A computer render (yes, this is NOT a photograph!) of the SIG Center for Computer Graphics by Jeremy Newlin, DMD '14.

Letter From Dr. Badler

This has been another energetic and exciting year for CG@ Penn. We're especially proud to welcome our new computer graphics faculty member, Dr. Ladislav Kavan. Once he accepted Penn's offer to become an Assistant Professor, we just had to celebrate. So we teamed up with his former employer, ETH Zurich, to host an open reception at SIGGRAPH 2012 in Los Angeles. About 130 people from Penn, ETH, Penn alums, and many other friends attended to enjoy drinks and dessert and to mingle with the excellent company. This year Ladislav has a SIGGRAPH 2013 paper. Thanks to great work by all our CG@ Penn family (DMD, CGGT, PhDs, PostDocs and faculty), we have produced a number of papers (and submissions) for conference, journal and book publication (http://cg.cis.upenn.edu/publications.html).

CG@Penn alumni continue to make us proud of their accomplishments, and our DMD Seniors this year continue the tradition of outstanding Senior Projects. We've even "adopted" a couple of non-DMD students (Karl Li and Nathan Marshak) into our community. Fantastic images in this Newsletter include work by Seniors Peter Kutz, Karl Li, and Dan Knowlton and a photorealistic model of the SIG Center by DMD Junior Jeremy Newlin. Also inside you can see how Penn alums contributed to the Animation Oscar for Pixar's Brave, and catch up with DMD alum Matt Roberts.

Our summer internship program continues to be an active part of our research enterprise. The Diane Chi 2012 Summer Research Award went to Nathan Marshak for his work on ADAPT with Alex Shoulson and Mubbasir Kapadia, and resulted in a SIGGRAPH I3D conference publication and an invitation to expand it into a IEEE TVCG article. The 2013 Welton and Dawn Becket DMD Award goes to Peter Kutz for his Senior Project on "Physically-Based Atmosphere Rendering"; Peter also took an Honorable Mention prize among CIS Senior projects – the first year DMD competed in the department-wide competition!

We hope you enjoy the update in this Newsletter, but we also invite you to visit our website http://cg.cis.upenn.edu – and stay in touch.

Dr. Badler was honored with the Andrew S. and Debra Rachleff Scholarly Chair.

Introducing Aline Normoyle

We are extremely pleased to announce that Aline Normoyle has accepted the position of Associate Director of the SIG Center for Computer Graphics. Previously, Aline worked in industry as a lead engineer on a variety of distributed simulation applications, as a research associate at Disney Research Pittsburgh with Alla Safonova and Jessica Hodgins, and as a research assistant at the Robotics Institute at Carnegie Mellon University with Max Likhachev. Prior to joining, she won the University of Pennsylvania Teaching Practicum Award for her work in Physically-based animation and mentoring student research. As Associate Director, Aline manages and maintains the diverse technology of the SIG Center and continues to mentor Senior Design students with Norm Badler. Working with Dr. Norm Badler and Dr. Steve Lane, Aline is pursuing a PhD in Computer Graphics, studying game design and character animation.

Senior Design Projects

This year's senior design is both our largest — with a total of 18 projects — as well as an extremely dynamic and diverse set. Senior design is a unique opportunity in the DMD curriculum for students to pursue their own interests, which students usually opt to focus on a topic which might only have been touched on during one of their courses. Thus, these projects truly reflect the diversity of interests in our DMD students. If you'd like to learn more about any of these projects, please visit our web page at: http://www.seas.upenn.edu/~cis497/Projects13.htm. Topics range from:

- photorealistic rendering (Peter Kutz, Karl Li),
- to real-time rendering (Karl Li, Sean Lilley, Ian Lilley),
- to physically-based water simulation (Dan Knowleton) , physically-base character animation (Nathan Marshak),
- to studies of emotional content in body language for character animation (Fannnie Liu),
- to visualizing photo collections with point clouds (Kanchalai "Yui" Suveepattananont),
- to real-time sound simulation and perception for game environments (Michael Walczyk, Jiali Sheng),
- to next-generation gestural user interfaces and hand capture (Michael L. Rivera),
- distributed game environments using webGL (Gianni Chen),
- to character rigging (Adam Malley),
- automatically generating game narratives (Jason Merrin)
- to generative methods for architecture (Stewart Hills),
- to creating a sword fighting game (Christine Uyemura),
- to facilitating collaboration between university student groups (Gaby Moreno-Cesar), and
- to data visualization (Mansha Mahtani, Liliana Matos).

Michael Rivera demos Project PAALM (Phalangeal Angle Approximation through the Leap Motion Controller) on Senior Design Poster Day.

Lauren Shapiro Wins Apple iOS Women in Technology Scholarship

Lauren Shapiro, a junior in the Digital Media Design (DMD) program, is a recipient of the prestigious Apple iOS Women in Technology Scholarship.

The scholarship is comprised of a $10,000 award and an Apple iOS Engineering internship. The team works continuously to improve both the iPhone and iPad devices. This is where future generations of the software and user interface are born, which makes it one of Apple's most inspiring and demanding teams. Congratulations, Lauren!

The Academic Year in Visitors

Carryl Baldwin
George Mason University
"Individual Differences in Auditory Spatial Perception"

Vinícius Cassol
Pontifícia Universidade Católica do Rio Grande do Sul - PUCRS
"Quantitative Comparison of Two Distinct Crowds"

Tianyu Huang
Beijing Institute of Technology

Sophie Jörg
Carnegie Mellon University
"Perceiving and Animating Finger Motions"

Björn Kruger
Universitat Bonn

Mark Pauly
École Polytechnique Fédérale de Lausanne
"Performance-Driven Facial Animation"

Stefan Rank
Austrian Research Institute for Artificial Intelligence
"Computational Affect in Interactive Media"

Remi Ronfard
INRIA Naples

Sam Slavitt
Germantown Friends School

Andreas Weber
Universitat Bonn

Changxi Zheng
Columbia University
"Listening to the Contacts: Physics-Based Sound Rendering of Collisions"

SIGGRAPH helps Digital Media Design students find jobs

The association has shifted its focus from creative projects to careers

The following is a reprint of an article from the Daily Pennsylvanian by Fiona Glisson which appeared on Feb 17th, 2013. Check out Fiona's articles at: http://www.thedp.com/

SIGGRAPH helps students create short videos to use in job applications such as one by Engineering senior Karl Li showing liquid falling on a rabbit.

Computer graphics and animation students can forget OCR and join SIGGRAPH instead.

SIGGRAPH, Penn's chapter of the Association for Computer Machinery's Special Interest Group on Computer Graphics and Interactive Techniques, has recently shifted its focus to help engineering students in the Digital Media Design program apply for jobs in computer graphics and animation. The group does this by offering students resources to help them create short demo reels to send to companies such as Pixar.

"It's our version of a resume," College and Engineering junior and DMD participant Jeremy Newlin said of the demos. "You submit a resume, but the main thing that recruiters in the animation and games industry are looking for ... is usually two or three minutes of your work that you have been doing over the course of your academic career."

Digital Media Design is an interdisciplinary program in the School of Engineering and Applied Science intended for students who wish to design computer graphics, animation, games, virtual reality environments and interactive technologies. Their graduates often go on to jobs within the animation industry.
However, DMD doesn't always provide students with all the necessary professional experience to apply for jobs.
"Part of our goal is to fill in these gaps that aren't really taught in classes but are really important when it comes to getting a job," said Dan Knowlton, a senior in the DMD program and a member of SIGGRAPH's board. Knowlton has interned at Google and Lucas Film Animation.

In order to fill in the gaps, they hold seminars every Sunday afternoon known as "Weeklies" which cover basic aspects of computer graphics.

