

PACE IN ACTION

Partners for the Advancement of Collaborative Engineering Education

First/Second Quarter 2006



Ed Arlin Recognized with Distinguished PACE Award



On April 11, 2006, Ed Arlin, Executive Vice President, Global GM Account for UGS was presented with the distinguished PACE Global Recognition Award from PACE's Executive Sponsor Council. Receipt of this award represents Ed's outstanding leadership and personal commitment to the global growth and success of PACE and all that it means to the current and future students, faculty, and industrial partners that participate in the

world-class PACE program. Ed Arlin is a founding member (c.1999) of the PACE Council of Executive Sponsors and currently co-chairs that body. Under his leadership, PACE has grown significantly to global prominence and was instrumental in accelerating in-kind grants to PACE institutions from a cumulative value of \$55M in 1999 to over \$3.7B in 2005.

Purdue University to Develop Product Lifecycle Management (PLM) Curriculum



In the manufacturing and design arena, one thing is certain, there simply are not enough college students graduating today with a well developed set of PLM skills. As one of the premier academic

institutions in the U.S and one of the leading PACE Institutions, Purdue University has recognized this need and is taking steps to address and support the educational emphasis of the PACE program.

In April of 2005, Dr. Mileta Tomovic of Purdue University was awarded a grant from the Society of Manufacturing Engineers (SME) Education Foundation to develop Product Lifecycle Management curriculum modules. The development of the PLM modules is truly an interdisciplinary effort with 23 faculty from the Colleges of Technology, Engineering, Science, and Business all contributing. Dr. Tomovic was also recently awarded a grant from the National Science Foundation to help further the development of the program. The curriculum design of the PLM program at Purdue is based upon a series of building blocks. The first course will be an Introduction to Product Lifecycle Management. The second stage will be a series of courses resulting in PLM Certification. The third and final stage will consist of the higher level courses resulting in a master's degree in PLM. Purdue may ultimately offer an Executive Master's program in PLM. In addition, it is anticipated that this training will incorporate many of the PLM tools in the PACE program and be highly sought after in the corporate world. The goal of the Purdue PLM program will be to provide the manufacturing industry with better educated and trained graduates that are able to provide leadership for the implementation of PLM in the global and rapidly changing environment.

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Partnering Globally With:



PACE Partners Welcome New Mexico State University to PACE

On March 16th, New Mexico State University (NMSU) was formally announced as a PACE Institution. This was the largest in-kind contribution ever received by NMSU with a commercial value of \$112.7 million. The contribution will enhance NMSU's engineering programs and help prepare students for careers in vehicle design, engineering and manufacturing, as well as other fields.



PACE Executives Present Membership Plaque to NMSU - Left to Right: Don Cooper (UGS), Dan Wecker (SUN Microsystems), Hulas King (UGS), Ed Shinouskis (EDS), Bob Kruse (GM), Mrs. Michael Martin (NMSU-First Lady), Steve Castillo (NMSU-Dean), Felicia Guerrero (NMSU Student), and Louis Everett (UTEF).

"Our students will be using the same computer-aided design and engineering systems used by General Motors and other leading industries, and our graduates will be prepared to hit the ground running," said NMSU Dean of Engineering Steven Castillo. "This will be a tremendous advantage to our students and to the companies that need a highly skilled and trained work force."

The PACE software, including UGS' NX, Teamcenter Engineering, and Tecnomatix, will be used primarily by engineering students and faculty. These powerful modeling and simulation tools will allow students to design projects ranging from more efficient factories to simulated automobile crash tests to the flow of blood through artificial heart valves. Additional software and training provided by the PACE

contribution includes Altair Hyperworks, FLUENT, Adams and Nastran from MSC Software. Computer workstations from EDS refurbished by Hewlett Packard were also contributed.

"We are proud to be a part of this elite group of institutions, and we are excited about the opportunities that this generous in-kind contribution will create for our faculty and students," said NMSU President Michael Martin. "This collaboration combines the university's strengths in engineering education with the resources and know-how of some of the world's leading technology companies."



NMSU was the 35th PACE Institution to be announced.

Korea University Joins Family of Global PACE Institutions



GM DAEWOO HELPS ESTABLISH PARTNERSHIP WITH KOREA UNIVERSITY THROUGH PACE PROGRAM. . .

GM Daewoo is helping to launch a new automotive planning, design and engineering partnership in conjunction with Korea University through the Partners for the Advancement of Collaborative Engineering Education (PACE) program.

