spring 13

Continuum

THE MAGAZINE OF THE UNIVERSITY OF UTAH

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THE IMPRESARIO: NOLAN BUSHNELL IS EVER THE ENTREPRENEUR

THE INNOVATOR: JOHN WARNOCK’S PUBLISHING REVOLUTION

THE IMAGINER: ED CATMULL MELDS SCIENCE AND ART

PIONEER IN SOUND: THE FATHER OF DIGITAL AUDIO

Game On

The U continues its computer graphics legacy with one of the top video-game programs in the nation
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www.healthcare.utah.edu/quality
The U continues its computer-science legacy with one of the top video-game programs in the nation.

By Jennifer Dobner

Launched in 2007, the University of Utah’s Entertainment Arts & Engineering program has quickly made its mark. The program was ranked third in the nation in 2012 by The Princeton Review, and alumni are already working in some of the top companies that create games. It should be no surprise that Utah’s flagship university offers this cutting-edge program, given the University’s legacy in computer science, and particularly computer graphics. U alumni who graduated in the late 1960s and ‘70s went on to develop technology and programming that essentially created the computer graphics industry, including object-oriented programming, simulation techniques, and computer animation. The pages ahead explore how the U’s video-game program came to be, and introduce you to some of the illustrious alumni and faculty members who helped pave the way and who continue to impact the industry today.

—The Editors

Curse of Shadows, a game created by U students, was published by a student company in 2012 and released through Xbox.
Your Comments

EXPLORING RARE BOOKS

Such a wonderful article ["Stories Within Stories," Winter 2012-13]—very finely written. …

Barbara Lynn Oleson Jeppson BS’64

Is there a reason that the staff are not wearing gloves? If I remember correctly, oils from the human finger could cause havoc on the paper. Just wondering.

Amy Birks BS ’98

I’m no expert on the wearing/not wearing of gloves when handling rare materials, but I learned from Luise [Poulton] that there is good evidence that wearing gloves causes problems. …

In any case, lovely article about a fabulous curator and great collection!

Alison Regan

Your Comments

Working with Fred [Montague] up at the Sill Center garden not only helped me recover from being a wayward theater major, but also served to help me ground myself in actualizing my values and becoming a responsible and aware world citizen (as much as possible). Although Fred did not stand in the way of the guilt and despair elicited by the revelation of environmental science facts and trends, he also taught us to have compassion for ourselves and each other as we tried to integrate this knowledge into our lives.

I have immense gratitude to him for his lessons in ecology and environmental citizenship, and he inspired me to follow my passion to my own vocation. I think of him often as I consider whether my lifestyle embodies my values, and especially when I’m working in my own organic garden. So, thank you Fred for turning on the light, so to speak. Your life continues to be a source of inspiration for how to live with integrity and passion.

Aaron Watt Rousseau BA’04

MEMORIES OF A MONUMENT

Great article ["A Monumental Tradition." Winter 2012-13]. I remember participating in the late ’50s as a freshman. Brought back many memories.

Carol Jean Summerhays BS’60

TRIBUTES TO THE ARTIST

FANTASTICO! ["The Groucho Marxist," Winter 2012-13]

Raynette Yoshida

All comments submitted via continuum.utah.edu

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Construction Update

The University of Utah currently has 12 major construction projects under way. Visit continuum.utah.edu to view renderings of some of the buildings.

Ambulatory Care Center
98 N. Mario Capecchi Drive
The center and its parking structures will provide a state-of-the-art facility for same-day health-care procedures and administrative offices for Primary Children’s Medical Center and the University of Utah Hospitals and Clinics.
Completion dates: Fall 2014 (first phase); 2024 (second phase)

L.S. Skaggs Pharmacy Research Building
1900 E. South Medical Drive
The structure will be connected to Skaggs Hall by an atrium and will feature research labs, animal facilities, and support and office space, and will also house the Utah Poison Control Center.
Completion date: May 2013

Kennecott Building expansion
1495 E. 100 South
The renovation and expansion include improving the south wing’s office and lab space, seismic retrofitting, a new stair tower and elevator, and a new chiller and boiler plant.
Completion date: Fall 2013

Student Life Center
1836 E. Ballif Road
The center will include gymnasiums, climbing walls, an indoor pool, fitness training facilities, and meeting space for students, as well as areas for food services and the Outdoor Recreation Program.
Completion date: January 2014

Lower campus parking terrace
1400 E. 100 South
The terrace will feature about 400 stalls and serve the lower campus area, including performance venues such as Kingsbury Hall.
Completion date: Summer 2014
**Continuum_Spring13_notebook_v5.indd   5**

- **David Eccles School of Business additions**
  1655 Campus Center Drive
  The second phase of the project features more classrooms, auditoriums, and office space. Completion date: May 2013

- **School of Dentistry**
  Wakara Way
  The three-story building will feature student, clinic, lab, teaching, and administrative space, and will have an adjacent multi-level parking structure. Completion date: December 2014

- **Football and Sports Medicine Center**
  600 S. Guardsman Way
  The building features training, locker, and meeting rooms; classrooms; hydrotherapy pools; an auditorium; and an athletes' lounge and cafeteria. Completion date: July 2013

- **Thatcher Building for Biological and Biophysical Chemistry**
  315 S. 1400 East
  This addition to the existing Henry B. Eyring Chemistry Building includes state-of-the-art classrooms, offices, laboratories for chemical research, and support spaces. Completion date: Early 2013

- **Beverley Taylor Sorenson Arts and Education Complex**
  1720 Central Campus Drive
  This will house the College of Education, as well as the Virginia Tanner Creative Dance Program, and will provide collaborative working and learning spaces, including classrooms and studios. Completion date: December 2013

- **Business loop parking terrace**
  1700 Campus Center Drive
  The terrace will have at least 600 stalls and will serve the Jon M. Huntsman Center and surrounding areas. Completion date: Summer 2014

- **School of Dentistry**
  Wakara Way
  The three-story building will feature student, clinic, lab, teaching, and administrative space, and will have an adjacent multi-level parking structure. Completion date: December 2014

- **S. J. Quinney College of Law**
  380 S. 1400 East
  The new building will reunite the law library with the school and will also feature teaching, gathering, and moot court/seminar space, as well as a rooftop garden. Completion date: Fall 2014
The University of Utah has begun a new admissions policy that allows new freshmen and transfer students to defer enrollment for up to seven consecutive semesters.

The policy goes into effect for the fall semester of 2013. The University made the change in late November 2012, to accommodate needs of students facing extraordinary situations such as illness, as well as students who decide to undertake military, humanitarian, or religious service. Requests to defer admission will be reviewed on a case-by-case basis. “This is an important new provision in our enrollment direction, and we strongly encourage students to take advantage of it,” says University of Utah President David W. Pershing. “Freshman students who want to study at the U and are faced with other obligations will not have to sacrifice their educational future. A deferment grants them a spot in their class at the U, and we guarantee a seamless re-entry when they are able to return.”

Students must apply and be admitted to the University in order to be considered for a deferment. For continuing students, the University’s existing leave of absence policy provides similar continuity.

The change in policy came after The Church of Jesus Christ of Latter-day Saints announced this past October that it would lower the age of eligibility for church mission service. A January report by the Utah System of Higher Education to the State Board of Regents notes that the impact of the LDS Church’s mission age change will vary among the state’s colleges, according to their student demographic makeup. Southern Utah University, Dixie State College, and Snow College expect a large impact, while the University of Utah, Utah State University, and Salt Lake Community College are preparing for smaller changes.

Most institutions expect to see enrollment decreases beginning this spring and continuing through the 2013-14 academic year, the report says. But those decreases are anticipated to be temporary, as many young men and women who serve LDS missions will return to campuses at a later date. Even so, the report says, with the younger missionary age, “there is also uncertainty as to whether re-enrollment will occur at the same rates as it does currently.”

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**Writer Liz Murray to Speak at Commencement**

Elizabeth “Liz” Murray—a writer and inspirational speaker whose life story *From Homeless to Harvard* has touched millions—will deliver the University of Utah’s general commencement address on May 2.

Murray grew up in the Bronx in the 1980s and ‘90s, a daughter of cocaine-addicted parents, in a home where there were always plenty of drugs, but never enough money or food. By age 15, Murray’s mother had died of HIV, her father had left, and she was homeless. She lived on the streets, riding the subway all night and eating from Dumpsters. But with incredible determination against seemingly impossible odds, Murray finished high school in New York in just two years, received a scholarship from *The New York Times*, and graduated from Harvard University in June 2009.

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**U Professor Coaches Orcs and Hobbits**

Sarah Shippobotham, associate professor and head of the University of Utah Department of Theatre’s Actor Training Program, recently returned from eight months working with hobbits and orcs and dwarves, as a dialect coach in New Zealand for Peter Jackson’s *The Hobbit: An Unexpected Journey*.

Shippobotham coached actors in several British accents as well as in the languages of Elvish, Dwarvish, and Black Speech. Shippobotham most often worked on the second unit, directed by Andy Serkis (Gollum himself).

“It was an amazing experience to work on such a huge production,” she says. “This was the first film I have worked on, and the sets were incredible.”
University to Create Center for Impact Investing

The David Eccles School of Business at the University of Utah plans to create the James Lee Sorenson Center for Global Impact Investing, through a $13 million personal gift from Sorenson (shown at left).

The new center will engage students at the University of Utah and partner universities in creating sustainable change on regional and global levels through high-impact social investment, innovative curriculum, and research. The center “will provide unparalleled experiences for our students and faculty to participate directly in solving some of the world’s thorniest and most persistent societal problems,” says U President David W. Pershing.

The issues the center will address range from education and health care to housing, green energy, agriculture, and more.

U School of Dentistry to Be Built in Research Park

The University of Utah’s new School of Dentistry building will be located in Research Park and named after Ray and Tye Noorda in recognition of a $30 million donation.

The school was approved by the Utah State Board of Regents in July 2012 and will enroll its first four-year class of 20 students in fall 2013. “This is a historic step forward for dental education in Utah, and we owe a tremendous debt of gratitude to Ray and Tye Noorda and their family for making this school possible,” says G. Lynn Powell, founding dean of the new school.