Paul Kanyuk, a 2005 DMD graduate and one of the founding members of the Penn student chapter of SIGGRAPH agrees. "You're not going to learn everything you need to know to work at Pixar in class.

"You need to go above and beyond," he added. "The student chapter of SIGGRAPH is all people of that mindset that are basically seeing what the latest research is [and] what methods are out there to make film."

SIGGRAPH also holds office hours, where students can get feedback on their completed reels and advice about tailoring their demo reel to the job or internship for which they wish to apply.

Courtesy of Karl Li and Dan Knowlton | DP

"Through trial and error we've arrived at what is a pretty good idea of what Pixar is looking for, what Dreamworks is looking, what ILM [Industrial Light and Magic, a part of] Lucas Film is looking for," said Karl Li. "So what we are doing now is trying to pass that on." Li is a DMD senior who was interned at Dreamworks and Pixar.
In addition, the group holds a Demo Reel Night where students, professors, and alumni watch and critique students' reels.

"We've been having alums that work at Pixar and Dreamworks and Blue Sky ... Skype in [on demo reel night]," said Newlin "They'll give feedback live over Skype."

In the past, SIGGRAPH functioned as a creative outlet for DMD students who wanted to make digital shorts and games outside of class.

But the group has moved away from doing these shorts. "In the past year or so we have tried to retool SIGGRAPH to be basically something that focuses way more on helping out" with jobs, Li said.

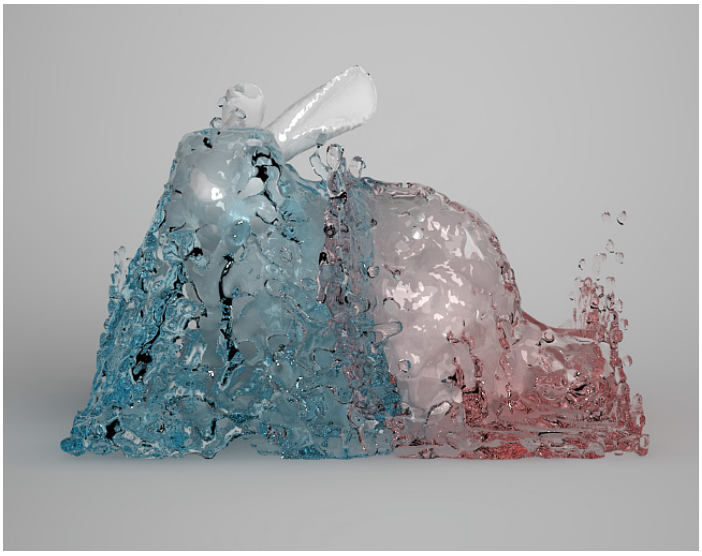
Since students must take core engineering courses during their first two years before focusing on DMD, SIGGRAPH Weeklies gives them an additional resource for learning more about animation.

"What we're trying to do is give them a look forward on what they will be doing by the end of their time here.

Because it's easy to get discouraged when you are taking physics and hardware, to be like 'I didn't come to DMD to do this,'" said Newlin.

Ariela Nurko, who graduated from the DMD program in 2009 and was a member of the SIGGRAPH chapter, cites these weekly seminars as being important in her academic growth while at school.

"You get to learn from people who are older than you and have more experience … and who've had internships before," she said.



