

# **SIGGRAPH 2016**

## A wide-eyed account

BROOKS MERSHON  
August 15, 2016

## Forward

Special Interest Group on computer **GRAPH**ics (and Interactive Techniques). The following is based on the experience of a 22 year old Student Volunteer (SV) attending the 43rd SIGGRAPH Conference on Computer Graphics and Interactive Techniques for the first time. The conference was held in the Anaheim Convention Center from the 24th through the 26th of one particularly hot week in July. Following graduation and the beginning of an exciting new job working on the CAD program *SketchUp*, this SV booked a ticket from Boulder to Anaheim, checked in with an Airbnb host, and joined a band of other accepted SVs from across the country and overseas who had all been tasked with ensuring that SIGGRAPH 2016 runs smoothly (and having fun in the process).

This is my little story about how I heard of SIGGRAPH, why I applied to be a student volunteer, how I got there, what it was like, and what I learned. This story spirals out a bit further from a faithful log of the events: it furrows down veins covering an attendee's undergraduate experience and mindset both before and during the event. SV stands for *Student* Volunteer; it is during this new graduate's transition from university to industry that SIGGRAPH took place. In fact, SIGGRAPH is a kind of celebration of this milestone, at least for the author, and attending the event confers certain special privileges and unique experiences that apply to these newly minted or soon-to-be graduates from schools like Ringling, RISD, Carleton, SCAD, Carnegie Mellon, UNC, SAIC, Dartmouth, Texas A&M, NHTV Breda University of Applied Sciences (Netherlands), and The University of Edinburgh. A lot of schools, a lot of shared experiences. Several of the students, like me, had just graduated and were working at places like Apple, MPC, and Dreamworks. Many SVs were returning for another year of volunteering and the vast majority were here in large part for the job opportunities. This my story, but I would not have minded reading such an account from another student when I was in my senior year of college, trying to evaluate all of the information and opportunities demanding my attention.

This is not a list of dos and don'ts, but rather a description of what I managed to take in while I was an attendee, which was certainly affected by my role, my housing accommodations, and the current stage of my education and career. I have tried to just throw down on the page a blow-by-blow of events with some attention to the thoughts I had as they happened. Some of the thoughts were deep, and others were along the lines of *this was totally awesome or that kind of sucked, so I did another thing instead*.

What follows has allowed me to reflect on why this young whippersnapper went to an academic conference on computer graphics during the summer after graduating from Duke. Perhaps what I ate and where we drank and whom I talked to is not that important. Perhaps my account is a little self-indulgent. This was certainly worthwhile for me to write and you are welcome to skip around or stop reading now. This is for me as much as it is for you, the person from whose perspective you will be reading about what went on at SIGGRAPH 2016.

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## 1 Second Semester Senior

During your last semester of college, you enroll in a course that will be taught by a student whose name you recognize: during the Fall of the previous year, a graduate student named Chris Tralie delivered a guest lecture to you and about a dozen other students enrolled in an introductory course in computational topology. That survey of topology taken during your junior year was the first of several positive academic experiences that occurred during the second half of your undergraduate career.

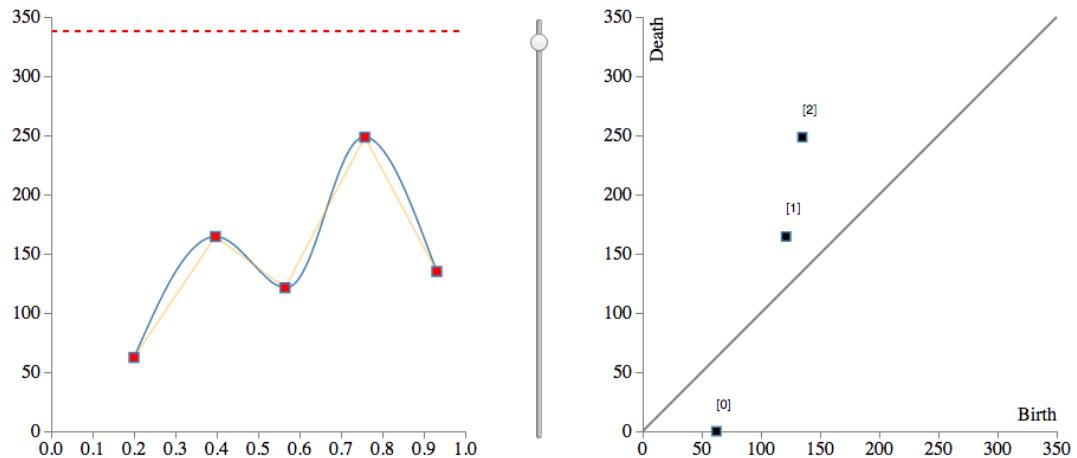
Not knowing very much at all about the field of topology and certainly lacking the mathematical background to cope with a pure presentation of the subject matter, you nonetheless found yourself relatively comfortable in a course designed to sweep much of the mechanics under the rug. The big ideas were left out in the open to impress, inspire, and possibly encourage subsequent and deeper study. In fact, most of these big ideas were communicated at the chalkboard as diagrams. You found them intuitive and beautiful. In a way, the reason you are going to attend SIGGRAPH 2016 is that you took MATH 412 with Paul Bendich during the Fall of 2015. That course introduced you to both ideas and people from whom you would learn a lot about, well, learning. That course led to instructors who became friends, to glowing letters of recommendation, to an internship at the Washington Post, and to your ticket to SIGGRAPH. That course eventually led a job after college. MATH 412 changed your attitude about math, learning, and communication.