"The opening of the PACE Center at Korea University is an extension of our commitment to Korea's automotive industry and the development of the next generation of industry professionals," said Nick Reilly, President and CEO of GM Daewoo. "By working with one of Korea's leading academic institutions, we will provide students practical experience today that will prepare them to meet the needs of industry tomorrow."

GM Daewoo will participate in establishing a product lifecycle management (PLM) education program with Korea University and PACE, as part of the effort to promote the development of automotive engineering and foster automotive industry talent in Korea. Students will be provided additional opportunities for practical learning by participating in PLM-related lectures and joint programs with GM Daewoo, as well as PACE competitions.

Korea University is the 36th PACE Institution to be announced.



GM of Canada Poses "Trunk Lid" Project to University of Toronto

In the fall of 2005, 35 students participated in a PACE project at the University of Toronto (U-T). The project was part of their third year course entitled *Kinematics and Dynamics of Machines (MIE301F)*.

The project parameters were prepared by the personnel of General Motors of Canada, Limited (GM of Canada), and involved the design of linkages for the trunk lid of an automobile using the *NX-3* software. The linkage was to guide the lid of the trunk through three prescribed locations; closed position, an intermediate position, and the open position. The students were also encouraged to take the manufacturability and ease of movement of the trunk lid into account in their designs. The students worked for 13 weeks in teams of either two or three.

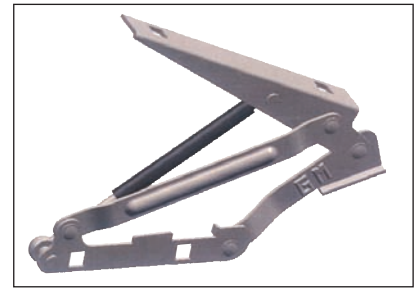
On December 2, 2005, the finalists for the *2005 University of Toronto PACE Award* gave presentations to a panel of judges from GM of Canada. The University of Toronto gratefully acknowledges the generous support from PACE, and the personnel of GM of Canada for making this project possible.



Finalists of the 2005 University of Toronto PACE Award, and the judges from General Motors of Canada Limited, Dr. T. Vest and Mr. J. Wood



Team of First Place Award Winners: Mr. Vajira Jayasinghe, Mr. Alex Perez and Mr. Marcus Obal



Award Winning Design of the First Place Team

PACE SOFTWARE - CURRENT VERSIONS

Below are the current versions of the software that PACE Institutions should be utilizing effective April, 2006. This maintains consistency between institutions and GM.

SOFTWARE	VERSION
UGS-NX 4	v22
UGS-Teamcenter Engineering	v10
UGS-Teamcenter Community	v5
UGS-JT Open	v1
MSC Adams	v.2005 (r2)
MD Nastran	v.2005.5.0 (r3)
MSC Sofy	v.2005 (r2)
Altair HyperGraph	v7.0sp1
Altair HyperView	v7.0sp1
Altair HyperMesh	v7.0sp1
Altair MotionView	v7.0sp1
Altair OptiStruct	v7.0sp1
FLUENT	v6.2.16
Fluent-FlowLab	v1.2.10
Fluent-GAMBIT	v2.2.30
Fluent-TGrid	v3.6.8
LS-DYNA	v970 Rev 6763
Autodesk-AutoStudio (formerly Alias)	v13
Autodesk-Maya (formerly Alias)	v7
Autodesk-PortfolioWall (formerly Alias)	v3
Autodesk-Direct Connect (formerly Alias)	v1.0
Autodesk-SketchBook Pro (formerly Alias)	v2
Engenious iSIGHT	v9.0

Monash Design Exhibit

December 2005- Graduating students from Monash University in Melbourne, Australia held their annual degree show. This event marked the culmination of the student's four years of studies and benefits from PACE design tools including Autodesk (Alias) StudioTools.

Projects from the Transportation Design stream included cool concepts like the Solace and Kiara designs shown here:



Solace



Kiara

For more information visit:

http://images.businessweek.com/ss/06/03/monash/index_01.htm

<http://www.monash.edu.au/pubs/monmag/issue17-2006/around-monash/clay.html>

BYU Leads Global Vehicle Collaboration Project

Students from 13 PACE institutions around the globe have been collaborating to create a virtual vehicle. With guidance provided from GM North America Design, GM Global CAE group, GM Powertrain, and UGS, the multi-national student teams are working to generate futuristic performance vehicle designs and the engineering infrastructure to support them.