Courtesy of Karl Li and Dan Knowlton | DP

Top downloads from Scholarly Commons [title, # of downloads]:

- A Kinematic Model of the Human Spine and Torso 3687
- ANIMATED CONVERSATION: Rule-based Generation of Facial Expression, Gesture & Spoken Intonation for Multiple Conversational Agents 2617
- Modeling Crowd and Trained Leader Behavior during Building Evacuation 2544
- Synthesis and Acquisition of Laban Movement Analysis Qualitative Parameters for Communicative Gestures 2374
- Visual Attention and Eye Gaze During Multiparty Conversations with Distractions 1813
- Creating Interactive Virtual Humans: Some Assembly Required 1787
- Animation from Instructions 1693
- Simulating Humans: Computer Graphics, Animation, and Control 1686
- Real Time Inverse Kinematics with Joint Limits and Spatial Constraints 1629
- A Machine Translation System from English to American Sign Language 1605
- A Low Cost Tactor Suit for Vibrotactile Feedback 1451
- Anthropometry for Computer Graphics Human Figures 1405
- Do You See What Eyes See? Implementing Inattentional Blindness 1360
- Real-Time Inverse Kinematics of the Human Arm 1322

Recent Penn grads work on Oscar-winning 'Brave'

Digital Media Design alums undertook painstaking animation at Pixar

Samantha Raja , DMD '10, also worked on Brave.

The following is a reprint of an article by Fiona Glisson from the Daily Pennsylvanian. The story appeared on January 31, 2013, prior to the 85th annual Academy Awards ceremony, where "Brave" was named the Oscar winner for Best Animated Feature. Photos have been updated to show the happy Oscar-bearing Pixar teams, however, to abide by the Academy's strict rule that photos of the Oscar cannot be published, we've used a bit of photoshop magic in these images! While the DP story highlights the contributions of DMD alumni Paul Kanyuk and Ariela Nurko, other DMD alumni, including Nathan Zeichner, Samantha Raja and Emily Weihrich were involved in the making of "Brave. " We congratulate you all on your first Oscar win!

Paul Kanyuk, a 2005 Engineering graduate from the Digital Media Design Program, worked on the animation team for the Oscar-winning Pixar movie "Brave."

For most students, working on an Oscar-nominated film at Pixar just a few years out of school would be a dream come true. For several Penn graduates, this dream is a reality. Ariela Nurko, a 2009 Engineering graduate and 2005 Engineering graduate Paul Kanyuk are part of the team that worked on the Oscar-nominated film, "Brave." The team also included fellow Penn and DMD alums All are graduates from the school's Digital Media Design Program.

Nurko worked in the rendering department at Pixar Animation Studios while Kanyuk worked on animation for crowds in the film.

Kanyuk worked to create the large crowds of Scotsmen in the scenes in the Great Hall and at the Highland games in the film.

Crowds pose a unique challenge to animators. It would be too arduous to animate every single swish of a kilt or swing of a mace.

“It can take a professional animator one or two weeks to animate a single character. So when you have 100, 200 or even 1,000 characters on screen, in order to animate and render them all, you need a lot of technical tricks,” Kanyuk said.

Still the crowds in Brave are intricately detailed “especially in the opening scene where you see them fighting behind these barricades and yelling at each other,” said Kanyuk.

“Pretty much every character is individually directed and carefully placed. No two are the same. They all have very particular motions,” he said.

While Kanyuk’s skill helped expedite the process of rendering a crowd, some characters in a crowd must still be animated individually.

“When Fergus [a character] does that big body slam, we had no idea how we were going to pull that off. That is actually just brute force animation,” he said.

According to Kanyuk, it is more difficult to animate a crowd of humans than a crowd of animals, robots or cars. Audiences are very well attuned to human facial expressions and movements. They will immediately notice if something is even slightly off.

“There’s a lot you can get away with with rats. You just make them a different size and change their groom and fur color and it’s clearly a different rat. With a person, you can’t just duplicate them,” he added.

Kanyuk’s all-time favorite crowd scene is the wildebeest stampede from “The Lion King,” which involves animals and early CG animation.

“It was a very dramatic and awe inspiring thing to behold those wildebeests coming down the cliff. It also was a vital plot point … It served spectacle, it moved the plot along and it was computer graphics,” he said.