In this topology course, you had the chance to *do math* for the first time at a chalkboard alongside a teacher with a gift for explication. You talked during office hours and drew diagrams in order to play fast and loose with new abstractions as you began stepping away from learning math the rote way towards engaging unfamiliar territory with whatever machinery you needed to build up your intuitions. For you, diagrams had a tremendous attraction. Diagrams consisting of lines, dashes, points, and commutative relations with arrows and spatial cues seemed less tedious than symbolic manipulation as you had previously encountered it in the form of algebraic relations and proofs with which you had little experience or foothold. In a way, diagrams come into play as a powerful tool for those who lack other possibly more powerful tools. Bendich was still feeding you some abstract stuff, but the way he presented the mechanics and the narratives that accompanied the *math* made the material not only palatable, but also enjoyable. A light bulb went off. You hear a chime.

In MATH 412, you had the opportunity to experience new models of teaching. This wasn't because the material in MATH 412 was so special, but rather because the instructor was just that good at bridging the gap between his own mental models and the tools that a student may or may not have to work with. That's really what teaching is all about, after all: bridging that gap with whatever tools you have available. Bendich knew when things did not click for the student, and he knew detours that other professors did not often try, alternative explanations which could bring the confused out of the

dark. You have said to others about your experiences in MATH 412 that Bendich is a new breed of teacher—the nouveau-instructor. He was and that number would come to sound higher than you would have expected. His excellence in teaching has only been matched by individuals who were 28 and 27 years old at the time they were your instructors. You cherish the lunches you have had with him a year after that course was over.

In MATH 412 you were learning about a geometry unconcerned with exact dimensions and entirely concerned with how components are connected to one another. This is important, because as abstract as these concepts could become, therein lay the wiggle room to allow someone not on the *Math Track* to play, create, and grow. The best language for topological intuition was probably lifted from another area of advanced math. The second best for those without such a background was a nice drawing on the chalkboard. You wondered if you could expand on this visual mode of learning by leveraging your modest programming experience and enthusiasm for Mike Bostock’s data-visualization in the hopes of bringing these chalkboard diagrams to life. You figured data-visualization made a lot of sense in topology if you let the data be geometry. What you wanted to show were lines, points, and shapes drawn with scalable vector graphics in a web page. The name of the game here was accessibility without watering down the content. What you were trying to do before you knew it even existed was create the experience that Wolfram Computational Document Format (CDF) was made for, guided along the way by the examples of illustrated technical concepts made by Mike Bostock with D3, his nascent visualization kernel.