The project is being lead by Dr. Greg Jensen, Associate Professor, Department of Mechanical Engineering, BYU, who has a strong passion for global collaboration in the world of academia. He explains..."We have organized collaboration among the 13 universities around the functional areas of the vehicle design. Teamcenter (UGS) provides a collaborative work environment where we can share component designs and discuss work-in-process in real-time via the internet, without incurring the costly expense of international telephone and travel costs. Without the Teamcenter PLM technology, a project of this scope would be cost-prohibitive in the academic sector."

Dr. Jan Helge Bohn, Associate Professor, Department of Mechanical Engineering and Director, CAD Lab at Virginia Tech, supports the leadership of this project and shares the same passion and values the lessons learned from working with academia around the globe. He explains..."We are offering our students a real taste of tomorrow's engineering environment today by providing them with this unique opportunity to learn and experience true multidisciplinary global product design. We have more than 110 mechanical engineers, electrical engineers, and industrial designers engaged across Australia, Brazil, Canada, China, Mexico, South Korea, Sweden, and the United States (US), all working together with GM designers and engineers using state-of-the-art collaborative design and engineering software and hardware to design a new family of low cost, sporty and fuel efficient vehicles. Truly, we are educating tomorrow's global engineering leaders today!"

Four institutions provided exterior and/or interior designs: Monash, Hongik, Virginia Tech, and University West. Engineering collaboration among the 13 universities, worldwide, was organized around the functional areas of vehicle design as follows:

- Brigham Young University (US) - chassis and coordination of overall vehicle assembly
- Hongik University (South Korea) - firewall and floorpan
- ITESM Monterrey (Mexico) - wiper and exhaust systems
- ITESM Toluca (Mexico) - door hinge mechanism
- Monash University (Australia) - roof and ABC pillars
- Shanghai Jiao Tong University (China) - brakes
- Universidad Iberoamericano (Mexico) - engine
- University West (Sweden) - hood and trunk substructures
- University of British Columbia (Canada) - steering
- University of Sao Paulo (Brazil) - bumpers
- University of Toronto (Canada) - seat mounts and adjustments, and differential
- University of Waterloo (Canada) - suspension
- Virginia Tech (US) - transmission and coordination of powertrain

"UGS is a proud sponsor of the PACE 2006 Vehicle Collaboration Project," said Ed Arlin, Executive Vice President, Global GM Account for UGS. "Together with our partners GM, EDS, and Sun Microsystems, we are advancing the education of promising young engineers around the world, transforming the process of innovation in academia, as well as the corporate sector."

Grace Lieblein Receives the UGS Global Diversity Council Award



On April 25th, Grace Lieblein, Vehicle Chief Engineer at General Motors, was presented with the UGS Global Diversity Council Award in recognition of her professional achievements and contributions to women and minorities in engineering.

Ed Arlin, UGS Executive Vice President for the GM Global Account (r) and Françoise Sudres-Kovac, UGS Diversity Council member (l) presented Grace Lieblein (c) with the award.

According to Ed Arlin, the UGS Diversity Council evaluated numerous corporate and individual role models within their customer base around the globe. He commended Grace for her perseverance to succeed in the manufacturing and engineering fields—arenas that Mr. Arlin pointed out, have historically been dominated by men.

PACE IN THE NEWS...

- Autodesk has Acquired Alias
- UGS Offers JT Open & Tecnomatix
- Engenious iSIGHT Joins PACE
- PACE In Kind Donation Values Top \$3.9B
- PACE Sponsored 11 Student Competitions in 2005
- Purdue Publishes 1st Official PACE Newsletter The PACESETTER
- New Textbook Repository on PACE Website
- PACE Announces 2 New Institutions
 - New Mexico State University
 - Korea University

First PACE Global Manufacturing Forum held at TU-Darmstadt

The 1st International PACE (Partners for the Advancement of Collaborative Engineering Education) forum on digital manufacturing took place December 7 - 9, 2005, at Technische Universität Darmstadt (TUD), Germany. Participants from the United States, Europe, South America, and Asia gathered to learn more about Digital Manufacturing concepts and the vast benefits to manufacturing and production optimization. The goal of the Forum was to present and discuss the latest developments in the field of Digital Manufacturing, and included keynote presentations given by Dr. Heinz-Gerd Lehnhoff (CIO, Adam Opel GmbH and PIO GM Europe Engineering) on *Global Engineering for Digital Manufacturing* and Hulas King (Director GO PLM-UGS Corp) on *Product Lifecycle Management: A Unique Perspective on Innovation, Productivity & Digital Manufacturing*. Highlights from Dr. Lehnhoff's keynote address covered the primary challenges in achieving digital manufacturing, including the "orders of magnitude quantity of data" required in manufacturing functions vs. product and design activities, integrating the "math and release" databases to achieve "a single Bill of Material," the management of graphics data, and new technology to support global re-use such as shape comparison.