According to the Noorda family, the donation exemplifies Ray and Tye Noorda’s passion for contributing to the public good, as well as fostering the innovation and research that drives economic development and job creation. Ray Noorda founded the software company Novell in the 1980s and died in 2006. His wife, Tye, and four surviving children all participated in making the decision to donate to the dental school.

Vivian S. Lee, the U’s senior vice president for health sciences, says the dental school will be an important partner with the U’s other clinical, research, and training programs in nursing, pharmacy, health, and medicine: “This new dental school helps move our health sciences programs to the next level.”
The Impresario

Four decades after Atari, U alum Nolan Bushnell is ever an entrepreneur.

Story by Elaine Jarvik      Photos by Ed Carreón

U alum Nolan Bushnell sits in his lab behind the garage of his Los Angeles home, where he likes to tinker and brainstorm ideas for new products and companies.
Spacewar! is the silent movie of video games; it is the crank telephone, the biplane, the paper fan—every beginning that now seems laughably and sweetly from another era. In the mid-1960s, when he was getting his bachelor’s degree in engineering at the University of Utah, Nolan Bushnell played Spacewar! every chance he got. This entailed 1) stuffing wadded-up paper into the lock of the computer room in the Merrill Engineering Building so the door wouldn’t click shut, and 2) sneaking in late at night with his friends, when no one else was using the expensive mainframe computers.

This was a time in the history of computers when only the lucky and geeky—either in academe or research labs—could play a game on a screen, and the few games that existed consisted of a smattering of white dots. The idea of a video game industry seemed as improbable then as the idea of a computer small enough to sit on your lap. But his time at the U convinced Bushnell that the people who figured out how to combine computers and fun were going to make a whole lot of money.

Bushnell had three things going for him: He had big ideas, he loved to tinker, and he was a born entrepreneur. When he was 10, he built a rocket ship out of a bottle, a roller skate, and some alcohol, an endeavor that produced a startling but brief ball of flame in his parents’ Clearfield, Utah, garage. Around that same time, he was known in the neighborhood as the kid who could fix your broken TV; he lured his customers in by charging only 50 cents for opening up the set, and he then inflated the price of the vacuum tubes to get it running again.
His father, a cement contractor, died when Nolan was 15, and the teen briefly ran the business. After high school, he enrolled at Utah State University and then transferred to the University of Utah in 1963. There was no computer science department at the U when he arrived (computer graphics pioneer David C. Evans BA’49 PhD’53 was hired in 1965 to start the program), so Bushnell BS’69 got his degree in electrical engineering. Retired electrical engineering professor Carl Durney remembers that Bushnell, the man who eventually helped launch an entire industry, was on academic probation nearly every quarter at the U but was “conscientious and dependable” as secretary of the student branch of the Institute of Electrical and Electronics Engineers.

Bushnell had always loved to play any kind of game, and during the summers when he was in college he worked on the midway at Lagoon amusement park, in Utah’s Davis County. After two summers, they made him manager of all the games. “It was my battlefield MBA,” he says now. When he was manning the booths, he learned how to convince customers to step right up and spend more money. As manager, he learned that if you streamlined the operation, using, say, four balls instead of six to knock down the pyramid of fake milk bottles, the park could make more dollars per hour. During his tenure there, he says, Lagoon’s midway games had the highest revenue-per-customer ratio in the country.

After the U, Bushnell went to work for the northern California electronics company Ampex, where he met Ted Dabney, a more seasoned engineer. Together, in their spare time, they created a video game called Computer Space, their version of Spacewar! They produced and distributed it in 1971—making it the first commercially sold, mass-produced video game in the world. It racked up $3 million in sales and made an appearance in the 1973 movie Soylent Green, as a symbol of the future. Still, it didn’t seem like the start of a revolution.

In the 2011 documentary film Something Ventured, Bushnell minces no words about his experience with Nutting: “These guys couldn’t find their butts with both hands. I said, ‘You know, I can run a company, and I won’t make any of the same mistakes these guys are doing.’” (Bushnell typically says what’s on his mind. Or, as venture capitalist Don Valentine says in the same documentary: “It takes a while to get used to Nolan.”)

Bushnell and Dabney decided to venture out on their own, and in 1972 they formally incorporated as Atari, named after a move in one of their favorite board games, Go!

The second arcade game they invented was Pong. Like Spacewar!, Pong wasn’t an original idea. Bushnell had seen a similar game called Odyssey, created by inventor Ralph Baer and
produced by Magnavox, but, as Bushnell later said, “I didn’t think it was very clever.” So he asked his newly hired engineer Al Alcorn to make something better. (Magnavox later sued Atari; the case was settled out of court.)

Pong included a white square (the virtual ping pong ball), two vertical rectangles (the paddles), and a broken white line (the net). Unlike Odyssey, it included a score box and some squeaky, buzzy sounds. Bushnell and Alcorn then built a small wooden cabinet, attached a Laundromat-style coin box, and took it a few miles up the road to a Sunnyvale, California, bar called Andy Capp’s. The machine didn’t have a name on it, and there were no instructions. A few days later, they got a call from the bar: So many people had played the game, the coin box was jammed with $100 worth of quarters.

So the two engineers built 12 more Pongs. They sent 10 to other bars and one to the giant pinball manufacturer Bally. The company was kind of interested but wanted to see the profit reports first. “They’ll think we’re lying. Shall we fudge the numbers?” is the way Atari veteran Curt Vendel describes Bushnell and Dabney’s reaction. Vendel, a computer games consultant who owns Legacy Engineering Group, runs the virtual atarimuseum.com and is the author of Atari Inc.: Business Is Fun. So they "skimmed off all the numbers" to make the profits look low enough to be believable, says Vendel. "And still Bally didn’t believe them." Eventually, Atari itself ended up making and selling the game—a total of 38,000 worth of the arcade iterations and, later, 200,000 of the consumer version, Home Pong.

“I think the technology we developed at Atari made it possible for video games to develop maybe eight years faster than they would have,” Bushnell now says. He credits his engineering education at the U: “I understood not just the mathematics but the real world of how these circuits worked, so I could cut some corners.” It then became a matter of tricking the circuitry to go fast enough, he says, “and using parts way outside spec.” Thirteen years after graduating, Bushnell was awarded the Distinguished Alumnus Award, the highest honor bestowed by the U Alumni Association, in recognition of his accomplishments in the video-game industry.

If Spacewar! was the biplane of video games, Home Pong was the DC-3, available at last to everyone. In 1976, a year after Sears started selling Home Pong, Bushnell sold Atari to Warner Communications for $28 million. In 1977, Time magazine profiled him in a story called “The Hot New Rich.” By then, he owned a Mercedes, a 15-acre estate, a ski cabin, and a yacht, and he was divorced (and single again). That same year, he started Chuck E. Cheese’s Pizza Time Theater, with its arcades and relentless animatronics. Within five years, there were 200 of the restaurants in four countries. As Inc. magazine wrote in 2009, Bushnell “pretty much invented the whole cocky-young-entrepreneurial-genius pose.”

For all his derring-do and confidence, however, Bushnell’s journey since Chuck E. Cheese has been less spectacularly successful—at times beset by bad luck and bad timing. With the Great Video Game Crash of 1983, stocks in game companies plummeted, and Atari ended up dumping 14 truckloads of game cartridges and equipment into a landfill in New Mexico. By then, though, Bushnell had already left the company, his nine-year noncompete clause with Warner Communications was up, and he was ready to get to work on his new ideas. He started a business incubator called Catalyst Technologies and set about developing some forward-thinking projects.
products that made him a lot of money but never quite caught on.

There was ByVideo, a touch-screen electronic shopping system (sort of like online shopping before there was a widely used Internet). There was Axlon, which created AG Bear, a talking stuffed toy. There was Etak, a pre-GPS but not always reliable navigation system for cars that was the first to digitize the world’s maps. He sold Etak to Rupert Murdoch for $50 million.

And there was the Androbot. A fan of science fiction since he was a kid, Bushnell was convinced that personal robots could make life easier and more fun. At the 1983 Consumer Electronics Show in Las Vegas, he introduced Bob and Topo, the robots he thought would start this revolution. He had financed the R&D costs himself by taking out personal loans from the investment arm of Merrill Lynch, secured by his Chuck E. Cheese stock. He planned to pay the loans back when Merrill Lynch took Androbot public. Then Merrill Lynch changed its mind on the IPO, Chuck E. Cheese stock plummeted, and Bushnell was deeply in debt. By 1985, he owed Merrill Lynch $23 million.

The ordeal with Merrill Lynch lasted 15 years. By the time it was over, Bushnell had lost his two houses (including an $8 million one in Paris) and all his other assets, he was sued by Merrill Lynch over a $500,000 promissory note, and he lost his backers for his next project, a newfangled restaurant arcade called E2000. He ended up renting a house in Los Angeles and starting over.

“My wife has said she’ll leave me if I ever try another robot,” he says about Nancy Nino, whom he married two marriages. “I’m trying to stay as current as I can, because I have all these kids, ages 18 to 42. …I can talk tech with any of my kids and generally stay ahead of them.”

He has also written his first book, Finding the Next Steve Jobs, a how-to (just published in February) about hiring and nurturing creative employees. Once upon a time, during the early days of Atari, Bushnell actually hired the real Steve Jobs, after Jobs had dropped out of Reed College. Later, after Jobs had left Atari, he came to Bushnell wondering if he would like to invest in a little home computer he and Steve Wozniak had come up with. But Bushnell and Atari had computer games on their minds, and turned Jobs down.

Bushnell isn’t one to dwell on the millions he might have made, or on failed ventures like his uWink Bistros. He opened three of the interactive entertainment restaurants with touch-screen terminals at each table, on which the diners (in the days before mobile handheld computers) could play video games with each other and watch short videos. But he was never able to franchise them. Then, too, there’s the uncertainty of whether the movie about his life, optioned by Paramount in 2008 and slated to be produced by and star Leonardo DiCaprio, will ever actually get produced.