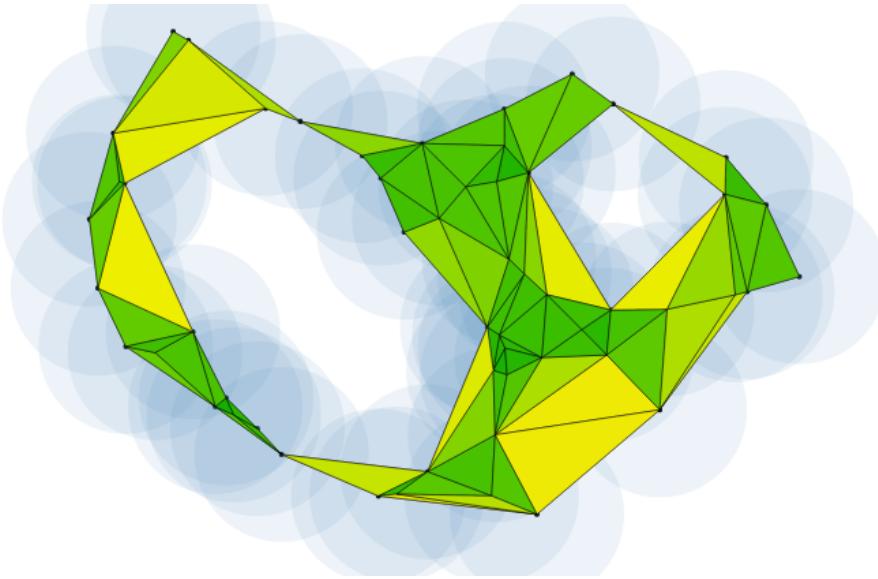
Height Function: The first interactive pedagogical tool built for MATH 412.

You developed interactive presentations of the concepts illustrated in class and experienced the joy of learning math by making things—indeed learning math by placing it alongside *design* and *programming*. It is the beauty of those chalkboard diagrams that

you latched onto and decided to bring alive with JavaScript running in the browser. You began putting many hours each week into your vision of a final project that would be delivered as the semester ended in early December. This final project was to be accompanied by a recorded talk where you demonstrate your work and describe the process that went into creating it. This presentation alone was a challenge you truly enjoyed. You learned just as much about communicating in MATH 412 as you did about the actual subject. The addictive nature of this work came from the design aspect to it: you would make something, play with it, and imagine how it might look differently—better. You were not particularly experienced at doing this sort of thing, but this was a perfect opportunity to figure out how to make these pedagogical tools the hard way. None of what you are doing was really taught at your school. You took advantage of an open-ended project and a professor's willingness to help and piled on some of your extra-curricular interests so that you could learn exactly what you wanted to learn. You wanted to learn how to make pixels dance as a means for teaching math concepts. You wanted to find a fun way of facing something you happened to be intimidated by.

A bit of math anxiety seems to drop away behind you during your junior year. It's still there, but you have more positive associations with math than you did before taking MATH 412. You wrote code to visualize ideas and derived tremendous satisfaction from seeing that work. If that's what math is, or what it can be, you think you ought to forge ahead, even after you graduate, in your pursuance of math. Maybe math is design, or design can be math. You've never been bad at math, but you've also never found it particularly pleasing or easy. To your friends, you have explained math as as an area in which you could never quite *dance*, where all things on the other side of standardized testing you felt came more naturally. You can't help being drawn towards math you can *show* to others after you receive praise for your final project. As it turns out, the whole enterprise of working on math you can show to others is something in which Chris Tralie has invested a great deal of time. That is what initially draws you to his work and piques your interest when you hear he will teach a course.

The spirit of that introduction to topology: *learn by example, learn by applying*. The course revolved around a significant final project in lieu of an exam and somewhere in the middle of the semester, Chris Tralie, then a fourth year graduate student, presented a lecture that tied into an exploratory exercise he had crafted for the class. *Data Expeditions*, it was called. The lab required students to use Matlab and a special visualization tool he had created to examine the structure of songs. The patterns to be found in these songs were visualized by his software as curves winding around in three-dimensional space. The bridge of a song often corresponded to a quick dash from one loop over to another loop, and the curve would often cycle around a loop multiple times before beginning another loop in space. The loops and undulations formed in real-time as the song played. More than fifty dimensions were projected down to our easily visualized three. A tremendous amount of effort went into designing this exercise and it is Chris's thoughtfulness and playfulness in his approach to pedagogy, demonstrated during his



Vietoris-Rips Complex: Another interactive pedagogical tool built for MATH 412.

50 minute lecture and answers to students' questions over email, that left a positive impression of him as a teacher.