Dr. Linda Joseph represented Manufacturing Engineering-GM North America and presented *Foundations for Success of Digital Manufacturing*, and Dr. Joerg Uthoff represented IS&S-GM Europe, presented *Virtual Factory as Part of GM Global Engineering*. A global perspective was experienced by all. Attendees shared insight into the differences and similarities between methods and approaches in the world of digital manufacturing. According to Dr. Linda Joseph, "Meeting with students and faculty from these universities, and talking to them directly about their ability to address some of the complex challenges facing Manufacturing Engineering at GM – especially global work sharing, simulation, visualization, flexible manufacturing and collaboration – was invaluable."

"The Digital Manufacturing initiative enables integrated analysis, simulation and optimization of product definition and production processes. As GM focuses on its 2006 Business Plan, Digital Manufacturing is a 'key play' in achieving positive business results," said Jim Wiemels, Vice President – General Motors Global Manufacturing and Labor.



Dr. Linda Joseph awards the winning prize to TUD students who demonstrated their developments in the area of Digital Manufacturing at the Forum.

PACE Competitions... As part of its commitment to encourage students to use digital data in the product development and production processes so critical to modern engineering practices, PACE is providing student design competitions in appropriate courses within PACE institution curricula.

Michigan Tech (US)



MTU 1st Place Team -Jeff Katalenich, Mark Shepard, James Wozniak, Amanda Scott along with PACE Judges from GM and UGS

April 20, 2006 – Six teams totaling 21 engineering students gathered on the campus of MTU in Houghton Michigan for a PACE Competition designed and integrated into their Engineering Modeling

and Design course (ENG1102). Many hours of preparation and hard work culminated when the teams presented their projects proposed in one of four choices: Human Powered Vehicle (HPV), Pump House/Levies for Flood Control, Design for Microbrewery Process, or Radio Controlled Vehicle (RCV) with Obstacle Avoidance. The judges, representing GM and UGS, paid close attention to some very impressive presentations requiring criteria including:

- Design concept
- Creativity
- Safety
- Physical model fit and function
- Budget
- Matlab simulation
- Collaborative teamwork

In second place, the runner up team scored 83 points (of 100 possible) for their Human Powered Vessel (HPV) with their 'outta the box' thinking and great model design (HPV team also 'dressed for success' which always earns bonus points with the judges). The first place team earned 86 points with their Cinco Cycle, Human Powered Bike scoring high (5=Rave Review) in form, fit, function, and impressive presentation criteria. The Cinco Cycle team's elliptical drive innovation and robust Matlab simulation put them over the top of the other five teams competing.

PACE competitions continue to engage students to think like engineers and designers and provide the use of digital data and tools used in product development processes. PACE looks forward to visiting MTU for their next engineering/design course competition.

SKKU (Korea)

The first PACE student competition in South Korea was held on Nov. 18, 2005, at Sungkyunkwan University (SKKU).

SKKU's PACE Competition took place in the junior / senior level "CAD/Digital Manufacturing (ESM 3039-41)" class. The design project for the PACE competition within the course was for designing the manufacturing equipment (battery loader) in a *real life* scenario from GM Daewoo in Korea.

The class was divided into eight teams of five students. Based on engineering knowledge on design and manufacturing, each student team designed appropriate and best equipment using UGNX. All decisions and design were validated by digital mockup and pre-assembly using VisMockup.

This competition judged critical areas of the virtual product development process including product design and digital mockup, and pre-assembly for design validation and optimization.

The five judges for the contest included representatives and experts from GM Daewoo and UGS. They judged each team on:

- Teamwork
- Collaboration
- Innovation
- Creativity

"PACE enables mutually beneficial and strategic relationships between GM Daewoo and South Korea universities. This SKKU competition can be a good example of an investment in the future of GM Daewoo and the automotive industry in Korea," said Steven L. Clarke, GM Daewoo, Vice President, Engineering.