Bushnell is never short of ideas for new products and companies, and he still likes to tinker. He has a small lab behind the garage of his Los Angeles home. It is filled with so many electronic parts, he says, “I basically could probably build the space shuttle if I had to.”

Four decades after Atari, and at age 70, he is still looking to create the next big thing.
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Game On

Robot Pinball Escape, a game created by U graduate students in the Master Games Studio, was published in 2012.
As kids growing up in Boston, Andrew Witts and his older brother Jason spent hours before a video screen, locked in fierce battle with armies of skeletons and zombies that were wreaking havoc over a virtual Conan the Barbarian-type world. The video game, Golden Axe, paired the brothers as heroes—one in the form of a gnome and the other a muscle-ripped barbarian. They fought against the kingdom’s archenemy, who had captured the royal family and stolen a magic axe. In the end, of course, the brothers always prevailed from their perch on the family couch, their nemesis was vanquished, and peace was restored to the kingdom.

The U continues its computer-science legacy with one of the top video-game programs in the nation.

By Jennifer Dobner
“It was pretty much *Lord of the Rings*, only with an axe,” says Witts, a self-described “hard-core gamer.” “I really felt like my brother and I were the rulers of this land and we were protecting it from the evil enemy. We played endlessly.”

Now, as a first-year graduate student in the University of Utah’s Entertainment Arts & Engineering program, Witts is learning to channel his unbridled enthusiasm for game playing into a career. A collaborative, interdisciplinary effort between the School of Computing and the Department of Film and Media Arts, the program teaches graduate and undergraduate students to develop, design, and publish video games. It trains artists and engineers in the creative, analytical, and technical skills required to navigate a wide spectrum of digital mediums and to be leaders in next-generation technologies. Graduates are becoming game designers, filmmakers, special effects experts, animators, and more.

“It’s an extremely broad set of skills and understandings that you have to have in order to make good games,” says Robert Kessler BS’74 MS’77 PhD’81, the program’s co-founder and the associate director of the School of Computing. “It’s very complex, and the technology and graphics being used are really pushing the frontier.”

Launched in 2007, the Entertainment Arts & Engineering program is already making its mark. The program has already been ranked among the top three video game design programs in the nation by *The Princeton Review*, which began issuing rankings just three years ago.

The program has already been ranked among the top three video game design programs in the nation.
Corrine Lewis is a gamer. She got hooked as a kid playing alongside her father. By the time she was a young teen, she was hanging out in a Salt Lake City-area bar where she played console games. She also loved *Dungeons & Dragons*.

“I think I have always been a puzzle solver,” says Lewis BA’03, who is program manager for the University of Utah’s Master Games Studio, the graduate component of the U’s Entertainment Arts & Engineering program. Many of the video games she played while she was growing up focused on finding keys to riddles in order to win the game. More often than not, she was playing games with and against boys. Later, when she began working in sales and marketing jobs in the tech industry, she was also often one of only a handful of women. “But the reason I always liked tech is that it never mattered what I looked like; it was what was in my brain,” she says.

Even so, Lewis says she thinks about gender balance a lot when it comes to her students. At the undergraduate level, only about 10 percent of the approximately 200 students in the U Entertainment Arts & Engineering classes are women. Women also have made up only about 10 percent of each of the program’s three graduate cohorts, Lewis says. The inaugural class in 2010 had 19 students, including three women, all of whom were artists. Class numbers jumped to 30 in 2011, but again that included only three women artists. The 2012 class also has 30 students and three women, although they come from diverse fields: one artist, one producer, and one engineer.

To help promote and support women in the digital entertainment industry, Lewis launched a U-based chapter of Women in Games International (WIGI) in April 2012, along with Laura Warner BFA’10 MFA’12, who was then a graduate student in the U program. Founded in 2005, the national nonprofit group, made up of both female and male professionals, works to promote diversity in all aspects of the video game industry, including game development, publishing, media, education, and workplace environment. Nationally, the number of female video-game designers is small. WIGI wants to change that, and believes that increased equality and camaraderie among genders will improve the industry overall and the quality of games produced. The WIGI chapters hold monthly social activities that double as networking and mentoring opportunities. The group also has an online mentoring service for members.

Graduate student Michelle MacArt BA’11 appreciates the effort. An artist whose true love is sound design, MacArt was one of the first women to enroll in Entertainment Arts & Engineering program classes as an undergraduate and expects to complete her master’s degree this spring. While developing games as class projects, MacArt says, she often advocates for the inclusion of female characters. She also pushes for those characters to look like “real” women, not ultra-skinny girls with unrealistic physical proportions.

“I was the only girl for the longest time,” says MacArt, who was on the student team that developed the *Rapunzel’s Fight Knight* game. “It’s a growing industry, and we need more women and ideas from women in game companies to balance them out. I’d like to see more in the arts and as programmers so that things are more diverse.”
In 2012, the U’s undergraduate program was ranked third in the nation, just behind the University of Southern California and the Massachusetts Institute of Technology. At the graduate level, the U’s program, known as the Master Games Studio, wasn’t among the 10 ranked programs, but was included with the nine other schools that received honorable mentions. “Those rankings are amazingly useful,” says Kessler. “Now we’ve got kids calling us from all over—kids who never thought about Utah before. This year, we had 12 or 13 international students apply. The first year, we had none.”

Another source of bragging rights is that Entertainment Arts & Engineering students get jobs. Good jobs. Six-figure jobs, sometimes even before they finish the program. In 2012, each of the 16 graduating students in the first Master Games Studio graduate-program class had jobs in hand, Kessler says.

One thing that sets the program’s graduates apart is that they enter the workforce having already published a video game. That puts them way ahead of the competition, Kessler says. “Industry says it’s like our students have had their first year of working out of the way, so that they can come in and really be productive. We really have tried to make this like a studio simulation.”

The U faculty members are also making technology advancements and developing new areas of academic research and design, particularly in the so-called “serious games” arena. That opens doors to commercial opportunities for the University and provides students with additional hands-on projects for learning.
Think only millionaires start endowment funds?  
ANYONE CAN – THESE STUDENTS DID

“Dr. Chapman changed our lives — and we wanted to thank him in a meaningful way.”

In September 2011, former College of Mines and Earth Sciences graduate students Kevin Furlong, Rob Harris, Bill Powell and Sean Willett established the David S. and Inga M. Chapman Endowed Scholarship Fund in honor of their former professor.

At Chapman’s formal retirement and 70th birthday party, the students celebrated the creation of this fund, which expands professional development opportunities beyond what is typically available to graduate students. Chapman’s outstanding work inspired his students to create a fund that will continue his legacy at the College of Mines and Earth Sciences.

IMAGINE U DOING THE SAME.

When creating an endowment fund, you can choose the name and what the fund can be used for – whether it’s scholarships, research, or other support. Endowment funds play a critical role in continuing the U’s mission.

Learn more about the great things your contributions accomplish at www.giving.utah.edu
Got game? The students of the University of Utah’s Entertainment Arts & Engineering program do. A driving purpose of the program at both the undergraduate and graduate levels is making sure students have the opportunity to produce and publish video games—valuable experience that gives them an advantage as they head to jobs in the entertainment arts industry. So far, most of the student-produced games are getting to market through small student-run companies—an experience that introduces them to careers as entrepreneurs. A handful of projects are being published through Utah Game Forge, a University-run company formed last year.

Here’s a year-by-year look at games students have created:

<table>
<thead>
<tr>
<th>Year</th>
<th>Game</th>
<th>Publisher/Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>Rapunzel’s Fight Knight</td>
<td>became the first published game by the student-created company Axull. About 500 copies have been sold through Xbox.</td>
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<td></td>
<td>Urban Space Squirrels</td>
<td>was published by DTA Entertainment, a student company. About 2,000 copies have been sold through Xbox Indie Games.</td>
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<tr>
<td>2011</td>
<td>Mr. Gravity</td>
<td>was published by the student-run team Angry Newton and distributed by Xbox. About 750 copies have been sold.</td>
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<td>The Last Pod Fighter</td>
<td>was published by the student company Fighter9 Studios and is distributed by Xbox.</td>
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<td></td>
<td>Minions!</td>
<td>was released by Turtle Toss Studios, a company composed of 10 students. With nearly 25,000 sold, this is the most financially successful Entertainment Arts &amp; Engineering program game and was ranked by players as one of the 16 best Xbox Live Indie Games.</td>
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<tr>
<td>2012</td>
<td>Curse of Shadows</td>
<td>was published by the student company 1 Block East. Released through Xbox, some 400 copies have been sold.</td>
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<td></td>
<td>Heroes of Hat</td>
<td>became the first student-generated game published through Utah Game Forge, a U company created to market student work, and was the first game from students to use multi-player cooperative mode technology, which allows players to work as a team to accomplish the game’s goals. About 400 copies have been sold.</td>
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<td>Robot Pinball Escape</td>
<td>was developed by a team of graduate students, published through Utah Game Forge, and distributed by Desura. Downloaded about 13,000 times, PC Gamer mentioned it as a top free download. The game was also published on a disk that was inserted in Computer Bild, a European technology magazine, and distributed to 500,000 subscribers.</td>
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<td></td>
<td>Erie</td>
<td>was also released as a free download by Desura, after being published by Utah Game Forge. The virtual horror game has been downloaded by more than 35,500 people. It can also be played though YouTube and has developed a following among players who have posted videos of themselves playing the game. More than 2 million people have seen those videos.</td>
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</table>
Those kind of credentials are exactly what Witts, a graduate of the University of Massachusetts at Amherst with a degree in English and creative writing, was looking for in a graduate school. After considerable research of the 50 or so programs nationwide, Witts says the U’s program was the “intelligent choice,” so he quit his marketing job and moved 2,500 miles west to Utah. “I wanted to make games and release games, and I wanted to be given a forum where I could express myself,” says Witts, a self-taught Web programmer who also worked for an education software company. “What I saw in this program was a program that promised opportunity above all. I knew it would prepare me to get out and get a job doing what I love every day.”