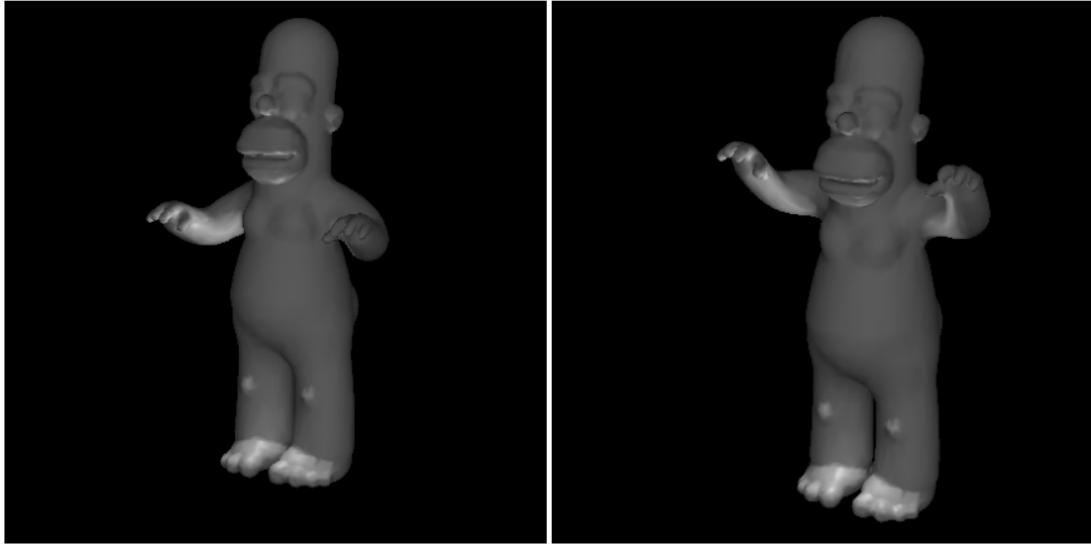
That Chris was not all that much older than you made it easy to imagine someday having the exciting opportunity to teach as he was doing. Your own visualization projects and the presentations you made of their use and development let you try on the hat of the instructor—the presenter—and you rather liked that type of work. Your work may have been rough, and you had a long way to mature, but you now felt the need to maintain an aspect of design and presentation in whatever you end up doing going forward. You liked thinking about how others would see your work and experience the ideas you are trying to illustrate. Everyone needs to design. Maybe everyone, deep down, really wants to perform for others.

Pacing back and forth in front of the class, sweating in the humid math building during one of the scheduled lectures for MATH 412, Chris excitedly painted a picture of his work and the applications of your course to his own research. He was raring for the opportunity to share his unique insights into connections between digital signal processing, computational geometry, and his own mathematical scaffolding he has constructed as he paved his way through academia. His whole life he has been a hacker. He was by now coming into his own as a teacher and academic as well. It is no surprise that he was awarded a teaching fellowship the following year—your senior year—which would allow him to serve as the instructor for a course of over 40 students with a curriculum entirely of his own design.

When you see that Chris is teaching *Digital 3D Geometry* in the Spring of your senior year, you check your clunky online portal to see if CS/MATH 290 happens to fit in

your gridlocked schedule. It does, but it will be your fifth course, usually considered overloading at your university. You show up for the second lecture and talk to the instructor after class, inquiring about auditing the course. He remembers you and expresses how much he would enjoy having you in his course, reminding you that he would not be able to give you as much attention during office hours to help with projects if you audit. The projects are where the real learning takes place, and you know you are going to want attention and help, so you enroll.

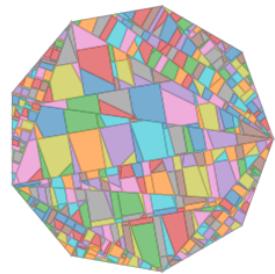
CS 290 quickly becomes your top priority. It is a class in which every lecture is a whirlwind sojourn into an entirely new slice of Chris's research, with small pillars of theoretical fundamentals erected only as they are needed. The first few lectures cover vectors, dot products, and notions of duality in geometry. The next few weeks after that involve matrix operations and a significant project on ray tracing and scene graphs. At some point you learn about quaternions. Then you leap to statistics which can be performed on point clouds to categorize shapes. You learn how to do linear algebra quite quickly with Python and you begin to wrestle with high-dimensional data analysis. Eventually, topology creeps up and you encounter the Euler characteristic, followed by a brief intro to data structures for geometry. Near the very end, you learn about Chris's connections made between geometry and his deep study of digital signal process.



Laplacian mesh editing in Chris Tralie's course.