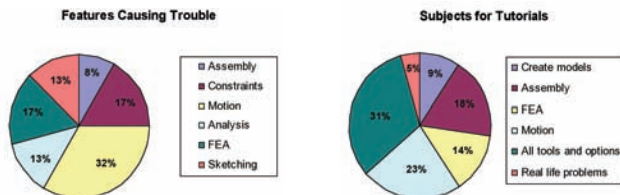


Winning team with judges and prizes

Students at UTEP Participate in Design Challenge (US)

The University of Texas at El Paso (UTEP) became a PACE institution April, 2005. To help students learn the PACE software, a design contest was implemented in a CAD/CAM class taught by Dr. Jack Chessa. The thirty students were required to design a pedal, crank and gear for a performance bicycle. Constraints required the design to fit a standard bicycle frame, provide for a suitable Q-Factor (used for assessing the quality and comfort of the mechanism) and manufactured at a cost competitive with existing crank mechanisms. Students used Altair Hypermesh to perform their analysis. The projects were judged by representatives from Altair, General Motors, Sun and UTEP faculty. Since the design, several students have taken research jobs where they continue to use their skills.

Through an assessment process, the students provided information about what features were the most difficult for them to learn. The results are shown in Figure 1. Figure 2 shows the tutorials that the students believe they need. The students also recommended a tutorial length of 30 minutes.



PACE Recognition Awards at ITESM (Mexico)

On February 28, PACE recognition was awarded to three ITESM campuses (Campus Estado Mexico, Campus Toluca, and Campus Monterrey). The ceremony took place at ITESM - CEM with many attendees including Mr. David Stenson - [former] Chief Engineer GMM Toluca Engineering Center, Ms. Karla Reyes - PACE Administrator, GMM Mexico, Dr. Roberto Rueda Ochoa -President of the Metropolitan Zone of the ITESM System, Dr. Pedro Grasa Soler - Director General of ITESM - CEM and Dr. Sandra Ortiz - Director General of ITESM - Campus Toluca. Dr. Roberto Rueda Ochoa welcomed David Stenson and other GMM executives. Mr. Stenson presented the Recognition Awards on behalf of PACE.



Design Competition at SJTU (China)

The "Design Competition" in progress is the first Shanghai Jiao Tong University (SJTU) PACE Course Competition of this kind.

SJTU has organized two classes of students, from the design course - "ME 250" (School of Mechanical Engineering), to complete a design project identified by local PATAC (engineering unit in GM China) design department. PATAC and GM China will also provide continuous support.

SJTU's competition design topic is the profile design of a cup-holder for a new GM Buick model. Through a competition process, PATAC has reduced the participating finalist teams and, by the end of 2006, GM engineering and design groups will select the final winning team.

"We regard this activity as the first pilot PACE competition at SJTU. We are trying to identify and solve problems upfront to smooth out the process for future PACE competitions," said Professor Welling Chen, Department of Mechanical Engineering at Shanghai Jiao Tong University.

Altair Offers Classes at IPN (Mexico)



In December of 2005, Altair's HyperMesh and OptiStruct classes were provided for 30 individuals at Instituto Politecnico

Nacional (IPN) in Mexico City. The classes were held in two PACE labs on campus at IPN and attended by both IPN teachers and IPN students.

Several students (Jair Ruiz Imm, Gabriel Ventosa, Gerardo Ventosa, and Eduardo Lopez) attending these classes were SAE vehicle team members who are now using the HyperMesh and OptiStruct tools to optimize the design of their next Mini Baja car. Some of the students are also learning MotionView and MotionSolve to redesign their Mini Baja suspension.

PACE and Altair thank Francisco Castillo Acosta of IPN for his help in configuring and setting up these labs as well as the administration for making the facilities available.

Instruction was provided by Jose Luis Garcia with assistance from Alexis Piementel and Jesus Gonzalez (dptec SA de CV in Mexico City) who are agents for Altair in Mexico. Jose's expertise and enthusiasm made this class a pleasure for all.

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* New PACE Institutions formally announced as of publication date



We welcome your comments, questions, and article suggestions to Deborah Peak, Editor-PACE In Action, GM Knowledge Center, 6442 E. 12 Mile Road, MC 480-303-110, Warren, MI 48090-9000; E-mail: deborah.a.peak@gm.com; phone: (586).947.2386; fax: (586).947.2715

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