Video games and other forms of digital entertainment media are big business. Economic forecasters project the global market for games—both hardware and software—will grow from about $67 billion in 2012 to more than $82 billion by 2017. In 2011 alone, the industry generated revenues of nearly $25 billion, according to data from the Entertainment Software Association. Consumer demographic data also show that the driving force behind the industry isn’t the stereotypical 17-year-old boy, playing games in his parents’ basement. In fact, more than 47 percent of all game players are women over age 18. Men ages 18 and younger make up only 17 percent of the games market. And the games themselves are also more diverse than stereotypes suggest. More than 40 percent of games played are digital versions of popular board games, puzzles, TV game shows, or trivia games.

In terms of dollars, Utah isn’t yet among the top 20 places where video games are made, but it’s getting close, says Roger Altizer MS’06, co-founder of the U’s Entertainment Arts & Engineering program and its director of game design and production. “The state is perched on the industry’s cutting edge, and the presence of the U’s program provides an invaluable opportunity for both industry and students, he says.

Information technology is among seven industries that receive the focused attention of the Utah Governor’s Office of Economic Development. The state has set aside $5 million to support new information-technology companies and recruit top researchers through the Utah Science Technology and Research initiative, or USTAR. Craig Caldwell, whose experience includes work as a 3-D specialist for Walt Disney Animation Studios and serving as head of the largest film school in Australia, was hired to lead the U’s program.
Video gaming is by far the largest sector of the state’s information-technology effort, says Jeff Edwards, chief executive officer of the Economic Development Corporation of Utah, a private, nonprofit group that works closely with state officials. A 2011 report by that group said Utah had the fourth-highest per capita concentration of multimedia artists and animators in the nation. The industry employs about 2,100 people and added more than $93 million to Utah’s economy in 2009. The state has approximately 5,200 technology companies, of which more than 100 are digital media shops or film studios. Among the notable names are Disney Interactive Studios; Electronic Arts, Inc.; Imagine Learning; Chair Entertainment/Epic Games; Smart Bomb Interactive; and TruGolf, Inc.

To grow, the industry will need a steady stream of skilled workers and creative, innovative thinkers. The U Entertainment Arts & Engineering program’s focus and deep connections to industry set it apart from programs at other Utah schools, says Steve Roy, associate vice president for economic development at Utah Valley University and USTAR’s director of outreach and innovation activities in central Utah. “One of the key elements of economic development is workforce development and talent development,” says Roy. “The University of Utah has been able to access the industry and align themselves with industry needs. I think that’s why that program is such a good, solid program. They’ve spent the time to develop the curriculum.”

It should be no surprise that industry would find Utah’s flagship university offers a breadth of talent and a cutting-edge program, Edwards says. The Entertainment Arts & Engineering program’s roots reach back nearly five decades, to the mid-1960s, when a fledgling Computer Science Department with a deep bench of visionaries began to revolutionize computer technology and graphics. Computer scientist David Evans BA’49 PhD’53 was hired by the U in 1965 to start up the Computer Science Department within the College of Engineering. Evans knew competing with early computer science powerhouse such as Stanford University and the Massachusetts Institute of Technology would be difficult, so he looked for a wide-open field in which a new program could establish itself. That field, he decided, was computer graphics.

Funded by grants from the U.S. Defense Department’s Advanced Research Projects Agency (ARPA), for open-ended research, Evans and his colleague Ivan Sutherland recruited bright graduate students and challenged them to make new discoveries and advances in computer graphics. Those students went on to essentially found the computer graphics industry, developing such concepts as graphical user interface, object-oriented programming, simulation techniques, and computer animation. And after graduating, those students established companies such as Adobe Systems, WordPerfect, Netscape, and Pixar Animation Studios.

Among the department’s alumni of note are Nolan Bushnell BS’69, the co-founder of Atari; Ed Catmull BS’69 PhD’74 who launched Lucasfilm’s computer division, later co-founded Pixar, and now heads both Pixar and Walt Disney Animation Studios; Alan Kay MS’68 PhD’69, who helped pioneer the laptop computer; and John Warnock BS’61 MS’64 PhD’69, who was the first to develop desktop publishing systems and co-founded Adobe. “It’s a great story about how Utah took a very early and very prominent place in the development of the computer industry,” says Edwards.
It’s one thing to build video games. It’s another to get them to market and into the hands of gamers, and the University of Utah has taken the unusual step of creating a company, Utah Game Forge, to do just that.

The University’s Entertainment Arts & Engineering program and the U’s Technology Commercialization Office started Utah Game Forge in 2012. The company is owned and financed by the U and works to place student games with commercial distributors. Utah Game Forge has also secured about a half-dozen commercial game-development contracts with outside companies and employs students to do the work.

“Few schools publish games, and we have yet to run into another that has a company dedicated to publishing student games and landing contracts for students to work on,” says Roger Altizer MS’06, co-founder of the U’s Entertainment Arts & Engineering program and its director of game design and development. “The University of Utah is one of the most entrepreneurial schools in the nation, and Utah Game Forge is both a product of that culture and a service for its business-minded students.”

Utah Game Forge cultivates relationships with game-platform holders such as Microsoft and Apple and offers them student-produced games for distribution consideration. Utah Game Forge then handles the finances and legal obligations of any contracts. Royalties from any game sales are shared equally by the students, Utah Game Forge, and the University. Students surrender some commercial rights to their games when they publish through Utah Game Forge. However, students retain their intellectual property rights to the games they develop and can use elements of them for future projects.

Some students form their own companies and publish their games on their own, but for those students who opt to use Utah Game Forge, the company makes the publishing process a bit easier, says Robert Kessler BS’74 MS’77 PhD’81, Entertainment Arts & Engineering’s co-founder and executive director. Having a published game to their credit gives program graduates a jump start in the highly competitive video games job market, he says.

So far, the company’s games have received more critical acclaim than financial reward. The first published game, *Heroes of Hat*, debuted in May 2012. About 400 copies have been sold, at a cost of $1 each. *Heroes* was followed in the fall by two games produced by graduate students: *Tactical Measure* and *Erie*. 
Can a virtual superhero have therapeutic powers? He might if his name is Vance B. Strong, star of Sandy Shores, a video game designed to help young cancer patients battle their disease.

The game was designed in 2011 by Roger Altizer MS'06, a professor and co-founder of the University of Utah’s Entertainment Arts & Engineering program, and a team of five graduate students, in collaboration with Carol Bruggers, a pediatric oncologist at Primary Children’s Medical Center, and Grzegorz Bulaj, a U associate professor of medicinal chemistry. Robert Kessler BS'74 MS'77 PhD'81, a co-founder and executive director of the program, handled the technical issues of working with new technology, and Craig Caldwell, the program’s director of digital technology, worked on the artistic aspects of the game. Sandy Shores became the first health game created at the U, and more are in the works. For Sandy Shores, Bruggers and Bulaj obtained seed money from the U Department of Pediatrics and approached Entertainment Arts & Engineering for help after talking about ways to incentivize treatment for children in a way that was not just fun, but also contributed to physical and emotional well-being. Young cancer patients often spend weeks quarantined in small hospital rooms and undergo intense treatments that leave them feeling sicker than their disease had. The result can be a loss of physical conditioning and emotional health, which can undermine the children’s ability to recover.

Altizer and the other U researchers set about creating a video game to help incentivize physical exercise for the patients. Then-students Kurt Coppersmith BFA'10 MFA'12, Laura Warner BFA'10 MFA'12, Brandon Davies BS'12, Wade Paterson MS'12, and Jordan Wilcken MS'12 also worked on the game. Each element of the game, from its theme and colors to the type of tasks accomplished and the physical movements the players use, was vetted and tested with patients, physical therapists, and social workers. Altizer was also able to tap his industry contacts to find a motion-control device being developed by Sony with an electronic frequency that does not interfere with sensitive medical equipment.

The resulting game features the cape-clad Vance, who battles a series of obstacles that threaten his relaxing beach vacation. In one scenario, Vance scrambles to clean up after an army of bright red robotic crabs littering the beach, and in another, he uses mortar and bricks to build a wall to stop a tidal wave from flooding a city. With each victory, Vance’s image on the screen gets stronger and healthier, just like the kids who are battling cancer. The children primarily use upper body and arm movements to play the game, which helps raise their heart rate. Best of all, the game isn’t boring. There are no pills, no IV bags, and no negative side effects. And, importantly, no one dies. “The psychological message of that is huge,” Bruggers says.

Bruggers and Bulaj plan to conduct a series of clinical trials and hope the FDA will eventually approve the game for therapeutic use. A nonprofit company in development through the University’s Pierre Lassonde Entrepreneur Center and the Technology Commercialization Office will eventually make the game commercially available, Bulaj says.

The U has already begun developing more health games. John Hollerbach, a U research professor who directs the robotics track in the School of Computing, is working on a National Science Foundation-funded project to enhance physical therapy for patients with spinal cord injuries. His team’s “treadport” is a giant treadmill inside a cave with three large video screens that transport patients to virtual worlds.

Entertainment Arts & Engineering students are assisting Hollerbach in developing other games and virtual environments to engross and motivate patients to work harder and spend more time on physical therapy. Neuroworx, a Utah physical therapy provider, is a project partner.
Games studies programs have existed in academe for about a decade. For many people, though, it may still seem counterintuitive to teach video games in a university setting. But technologies and digital media permeate both the modern economy and the cultural conversation, making games “too big to ignore,” says Altizer.

Even with the U’s history of innovation in computer science, the Entertainment Arts & Engineering program’s existence is something of a serendipitous accident. In the mid-2000s, Kessler was pondering a couple of problems. Enrollment in computer science courses was dropping, and the program needed a jump start. Kessler also wanted a better way to teach engineering students how to develop software programs that would last more than a nanosecond.

A video game provided a solution. At a Microsoft conference, Kessler acquired the source code for the game Half-Life 2. Back in Utah, he set students to work rewriting nearly a half-million lines of code, altering the game from its dark and violent, first-person shooting foray into a team-oriented video version of capture the flag. “The students loved it,” he says. “They already loved games, and then this is a game that they got to modify and work on.”