There are countless positive memories you have from his class in which you felt you truly learned something through experience that cannot be read out of a textbook. One morning found you struggling to debug a recursive ray-tracing algorithm that you were implementing. You had chosen to dive head first into an ambitious project the had set up for the class, striving to achieve one of the first milestones as soon as possible because

you knew subsequent tasks would only be harder and more prone to set backs. In the back of your mind you were always concerned that you might suddenly let him down, that something would suddenly become too difficult and you would not be up to snuff. Chris was so pleased at your efforts to make a dent in his project that he held office hours remotely in the middle of a snow storm, working with you over Google Hangouts as you were couped up in a library to debug your code. Early on you established that you would give your all in his projects and work closely with him to provide feedback and often times help relieve his work load by your very catching of problems with an assignment before an entire class was confused and against a deadline.



Equidecomposability: final project for Chris Tralie's course.

While you are among the stronger students in the class, it is not your programming ability that Chris respects in you or your mathematical aptitude, but rather your ability to work hard and honestly in return for his hard work and effort put into producing a fantastic learning experience. Chris has made it clear early on that he respects hard work and detests what he calls "genius worship." You are *in the mix* as he says, and so long as you keep eagerly doing everything you can to improve and learn in his course, you are doing things right in his mind. You have enough ability to do the work and have an attitude about learning that meshes well with his own. You respect his willingness to balance being a full-time graduate student with never failing to deliver a well-prepared lecture and projects which sometimes take 10 to 20 hours for him to design and produce boiler plate for. While you are just another one of his students, and you are sure to respect this arrangement, you are also close during office hours, talking through more than just the material you are learning and hiccups related to a recent assignment. You talk about work habits, about his good and bad experiences in academia, about working

with team members, about organizing your time, about dealing with anxiety, about relationships, about what it means to balance studying math with living your own life. Chris is your senior, but he is still only 27 years old.

Fairly early on in the semester, Chris announces to the class that SIGGRAPH accepts student volunteers. He encourages you all to apply and by this time he knows you well enough to happily write a letter of recommendation for you. For this, and for the subsequent letters of recommendations that he has written, you are extremely grateful. Chris was first a student, then an instructor, and then a friend to you. He was a mentor like the few other exceptional people you have had as professors during your undergraduate career. Chris admits to you that his knowledge of the industry is nearly nonexistent, perhaps willfully so! Chris can coach you on entering academia, but when it comes to figuring out what to do after college, SIGGRAPH is probably one of your best bets for meeting potential employers and ideally discovering something you love that you had not previously known even existed. Chris is excited for you and really hopes to see you find something you enjoy.



Mock Ted Talk: Paper, Pencil, Program.

It is worth noting that while your junior year was heavily influenced by your course with Paul Bendich and your senior year ended with a string of significant coursework in Chris's class of which you are quite proud, there is one other character who very much has pushed in the right directions, acting as a mentor and showing you what

is possible. Justin Curry, only 28 years old when he was an assistant professor at Duke and your instructor in a course in linear programming, is one of those people who you will never forget. Paul and Chris know Justin because he too works in the field of topology. To put things simply, when you were tasked with delivering a mock Ted Talk in your public speaking class during your second semester of senior year, you could not think of any story more worthy of sharing than the one that tells of how these three mentors had a great impact on your. All this is to say, you are headed to SIGGRAPH on account of a few mentors you lucked out into crossing paths with in college. Chris is perhaps most directly responsible for your journey to SIGGRAPH, but these three figures are connected in your mind. The actual outline you wrote for mock TED Talk is included on the next page. It more or less contains the best of what the second half of your undergraduate career brought you.

Going into SIGGRAPH, the only thing that will have changed since you were in Chris's class is the need for a job. In fact, you have been humbled by the search for a job and are all the better for having worked to finally arrive at a place where you are happy and feel you can learn. The next step after college wasn't as obvious as the step into college. With that worry out of the way, you are free to focus on seeing what it is that other folks are doing in the field of computer graphics. Your goal is to observe and absorb. Funnily enough, Chris's class took such an odd tour through interrelated topics in computational geometry that what it means to actually render geometric models on the screen barely came up in the course. You certainly are not walking into SIGGRAPH with the same culture that most of the artistically-inclined students will share. You know SIGGRAPH will be wonderful and probably worthwhile, but beyond that you know little about what to expect.