The other difficulty in animating crowds comes from clothing, Kanyuk said. For example, the people in the movie “Wall-E” wore spandex, which had less movement and detail then the traditional Scottish kilts worn by the characters in Brave. “These medieval characters had lots of multi-layered costumes like kilts and tartans and beards and lots of secondary and complex motion,” he said. “To flesh that out for a whole crowd took quite a lot of work.”

When the film premiered in June 2012, the intricate detail of the hair of the main character, Merida, received a lot of

The Brave team, including DMD alumni Paul Kanyuk ‘06, Ariela Nurko ‘09, and Emily Weihrich ‘10.

attention. This also created a challenge for the rendering department.

“She had really curly hair and she had a lot of it…. It look[s] amazing when you look at it on screen,” Nurko said. “But it was one of those things we had to work on to make sure that we could render everything in a reasonable amount of time.”

Rendering is the final step in the animation process. After shots are rendered, they are sent to the director for approval, and then added to the film.

Animators at Pixar also made use of a new technology based on a recent Special Interest Group on Computer Graphics and Interactive Techniques paper called Loom. Loom enabled the animators to better emulate woven material on screen.

“If you look at Merida’s dress, you can see the stitches and you can also see the little fuzzies on it which would happen if you wove something … it was very cool,” Nurko said. Improved technology is what makes images like Merida’s hair and the weaving on her dress possible.

“Every new movie that I’ve worked on since here has had new technology that can do amazing, amazing things … it’s just constantly evolving, which makes it really fun,” Nurko added.

Despite all the technological advances, animators still have a very challenging job.

“We just keep adding more artistic demands, more beautiful sets, more rich characters,” Kanyuk said. “Technology is not giving us a free ride. We’re working harder than ever.”

Peter Kutz, DMD ‘13, received a Senior Design Project Honorable Mention for his atmospheric renderer, Photorealizer.

Alumni Profile: Matt Roberts

Senior Producer, Microsoft Studios

How did you get into games development?

I entered the Digital Media Design program in 1999 with the intent of being a professional games developer. In 2003 I graduated into the bottom of the tech recession following the Dot-Com bubble of 2000. The job market was brutal. I struggled to find a paying job, let alone a position in the competitive (and somewhat oddball) games business. So I took a job in IT to pay the bills – but I kept designing and coding on my own time. I built simple games in Flash at night, and kept a sketchbook of ideas. And I kept learning, teaching myself database and web programming as well.

After about two years, I got an email from a friend who had recently moved to San Francisco and had landed a position as an animator at a console games studio in Menlo Park called Crystal Dynamics. He said they were looking for a UI programmer and designer to help ship the latest version of Tomb Raider. I flew out on my own dollar to meet the hiring manager on a Saturday morning. The interviewer looked exhausted – the team had been working overtime for months to get the game in shape to ship.

I had my portfolio from school to show him, but because I had kept working on personal projects I also had a bunch of more recent work to share as well. I think showing that I bridged the gap and pursued my passion even though it wasn’t my day job was an important signal that I was serious about games as a career.

The interview was brief - it was only a temporary contract position, and it paid 75% less than the salary I was earning in IT at an investment bank in Manhattan. But I jumped at the opportunity and moved out West with only a suitcase. It was hard – I had to separate from my long-term girlfriend

in New York City (luckily for me, however, she forgave me and we later married), and worked 12-14 hour days for a few months straight to help finish the game. But I was eventually hired full-time. It was validating, and I just kept pushing on from there into different roles – technical art, design and ultimately, production.

What was your experience at Penn like?
I loved the thriving, urban, interdisciplinary community that is Penn. As a native Pennsylvanian growing up outside Philadelphia, I longed to be a part of the city, and Penn opened the door to a wealth of experiences that broadened my understanding of myself and the world. To me, DMD and SEAS were a furnace of energy, ideas, and productivity that inspired me to code longer, learn more and push myself creatively. In DMD I was surrounded by motivated, talented peers with passion for software, music, art, design, and business. I had a healthy and invigorating sense of belonging and competitiveness. These people today remain my some of my closest friends and colleagues.