With the seed of an idea now growing, Kessler sought out his industry contacts to get a clearer picture of their needs. When graduates enter the workforce, he asked, what skills are students still missing? The answer: Most have good computer science skills or really good art skills, but they don’t have any idea how to work together. “I talked to a lot of companies—Pixar and Disney and Electronic Arts and Microsoft—and they all said, in essence, the same thing: You have to be really good, and you’ve got to be able to work with the other side,” Kessler says.

Back in the classroom, Kessler was working on a second video-driven experiment: a course in machinima, or 3-D movies that

Digital media permeate both the economy and the cultural conversation.

The U student game The Last Pod Fighter was released in 2011.
use video-game programming to generate computer animation. Again, the students responded with enthusiasm. “And this is when the serendipity happens,” Kessler says. One of the graduate students in the class at the time was Altizer, who was studying communications and had been working as a video-games journalist. Altizer was also teaching video-game design courses in the film department. They decided to try to create a way for art, film, and engineering students to take classes together.

Selling the idea across the campus to both Film Department and administrative leaders wasn’t hard. “I haven’t had anybody up here at the University who thinks this is a bad idea,” Kessler says. To make the new program a reality, a committee of faculty from both the Film and Computer Science departments met to examine existing electives and knit together the academic requirements of the program. “We didn’t ask for any money, and we didn’t create any new classes; we just kind of moved things around,” Kessler says.

When the program was unveiled in the fall of 2007, students in both disciplines clamored to join it, and the demand has remained strong ever since. The program now has three tracks: design and production, led by Altizer; art, directed by Caldwell; and engineering, directed by Mark van Langevelde PhD’09. For the current academic year, Kessler estimates that of the 800 students collectively enrolled in the Film and Computer Science departments, about 200 are in the Entertainment Arts & Engineering program. The program has remained only an academic course of study, but that may change during the 2013-14 academic year if a proposal to elevate it to a full-fledged degree program is approved this spring by the state Board of Regents.

Success at the undergraduate level helped lay the groundwork for a master’s degree program launched in 2010, under the Master Games Studio name, with just 19 students. The studio provides a study program for artists, engineers, and producers—the key team leaders who in both the classroom and industry manage projects from start to finish. The students from the various disciplines work together throughout most of their two years of academic study.

In the first year of study, students work on prototype games for real-world clients. In 2012, those included a marketing-focused game to drive up sales of the Utah-made Beehive cheese and a game to teach the Shoshone language to Native American teens. Second-year students focus on developing an original video game for publishing. The University in 2012 launched Utah Game Forge, a company that helps students market their games without having to form their own companies. Currently, 60 students are enrolled in the graduate program—a number Kessler hopes to double.

The results of both the graduate and undergraduates tracks have been extraordinary. Students are winning awards for their video games and films. They’re also pushing the boundaries of technology and grasping an academic approach to video games with ease. And the interdisciplinary work helps the students evolve and learn. “In the beginning, I think there’s not a lot of respect between them,” Kessler says. “You have the artists saying, ‘It’s because of me the games are beautiful, and you don’t have any art skills,’ and the engineers are saying, ‘It’s because of me that the game even works.’”

Kevin Hanson MFA’84, chair of the Film Department, says the artists and engineers often discover skills they didn’t know they had: “There are some engineers who turn out to be painterly, and some filmmakers who can actually do calculus.” Corrinne Lewis BA’03, who directs the Master Games Studio, says the students grew up playing video games, and the program helps transform their knowledge. “We give all of this practical skill stuff with an academic flavor so that they think more broadly,” she says.

Even after a single semester, Witts says the program has stretched his creativity, and his ideas about games. “Video games go way beyond just sitting there for hours getting to new levels and shooting people,” he says. He now finds himself playing games with a notepad at his side and pausing to write down what he finds interesting about how a game is designed. “It doesn’t ruin the fun of playing,” he says. “I’m still having fantastic fun.”

—Jennifer Dobner is a former longtime Associated Press reporter and editor who now is a freelance writer based in Salt Lake City.

Visit continuum.utah.edu to watch video trailers of some of the student games and to view a gallery with more photos.
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John Warnock stands outside the Blue Boar Inn, which he and his wife, Marva, own in Midway, Utah.
During one summer in the mid-1960s, John Warnock toiled away at a tire store in Salt Lake City, recapping old tires with new tread. It was difficult work: Grind off the old tread, apply adhesive, carefully align new tread on tire, seal the new tread. Repeat all day long. It was loud and hot and uncomfortable. And the tire shop gig just wasn’t working out.

Warnock was just finishing up his master’s degree in mathematics at the University of Utah, but his job prospects as a fully credentialed mathematician seemed uncertain. Sure, he could teach, but that wouldn’t provide much more cash than recapping old tires, and he wanted to provide for a family one day. “I remember thinking, ‘This is crazy. I’ve almost got a master’s degree in mathematics. I need to get a good job,’ ” Warnock now says.

He shot out a resume to IBM, and the company snatched up the young mathematician and sent him to a couple of different computer schools around the country for training. Once he devoted himself to computers, nothing would ever be the same.

Warnock BS’61 MS’64 PhD’69 has changed the way people interact with technology. He co-founded Adobe Systems, Inc., one of the most successful companies in America. His awards and honors have included the U’s Distinguished Alumnus Award in 1995, the American Electronic Association’s Annual Medal of Achievement Award (along with Adobe co-founder Charles Geschke) in 2006, the 2008 National Medal of Technology and Innovation, and...
The University of Utah’s John E. and Marva M. Warnock Engineering Building was completed in 2007 and provides some of the country’s most advanced engineering classrooms and facilities.

in 2010, the Marconi Prize, the highest honor for work in information science and communications.

The son of a prominent attorney, Warnock grew up in the Salt Lake City suburb of Holladay, Utah, along with his older brother and sister. He attended Olympus High School, where he had a singularly undistinguished and completely average high school career. Today, he would probably be labeled “unmotivated.” He expressed a passing interest in engineering, but a high school counselor told him that he had zero chance of being a successful engineer. He didn’t have a head for math.

Ninth-grade algebra was a disaster. He just didn’t understand mathematics, and he failed the class. But a math teacher at Olympus took an interest in him. “I had an amazing teacher in high school who, essentially, completely turned me around,” Warnock says. “He was really good at getting you to love mathematics, and that’s when I got into it.” When Warnock left high school, he was pulling straight As in math.

He attended the U after graduation—in part, because that’s what everyone else was doing. Almost everybody at that time who grew up in Utah went to the University. My dad went to the University, and my mom went there for a while.” In college, Warnock was, in his words, a “mediocre” student. He says that he’s fairly certain professors viewed him as one of those students who was solidly in the middle of the pack. He received his bachelor’s degree in mathematics and philosophy, and went on to graduate school at the U, finally managing to keep his grades up.

While working on his master’s degree, Warnock in 1964 solved the Jacobson radical, a rather complicated problem in abstract algebra that had remained unsolved since being posed in 1956. “I got swept up in the problem after I read about it in a book by [mathematician] Nathan Jacobson, and thought very hard about it for about one and a half years,” he says. “My thesis advisor worked through the write-up, and it was submitted and accepted for publication in the Transactions of the American Math Society.”

Soon after, in 1965, Warnock met Marva Mullins BS’66, who also was a student at the U. They dated for only five weeks and were married in September. “I knew right away that she was the one,” he says.

Armed with his master’s degree and a new sense of purpose, he got the job with IBM and then returned to the U, where he received a doctorate in electrical engineering in 1969. Warnock has said that he holds the dubious distinction of having written the shortest doctoral thesis in University of Utah history. That 1969 thesis outlined the “Warnock algorithm for hidden surface determination.” In layman’s terms, the algorithm assists a computer in its attempts to render a complicated image by breaking the image down into smaller parts that the computer can handle.

During his doctoral studies, Warnock also began working with ARPA, the U.S. Defense Department’s Advanced Research Projects Agency, on part of a government-funded contract granted to Evans & Sutherland, a University-based startup that was founded in 1968 by two leading professors in the U’s Computer Science Department, David Evans BA’49 PhD’53 and Ivan Sutherland. Most of the company’s staff members were current or former students. ARPA was designed to promote technological breakthroughs and big-picture thinking (initially to counteract work done by the Soviets) using small research teams. At Evans & Sutherland, Warnock first began to work on ideas for a computer language that would allow computers and printers to talk to each other. "The University was a very special place in the late 1960s," Warnock recalls. "With the ARPA contract that Dave Evans had, he was able to attract Ivan Sutherland and Tom Stockham and some of the really great researchers from around the country, and the group at Utah was just incredibly creative and really invented a lot of computer graphics as we know it today."

Warnock left Evans & Sutherland in the late 1970s and became a principal scientist at Xerox’s Palo Alto Research Center (PARC), in California. The center was doing some of the more cutting-edge computer graphics research at the time, and Warnock worked on interactive computer graphics projects that would shape the way computers would evolve over the next three decades. "Essentially, Xerox really invented the personal computer the way we know it today, with the use of graphical user interface, and the use of type and laser printers," Warnock says.
At Xerox, one of Warnock’s colleagues was Geschke, head of PARC’s Imaging Sciences Laboratory. The pair were like-minded idealists and innovators, intent on solving some of the thorniest problems in computer graphics. They had a particular interest in tackling a solution to computer-generated typefaces and images. At the time, it was virtually impossible for a computer to render a smooth, aesthetically pleasing typeface or picture, let alone send the image to a printer. The two scientists eventually developed InterPress, a printing protocol that allowed computers and printers to communicate.

But Xerox balked at Warnock and Geschke’s brainchild. The duo tried to convince Xerox executives that the system they had developed would be the wave of the future. Xerox wanted to make it a proprietary form, while Warnock and Geschke believed that InterPress would be better put to use in the marketplace, where it could become standard on its own. After two years of lobbying by the scientists, Xerox preferred to just sit on the idea. “They decided that they weren’t going to adopt what we had worked on, [and] they weren’t going to let the world know about it,” he says. “We thought that was crazy.”

