: The California Institute of Technology; The University of California at Santa Barbara; The University of Minnesota; The University of Illinois at Urbana-Champaign; Georgia Institute of Technology; The Pennsylvania State University; The University of Wisconsin; Northwestern University; The University of California at Berkeley; Carnegie Mellon University and The University of Michigan.

Each university partnership has been designed to build off of its unique strengths — its faculty, facilities, institutes and infrastructure. Areas of research include: catalysis, process development, and new materials for application in electronics, energy, transportation, and consumer applications. Dow's investment will support faculty, students and infrastructure, enabling a critical mass of resources to address some of the world's leading challenges.

News Release