In the classroom, I learned how to solve problems, collaborate with others and ask meaningful questions. I most remember and cherish experiences like critiques with Joshua Mosely, and creative simulation projects from Dr. Stephen Lane. I'm not a "natural" engineer (and I know that now because at Penn I met a few) – I had to work very hard to keep up with my peers, and I wasn't always at the top of the class, but Penn was an environment where I wasn't afraid to try and fail because I got such great, inspirational support from the faculty and my fellow students.

Also, I was fortunate to have a rich academic experience outside the classroom. I was a designer and photographer and for the Daily Pennsylvanian and an editor on 34th Street magazine. It was in the offices of the DP that I really learned how to "ship" products – there's very little time for hesitation when you publish a full newspaper five days a week. At the DP I learned what it meant to have real "customers" – our readers – and how to deliver what they want. It was easily as important as my in-classroom experience. I met many great friends there, and still smile when I see former DP colleagues' names in the bylines of the world's most respected publications today.

If you could go back to your junior year in DMD, what do you know now that you wish you'd known then?
The main thing I have learned since DMD is that you don't have to play it as safe as you think. I wish I had been bolder and braver after graduating – I wish I had taken more risks early on in my career. For example, I might have more quickly moved closer to cities with strong games development industries, like San Francisco or Seattle. Or perhaps I would have started a company, or taken a year in the Peace Corp. Although I like my work, I spent way too much time in office buildings during my twenties. Great citizens of the world make great products – you have to remember to seek the experiences and adventures that make you a whole person.

How did your education at Penn help you in your workplace?
The interdisciplinary work I did in art, engineering and design has been an immensely useful cognitive base for my career in games. As a producer, I have to quickly shift focus from technical to creative problem solving, and from logistical organization to financial modeling. I have learned a lot on the job, but the quantitative, logical and creative development skills I practiced and Penn gave me the foundation and confidence to dive into nearly any software or media challenge I face.

Group projects were invaluable. It's hard to understate how important collaboration and cooperation is on a professional game team. Everyone relies on everyone else. In my experience, "lone wolf" geniuses are useful, but can have limited value in business because most problems are too big for one (even really smart) person to solve. It always takes a team.

Smart generalists who can flex and cooperate with others to get the job done can be just as valuable as deep subject matter experts. You have to be an omnivore to succeed on a game team – games are the ultimate computational and creative cauldron, you have to be able to understand multiple sides of the problem. If you're unwilling or incapable of compromise and cooperation you will probably fail. Group projects at Penn were great way for me to start to learn how to deliver as a team and how to share responsibility and empathize with colleagues.

What is it like in your current position? Describe your day-to-day responsibilities.
I am responsible for the overall completeness, correctness, budget and quality of the games I produce. I am also required to think critically about the market and originate new products and ideas to compete in the marketplace. I design teams, connect talent and allocate capital to create relevant, innovative and fun games that customers love to play.

Specifically, I work with software developers to solve technical problems and improve gameplay quality and "polish." I work with game designers to invent new game mechanics and improve existing designs. And I work with artists to deliver market-leading presentation and fidelity in our titles. I try to channel my experience as an editor to bring out the best work in others – which is to say, I don't try to do their jobs, I try to understand the problems, ask the questions and unlock the resources that free my colleagues to do the best work they can.

What are your future goals?
I love working on new platforms and technologies. I have had very fulfilling experiences at the forefront of mobile, tablet and online games, and I hope to continue to work on nascent, promising platforms that have the potential to redefine what software and games can be. I especially love building products and businesses from the ground-up, and I expect I will continue to seek early-stage ideas and opportunities. I am an addict for "day zero" problems and have the most fun when the rules are least defined.

A rendered image of diamonds by Peter Kutz, DMD ‘13.

SIG Center for Computer Graphics
200 S. 33rd Street
Philadelphia, PA 19104