Warnock and Geschke decided to make a go of it on their own, and they left to found Adobe Systems in 1982. One of their first technological breakthroughs was PostScript. Built on what they had learned with InterPress, PostScript paved the way for computers and printers to efficiently swap information, and it was developed for Apple’s LaserWriter printer in 1984.

Before Adobe’s PostScript, printing and publishing were solely the domain of companies that could afford expensive printing presses. To have anything printed in appreciable quantities required copious amounts of ink and large clattering machines that would take up the better part of a spare bedroom—even for the smallest machines. It was a process dating back to the earliest days of printing, largely unchanged. But Adobe’s new creation kicked off the desktop publishing revolution.

Adobe’s early days were rough. The Internet was just taking off, and Adobe’s own management team was at odds with each other over where the company fit in...
the computing spectrum. Then, in 1991, Warnock wrote a research paper about a program he dubbed “Camelot” (during Adobe’s formative years, programs were often given code names). The paper outlined an early version of what would later become the Portable Document Format, or PDF. For the first time, an electronic version of a document could be searched, reviewed, and sent to another user. The fonts in a PDF are preserved—what you see, the receiver will see. It allowed legal or business documents to be easily swapped between computers.

The PDF put Adobe on the map. Over the past two decades, the PDF format has replaced much of the flow of paper documents between users. Other revolutionary products followed at Adobe, including Illustrator and Photoshop, the latter of which has become an industry standard for graphic design work. Adobe is now a billion-dollar company and the world’s third-largest software developer for personal computers. Warnock stepped down as chief executive officer of Adobe in 2001 but still serves as co-chairman of the board, with Geschke.

These days, Warnock devotes much of his time to his other interests. He began collecting rare books in 1986, starting with the purchase of a 1570 edition of Euclid’s Elements from a bookstore in London. In 1995, he started a company called Octavo. The idea of the company was to sell CDs with high-resolution scans of the books. “We scanned some of the great books from the greatest libraries in the world, as well as a lot of the books I own,” he says. “The company was not successful for a number of reasons, but I had all the book files.” So he created the website rarebookroom.org to showcase the scanned images and make these rare books readily available to anyone with a computer and Internet access. The site now features more than 400 volumes.

Warnock’s other passion is Native American art. Over the years, he and Marva would often travel to the Four Corners region with their three children to visit Native American sites, and the trips sparked an interest in American Indian art and culture. “We started collecting casually, maybe 10 or 12 years ago,” he says. “We think the early history of the United States is interesting, and the art produced by Native Americans is incredible.”

The Warnocks’ collection began with baskets and pots and has since grown to include hundreds of items, including moccasins, shirts, and beadwork, from more than two dozen Native American tribes. The collection has toured the country in many exhibits, including one at the University of Utah in 2010, and a number of the pieces may end up going to Paris for an exhibit in 2014.

The Warnocks also have devoted attention to their home state in other ways. In 2003, the couple announced a major donation to the University of Utah, providing the funds to kickstart construction on the John E. and Marva M. Warnock Engineering Building. The 100,000-square-foot structure was completed in 2007 and provides some of the most advanced engineering classrooms and facilities in the country.

The Warnocks, who have a home in Deer Valley, still hit the slopes for skiing every winter. And they own the celebrated Blue Boar Inn in Midway, which also keeps them busy in Utah.

It’s been nearly a half-century since John Warnock spent that summer recap- ping tires. Thirty years after founding Adobe, he shrugs off his success and offers up one of his characteristic under-statements: “We sort of learned as we went. And it turned out all right.”

— Jason Matthew Smith is a freelance writer in Salt Lake City and a former editor of Continuum.

Visit continuum.utah.edu to view a gallery with more photos.
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Ed Catmull, who co-founded Pixar Animation Studios, stands in the company’s headquarters in California.
Imaginer

U alum Ed Catmull has taken a path that melds science and artistic endeavor.

By Kelley J. P. Lindberg

In the 1950s, young Ed Catmull loved Walt Disney animated films such as *Pinocchio* and *Peter Pan*. He dreamed of becoming an animator, and he filled up sketchbooks and created his own flipbooks. At Salt Lake City’s Granite High School in the 1960s, he took every art class he could. His heroes were Disney and Albert Einstein. “Animation and physics fascinated me,” he now says.

By the time Catmull enrolled at the University of Utah, though, he realized he couldn’t draw well enough to make a living as a professional animator, and the pathway to that career wasn’t apparent. “There was no school for animation. There was no entryway into that field, and I had no idea how to get there,” he says. “Because I couldn’t figure out how to do that, I switched to physics.”

But his path through science and technology soon led him back to his early ambitions. At the U, he learned he could combine his interests in art and computer science. He realized during his studies that he wanted to make computer-animated films, and his computer graphics discoveries enabled him to chart that course.

Forty years later, he’s now regarded as a pioneer in computer animation. He has won five Academy Awards, including a 2009 Gordon E. Sawyer Award from the Academy of Motion Picture Arts and Sciences, for his lifetime contributions to computer graphics used in the motion picture industry. And he’s president of both Pixar and Walt Disney Animation Studios.

“I’ve thought a lot about creativity,” he says from his office in Burbank, California. “I think of it as problem-solving and expression. ...Some people only use what they’ve learned. But there’s a certain amount of things you know, and then there’s stuff that’s brand new and mysterious because it doesn’t exist yet. The proper balance is how to rely on things you know and still be willing to learn the things you don’t know.”

Catmull BS’69 PhD’74 was born in Parkersburg, West Virginia, while his father was a Marine deployed in World War II’s Pacific theater. When Ed was 2 years old, with the war over and his father safely returned, the family moved to Salt Lake City, where Ed and his four siblings grew up. His father became a math teacher at Granite High School, then principal of the brand-new Taylorsville High School. His mother was a secretary in the school district.

In his last year of undergraduate work at the U, Catmull realized that his bachelor’s degree in physics would leave him still a beginner in that field. So he took a look at the U’s fledgling Department of Computer Science. “Here was an area just open with possibilities,” he says. He enrolled in the program and graduated with two bachelor’s degrees, just four years after completing high school.
Catmull then worked briefly for Boeing in Seattle. But when an economic crisis forced Boeing to lay off thousands of employees, Catmull returned to the University of Utah for graduate school. “The first course I took was the brand-new course they offered in computer graphics,” he says. “We’re in computer science, at the frontier, and I got to make pictures with the potential for making art. That was it. Now my direction was set.”

The U’s Computer Science Department in the late 1960s and early 1970s was under the direction of David Evans BA’49 PhD’53, a computer scientist hired in 1965 to start the department within the College of Engineering. Funded by significant grants from the U.S. Defense Department’s Advanced Research Projects Agency (ARPA), for open-ended research, Evans and his colleague Ivan Sutherland recruited bright graduate students who they thought would work well together, including Catmull.

That environment helped shape Catmull’s ideas about nurturing the creative process, throughout the rest of his career. “Most people like to think in terms of structure. The way [the U] developed computer science was more unstructured,” he says. “Make a safe environment for people to create. That’s what the program at the University of Utah was: a safe place to make failures. It changed everything. For me, this was the right way to think about things.”

As one of his class assignments, Catmull tackled a short piece of digital animation. “In that class, they had some canned software that people used to make pictures,” he says. “Three of us decided not to use the canned software. Those three of us are the ones still in the industry today.” By choosing to develop his own ideas rather than use the paint-by-numbers software, he says, “I was trying to prove it was possible to do animation.”

The result of his endeavor was a minute-long, three-dimensional animation of his left hand moving, recognized today as the first digitally animated film. In 1976, his animated hand even landed a bit part in a science-fiction feature film, Futureworld. Catmull’s film, known simply as A Computer Animated Hand, was added to the National Film Registry of the Library of Congress in 2011, as a “culturally, historically or aesthetically” significant film. Through that film, Catmull proved computers could be used to create at least rudimentary animation. “What it meant for me was I had a new goal in life: to produce an animated film,” he says.

With his new doctorate from the U in hand, he joined the New York Institute of Technology as director of its Computer Graphics Lab, assembling a team to develop tools for 2-D and then 3-D animation. After five years, Catmull’s reputation hit George Lucas’s radar. “George Lucas had just made Star Wars,” Catmull says. The effects in Star Wars were the best that had ever been done, but Lucas wasn’t using any computer animation yet. He was still using film, cel animation, and modeling, although he was using computers to...
control the models. Lucas was interested in investing even more in movie-making technology. "The rest of the industry was averse to technology," Catmull recollects. "George was the only one willing to invest."

Lucas brought Catmull onboard in 1979 as vice president of Lucasfilm’s computer graphics division. According to Catmull, Lucas hired him “to bring higher technology to the film industry: computer graphics, computer audio, and digital editing.” Catmull and his team did just that, pushing the digital frontier forward once more by developing numerous technologies and tools, including digital image compositing technology that combines multiple images in a realistic and convincing way. It was here that Catmull and his team also developed the precursor to RenderMan, the groundbreaking software and application programming interface that for the first time made it possible to produce realistic-looking complex 3-D images.

In 1986, Lucasfilm spun off the digital division as its own corporation, co-founded by Catmull and Alvy Ray Smith, and funded by Steve Jobs. Catmull became the chief technical officer of the new company, now called Pixar. "For the first time," Catmull says of the transition, "it wasn’t just running a research group; it was trying to run a company. It meant not just learning about the technology, but learning how you keep people engaged, and how you handle issues with managing people.”

Catmull turned his creative energy to making Pixar successful as a business. After producing several commercials and establishing RenderMan as the industry standard for 3-D imaging, Pixar made Catmull’s lifelong dream a reality in 1995 by releasing *Toy Story*, the first digitally animated feature film. One week after *Toy Story* was released, Pixar went public with the biggest IPO of the year. “It was a dramatic change,” he says. “But for me, I felt a little lost. I’d just achieved my goal. I didn’t want to go into coasting mode after that.”

He watched friends in Silicon Valley as their companies rose and fell. “I’d see some of those companies doing amazingly stupid things,” he says. “It was intriguing. What in the world was going on? They were coming together as creative endeavors with smart people, but then they’d fall apart. It was very stimulating to figure out what was going on.” Catmull realized Pixar could suffer the same fate if he didn’t learn how to keep it successful.

His solution was to try to build a sustainable, creative culture at Pixar. “The way you make things happen is you attract smart people and make it safe...
“Creation by definition means you don’t know exactly what you’re going to get, and you have to be okay with that... If you have a lot of people who are well-intentioned, unleash them. Get their collective brainpower working.”

for them to create,” he says, explaining one of his business fundamentals. “If you hire people smarter than you are, it makes you smarter. ...It changes the level of everything.” He also believed that making RenderMan an open development interface was important. “Many companies say, ‘I want to keep everything secret so we have a proprietary advantage.’ I didn’t do that. We freely published everything and gave out a lot of our secrets. The reason is that secrets aren’t that important. What is important is the people working on it.”

Even the Pixar building and surrounding grounds were designed to foster creativity, innovation, and collaboration. The heart of the modern, airy glass and steel building is a spectacular atrium designed to prompt unplanned encounters and collaborations. Instead of typical cubicles, animators have small “houses” that they can decorate however they wish—from a cowboy saloon complete with swinging doors to a candy pink hideaway with doll limbs poking out of a flowerbox. Employees can relax with foosball and other games, a café (which features vegetables from the on-site organic garden), video games, a fitness center, an Olympic-sized swimming pool, sports fields and courts, a jogging trail, two 40-seat viewing rooms, and, of course, a large theater.

When Disney acquired Pixar Animation Studios in 2006, Catmull became president of both Disney Animation Studios and Pixar. He and his colleague John Lasseter were tasked with reenergizing the Disney Animation Studios. “I took my ideas and theories and had to apply them to an entirely

Ed Catmull’s student film of 3-D images of his moving hand was the first digitally animated movie.
new group of people, none of whom I knew,” Catmull says. It was a daunting prospect, but for seven years now, it’s been working. Both studios are now successful entities, each with what he calls their own personality and different ways of working.

“Creation by definition means you don’t know exactly what you’re going to get, and you have to be okay with that,” says Catmull. “Trust that the people there are trying to do the right thing. That’s always been true for me. If you have a lot of people who are well-intentioned, unleash them. Get their collective brainpower working.”

That collective brainpower at Pixar has produced 13 digitally animated feature films to date, all of them commercially successful. The studio has received 29 Academy Awards, seven Golden Globes honors, and 11 Grammy awards. True to his roots, Catmull has remained involved in the University of Utah, as a member and past chair of the U’s Engineering National Advisory Council. He gave the University’s commencement address in 2012. “We are so accustomed to assigning patterns, and we attribute our success to our genius rather than to randomness,” he told the graduates. “We should plan for the unforeseen, not prevent it. Rather than being scary, this is where the fun stuff happens.”

Catmull still has family in Utah, including his 91-year-old father and some of his siblings, so he makes it back to visit about twice a year. The rest of the time he splits between his California offices with Disney in Burbank and Pixar in the Bay Area, and his home in Hawaii, where he lives with this wife, Susan, and the youngest of their five children, as well as a rescued Maltese dog that his wife surprised him with last fall. He also manages to find time to enjoy his first grandchild.

Catmull continues to champion his ideas of constant change, innovation, and excellence with both Pixar and Disney, directing his employees to continue to seek both the frontiers and the balance of entertainment and technology. “I have never been good at predicting the future,” he says. “I just see the possibilities and push in that direction.”

— Kelley J. P. Lindberg BS’84 is a freelance writer based in Layton, Utah, and a frequent contributor to Continuum.

Visit continuum.utah.edu to view a video of Catmull’s student project of his animated hand, as well as a gallery with more photos.
Five Selected for 2013 Founders Day Awards

Four outstanding graduates of the University of Utah and one honorary alumnus received 2013 Founders Day awards in February.

Health care and public policy expert Robert P. Huefner BS'58, automotive dealer and philanthropist Mark C. Miller ex'70, historian Laurel Thatcher Ulrich BA'60, and businessman Norman H. Wesley BS'72 MBA'73 were each presented with the Distinguished Alumnus/Award at the Founders Day Banquet on February 28. These awards are the highest honor the University of Utah Alumni Association gives to U graduates, in recognition of their outstanding professional achievements and/or public service.

Philip G. McCarthey received an Honorary Alumnus Award, in recognition of his support of the University.

Huefner, after graduating from the U, went on to receive a master’s degree in city planning from the Massachusetts Institute of Technology and a doctorate in finance from Harvard University. He is a noted health care and public policy expert, and he directs the Institute of Comparative Health Services Research at the University of Utah, where he is a professor emeritus of political science. Huefner formerly worked in city, county, state, and federal governments and held the Governor Scott M. Matheson Presidential Endowed Chair in Health Policy and Management at the U.

Miller, founder and owner of Mark Miller Auto Group, has been a pioneer of automotive industry computer programming. He has also been a leader in environmental responsibility, building two LEED-certified facilities. Miller has donated millions of dollars to a wide range of nonprofits and is also an active volunteer with Angel Flight, an organization of pilots who provide free transportation of medical supplies, patients, and more.

Ulrich, after graduating from the U, later received a master’s degree in English from Simmons College and a doctorate in history from the University of New Hampshire. She is an esteemed historian and Harvard University professor, and in 1991, her book A Midwife’s Tale: The Life of Martha Ballard Based on Her Diary, 1785-1812, won the Pulitzer Prize for history. Ulrich in 1976 coined the phrase “Well-behaved women seldom make history,” which later became a popular slogan. Her current book-in-progress is A House Full of Females: Faith and Families in Nineteenth-Century Mormon Diaries.

Wesley is the former chairman and chief executive officer of Fortune Brands, Inc., a multibillion-dollar consumer-products company managing such popular brand names as Master Lock, Swingline, Moen, Jim Beam, and Titleist. Wesley has also served community and philanthropic programs, including as a member of the National Advisory Board of the U’s David Eccles School of Business and the Civic Committee of the Commercial Club of Chicago, which promotes civic and educational projects.

McCarthey, who holds a bachelor’s degree from Gonzaga University, is a longtime donor to the U and former member of the Crimson Club Board of Directors. In recognition of one generous gift, the indoor practice football field on Guardsman Way is named the Thomas Kearns McCarthey Field in his father’s memory. The McCarthey family also gave the $2 million lead gift that enabled the U to unveil a new on-campus track and field in 2010 after the U had been nearly 30 years without one.
Shirlee J. Draper, a University of Utah student in social work, has been selected to receive the 2013 Founders Day Scholarship.

Draper grew up in the Fundamentalist Church of Jesus Christ of Latter-day Saints (FLDS) community in Colorado City, Arizona, and Hildale, Utah. "In a society where outspokenness (especially in females) was not acceptable, I was outspoken," she says. She obtained her associate degree from Mohave Community College before she was married.

Her husband was chosen for her through assignment, according to FLDS custom. She had four children, including one who has health challenges. Draper eventually decided to take her children and leave the FLDS community.

She found mentors and now is enrolled in the U College of Social Work’s Distance Program in St. George, Utah. "Although she was constrained by the bounds of that [FLDS] community, she was a seeker of knowledge," writes Susan Ann Stauffer BUS’91 MSW’98 PhD’07, an associate instructor in the U program, in recommending Draper for the scholarship.

“She extended herself in study and learning, and eventually, courageously, chose to leave the FLDS community,” Stauffer says. “She has learned, mostly by her own wits, how to survive and succeed. Her journey has been difficult and trying, but she has a steely strength.”

Draper says her main inspiration has been her children. After she graduates, she aims to continue to assist other women and children who have left the FLDS community, or want to leave, in making a successful transition to the larger world. “I have been able to help other people who, like me, leave the FLDS with no coping skills, no assets, and no idea how to proceed,” she says. “I laugh as I wonder where I will end up, because if I have learned nothing else, I have learned that life will continue to present me with challenges. I know that I absolutely have the resilience and the tenacity to overcome obstacles and challenges and turn them into opportunities and assets.”

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Don't underestimate the power and determination of University of Utah alumni and students: They delivered on their promise to the Utah Food Bank to make this year’s Unrivaled Rivalry Food Drive a huge success. Their efforts resulted in an impressive 400,030 pounds of donated food and $85,424 in monetary contributions.

From November 5 to 24, the U Alumni Association’s Community Service Committee and Student Alumni Board mobilized the campus community, along with 36 local elementary schools and dozens of grocery stores and businesses throughout the Salt Lake Valley.

"[The] University of Utah food drive truly is unrivaled," says Karen Sendelback, chief executive officer of the Utah Food Bank. "When combining food and funds, [the 2012] drive will feed 538 individuals for one year, 135 families of four for one year, or 67 families of eight for one year. Any way you look at the results, this annual event is crucial in the fight against hunger in Utah."

Until 2012, the annual food drive was based on an 18-year rivalry between the University of Utah and Brigham Young University. Citing the changing nature of the schools' rivalry, BYU last year informed the U Alumni Association that it would no longer compete and instead would participate with other Utah County higher education institutions in a cooperative food drive. That didn’t deter the U volunteers, who forged ahead with the Unrivaled Rivalry Food Drive.

Student Alumni Board member Jackson Haslam, a junior majoring in communication, helped arrange collections of food and money in local grocery stores. "We had a great time collecting, and people were very generous," he says. "We’re very thankful to Smith’s, Dan’s, and Harmons for providing us the opportunity."

Support from the Alumni Association Board of Directors and online donations were at a record high this year, as were cash collections by U students at grocery stores. The Alumni Association Board of Directors generously matched every dollar that U students collected.

"We’re very excited about the overwhelming results from our food drive," says Craig Stagg BSN’83, a member of the U Alumni Association Board of Directors and chair of the board’s Community Service Committee. "The contributions will definitely help those in need throughout our community."

U Effort Yields 400,030 Pounds of Donated Food

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The University of Utah is home to one of the top-ranked games programs in the nation:

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eae.utah.edu
The University of Utah has been a leader in personal computing since the phrase was coined. Many of the very foundations of modern computing were built by U alumni such as Alan Kay MS’68 PhD’69, who helped innovate the graphical user interface and object-oriented languages, as well as the laptop computer. His groundbreaking work has been recognized over the years with many honors, including the A.M. Turing award, known as the “Nobel Prize of computing.” Kay is currently president of the nonprofit Viewpoints Research Institute and an adjunct professor of computer science at the University of California at Los Angeles.

The long list of U computer science pioneers also includes such innovators as Alan Ashton BA’66 PhD’70, who cofounded WordPerfect; Jim Clark PhD’74, cofounder of what became Netscape; Fred Parke BS’65 MS’72 PhD’74, a trailblazer in early animation combining facial expressions and vocals; and Jim Kajiya BS’77 MS’77 PhD’79, whose honors include an Academy Award recognizing his groundbreaking technique for creating computer-generated images of fur and hair. Ashton and his wife, Karen, later founded and still own the Thanksgiving Point gardens and museum complex in Lehi, Utah. Clark, who was one of the co-founders of Silicon Graphics, Inc., also founded Healtheon, which merged with WebMD. Parke is currently a professor and director of the Visualization Sciences Program at Texas A&M University. Kajiya is a researcher emeritus with Microsoft Research and founded Tolt Machine Works in 2010 to create complex, precision components for applications such as wind and hydroelectric power.

The U has continued its computing innovation, making deep inroads into the latest computer graphics applications with the introduction and fast rise of its Entertainment Arts & Engineering program, which focuses on video games, as well as game technology-based digital films. Now in its sixth year, the program is already sending out successful graduates. Jason T. Williams BS’10 MS’10 currently works for Microsoft Studios, which develops and publishes games for the Xbox, Xbox 360, Windows, and Windows Phone platforms. While still at the U, Gene Peterson BS’10 MS’10 interned with both Disney
Interactive Studios and Electronic Arts, Inc. He is now a senior software engineer with Zynga, where he worked on the Mafia Wars franchise for a few years and now focuses on mobile games. Chris Bireley BS'10 MS'10 is also now with Zynga, as are Daniel Van Tassell BS'11 and Russell Bloomdale BS'12.

The U added a master’s degree to the Entertainment Arts & Engineering program in 2010, and many of the program’s first undergraduate class continued on in this new Master Games Studio. One alum of both the first bachelor’s and master’s cohorts, Sean Forsgren BA’11 MFA’12, as an undergraduate was the lead producer on Rapunzel’s Fight Knight, the first game released by the U program. He is now working for glasses.com on an Augmented Reality project. Tyler Hamill BA’11—who while at the U worked on the highly successful game Minions!—is now an animator with Electronic Arts.

During his undergraduate studies, Damean Lyon BA’12 led a team of fellow students in creating the game Heroes of Hat, which in May 2012 became the first student-created video game released through Utah Game Forge, the company the U created to help students market their work. Lyon, who is now in the U graduate program, has been producing short films and banners for Forward Solutions, an entrepreneurial company focused mainly on training items or tools for military personnel. Lyon served in Iraq with the U.S. Marine Corps as a sergeant specializing in aviation ordnance, and he also now does graphic design for Rogue Corps, which helps wounded veterans participate in outdoor activities. The nonprofit group was founded by his brother, David, a double amputee injured while serving as a Marine in Afghanistan. Heroes of Hat’s lead designer and programmer, Jon Futch BS’12, is also now in the graduate program, as well as working full time at Disney Interactive Studios in Salt Lake City. Hat team member Johnathan Nielsen BS’12 recently built the user interface for Superbot’s new game PlayStation All-Stars Battle Royale.

Alumni who worked on the first Master Games Studio release, Robot Pinball Escape, also are continuing to create. Laura Warner BFA’10 MFA’12, one of the game’s main animators, is now working at Disney Interactive in Salt Lake. She cofounded the Utah chapter of Women In Games International, which works to support girls and women interested in joining the video game industry. Game producer Kurt Coppersmith BFA’10 MFA’12 is now technical program manager with Daily Bread Food Storage and a producer with Argonaut Interactive. Alex Johnstone BA’09 MFA’12, the game’s lead designer, is running the exhibit part of The Leonardo museum in Salt Lake. Artist Eugenia Hernandez BFA’10 MFA’12 is an e-learning developer with Intermountain Healthcare. Adam M. Ellis MS’12, an engineer on Robot, is now with Microsoft Studios in Redmond, Washington. Engineer Wade Paterson MS’12 is working at Merge Interactive in Texas, while engineer Brandon Davies BS’12 is with Electronic Arts.

The nine students who worked on Utah Game Forge’s second release, Erie, include Matt Anderson HBA’09 MFA’12, the game’s chief designer, who was an Independent Game Developers Association scholar in 2012 and is now a producer at Wyrd Games and creative...
director for Broken Compass Studios, which released the app game *Catball Eats it All* in 2011. Level and sound designer **Christopher Diller BA’10 MFA’12** is working in IT with the Natural History Museum of Utah. **Jamie King MS’12**, the game’s main engineer, is teaching at Neumont University. **Ryan Bown MFA’12**, the game’s main environmental artist, is now an adjunct instructor for the U’s program and is working on *Erie II*. Diller and Bown later teamed up with Adam Ellis and **Betina Tin MFA’12** (also an artist on *Robot*) to create *Tactical Measure*, which took Honorable Mention at Microsoft’s 2012 Imagine Cup.

Other alumni have drawn on their U experience with “machinima,” movies created using video game technology. **Eden**, created by a team of 12 students led by senior film student Luke Hartvigsen, won the Best Science Fiction award at the International Student Film Festival in Hollywood, California, in 2011. **Edgar Nielsen BFA’11** provided the 2-D animated opening sequence for the film. Nielsen and fellow film graduate **Michael Whitaker BA’10** co-founded the game company Cerbercat and have published titles online and on mobile devices, including *Grow the Grass*, *Puzzle Candy*, and *Halloween Panic*. Nielsen also teaches animation and the basics of story to students at Salt Lake City’s Bryant Middle School and has contributed to the Render Exhibit at The Leonardo museum. He also creates cartoons that he features on his personal website, partnered YouTube channel, and elsewhere. Another former machinima student, **Sarah Ripley BS’12**, is now a software developer with L-3 Communications, where she has worked on projects including the NASA Global Hawk program.

Several of the core faculty members in the U’s program are also alumni. **Corrinne Lewis BA’03** is program manager for the Master Games Studio. **Robert Kessler BS’74 MS’77 PhD’81**, associate director of the School of Computing, cofounded the Entertainment Arts & Engineering program and has been executive director of the Master Games Studio since its inception. He worked as a student programmer with Burroughs Corp. in the early 1970s (his master’s project became a text editor and file system for a Burroughs computer system), and he went on to found two software companies and serve as a visiting scientist at the Hewlett-Packard Research Labs.

Another Entertainment Arts & Engineering program cofounder, **Roger Altizer MS’06**, is the program’s director of game design and production. He previously worked as a tester on the original Xbox and was a videogame journalist for *about.com*, a website owned by *The New York Times*. **Mark van Langeveld PhD’09**, the program’s engineering track director, designed and directed interactive music videos for Sting and Peter Gabriel, as well as the first major interactive TV (I-TV) show at Microsoft, *Vine Street*. He has now taught computer graphics for more than 20 years.

—**Marcia C. Dibble** is associate editor of Continuum.
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The first person to create a practical method of recording and playing digitized sound was the University of Utah’s own Thomas G. Stockham, Jr., an associate professor of electrical engineering and computer science.

Stockham was a pioneer in many facets of computer science, including computer graphics and the development of the Internet, but it is as the developer of digital recording and playback that the world owes much to his genius. His work helped pave the way for compact discs, iPods, and digitized sound in videos and video games.

“He won not only the respect of his peers but also major honors from the entertainment industry he helped to transform,” The New York Times wrote in his obituary in 2004.

Stockham was born in New Jersey and received bachelor’s, master’s, and doctoral degrees from the Massachusetts Institute of Technology. He began working on early efforts toward digitized sound soon after he became an associate professor at MIT in 1957.

When Stockham came to the University of Utah in 1968, he focused on finding a practical way to digitize music. He and his students in the U’s Computer Science Department developed methods of digital signal processing.

Stockham demonstrated the fruits of his research by digitally processing and restoring RCA’s entire collection of early 20th-century recordings of the famous Italian tenor Enrico Caruso. RCA began releasing the series in 1976. Later that year, Stockham made the first live digital recording, of the Santa Fe Opera.

At the height of the Watergate hearings, Stockham was one of a panel of six experts convened to examine the Watergate tapes.

He discovered that the famous 18-minute gap in a crucial Watergate tape made in President Richard M. Nixon’s office was caused by at least five separate erasures and rerecordings. The findings led to the tapes being turned over to Congress.

Stockham left the University in 1975 to found Soundstream, Inc., the first digital recording company in the United States, located in Salt Lake City. The company developed new digital audio recording technologies for professional use—innovations that laid the groundwork for later technologies such as the CD and the DAT (digital audio tape).

Stockham returned to the U in 1983 and was honored with its Outstanding Teacher Award in 1986. He left the U in 1994, when he was diagnosed with Alzheimer’s disease.

The accolades continued to pour in for his landmark accomplishments. He had won an Emmy award in 1988 for his digital audio and editing systems. He received a Grammy award in 1994 for his “visionary role in pioneering and advancing the era of digital recording.” And he received an Oscar from the Academy of Motion Picture Arts and Sciences in 1999, for his “pioneering work” in digital audio editing.

—Roy Webb BA’84 MS’91 is a multimedia archivist with the J. Willard Marriott Library.

Visit continuum.utah.edu to watch a video of Stockham digitizing a Caruso recording and to view a gallery with more photos.
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