# Paper, Pencil, Program

- Intro
  - I have had three mentors at Duke who have changed the way I now approach learning math.
    - I've never thought of myself as a math person, **confidence, unfamiliar territory**
    - Because of them, I have learned to **recognize, appreciate 3 modes** of learning that I am now always trying to put into **practice**.
  - Three words: Paper, Pencil, Program.
    - I call the first mode **paper**, because
      - Engaging source of info, formal, rigid | textbooks, linear presentation
      - Reading how someone else thinks, but that's not always how YOU think.
    - The **Pencil** mode represents
      - The act of interpreting, visualizing, integrating new ideas with old ones
      - Draw what you need to see things in a different way.
      - **It's about being playful.**
    - **Program** mode represents an *imperative* I now feel to code
      - Take loose, squishy ideas and insert them into a scaffolding
      - Exercise in teaching things to yourself, to others, and to a machine!
      - When abstraction meets the machine, **things get concrete real fast**
- **Paul Bendich** - was my professor during fall of my Junior year **topology**, weird form of **geometry**
  - Interactive teaching tools to visualize the diagrams he drew on the blackboard
  - **Programming** can lead to positive feelings. **I made this.**
  - **I taught a computer, I taught myself.**
  - I spent an hour in class, then 10 hours on my own struggling to make a **program**.
  - *Where did the real learning take place?* **POINT AT PROGRAMMING**
- **Justin Curry** - I encountered his gift for teaching last semester - **Linear Optimization**
  - Sounds boring. It's not. It's about optimizing things!
  - He taught me to look for the philosophy and "big ideas" that could be gleaned
  - The first time I'd ever done math for an hours straight at the chalkboard - **pencil mode**
  - Giving us inspirational papers to read: **Curry taught me to seek out better resources.**
- **Chris Tralie** I'm in his course right now. It's called Digital 3D Geometry.
  - We get a **whirlwind** tour of the subject's landscape
  - **dive deep** : simulating echoes in 3D environments, aligning 3D shapes (Nasher sculptures)
  - In the middle of putting 30 hours into an assignment, fear not figuring things out
  - Walk out of lecture understanding. When I try to code it up, that's where the magic happens
  - **Programming is an emotional journey**, Learning should be an emotional journey
  - Trigger a sense of **wonder and discovery** by pushing me from **Paper to Pencil to Program**
- Conclusion
  - This semester, I've **had lunch with these guys** and told them as much as I've told you.
  - I hope you reach out to whomever has been a great influence on how you learn.
  - In Chris's case, he's **more experienced than I**, but **we talk all the time about learning**, because we're **both trying to figure out how to learn math**, and in his case, **how to teach it**.
  - For him, teaching us is a **programming** exercise in itself!

## 2 Welcome to Anaheim

You wake up early to take the bus from Boulder to Denver International Airport. During the flight, you finish reading *How to Get Filthy Rich in Rising Asia* by Mohsin Hamid. You find the second-person conceit refreshing and decide you might as well give that a try when you write about your experiences at SIGGRAPH. You secretly wonder how many people at the airport or on your plane whole-heartedly believe or, like you, at least want to believe the conspiracy theories surrounding Denver International Airport. You hear one lady seated near you in terminal make a reference to this and you smile. There is something up with DIA. You've seen the strange artwork and read about the Masonic symbols. You're happy your home airport is this interesting, because you hope to fly out of it a few times this year.

Arriving at John Wayne Airport in Orange County, you are struck by the awful heat wave they are currently experiencing and your excitement for your Anaheim trip falters as you head through Friday midday traffic in the back seat of your Uber driver's cluttered Scion xB. After 30 minutes of motoring, you retrieve a key from the lockbox at the big empty house where your Airbnb host lives. It's Friday. On Saturday you must report for a day of SV orientation before SIGGRAPH kicks off the following day. You make it out on foot through the seedy strip of South Beach Boulevard to grab a few groceries. You feel fairly close to experiencing heat stroke for the first time as you jog to the nearest CVS to stash a week's worth of snacks in your kitchen. You'll be commuting 15 minutes each day from your host's home to the convention center. Meals will occasionally often consist of restaurants and daily over-priced bento boxes for breakfast (and lunch) from a Hilton Starbucks next to the convention center.

You decide not to waste the Uber fare on exploring the Convention Center, deciding instead to hang out sweating in your bedroom where it never falls below 85 degrees, despite the A/C set on full blast. You wonder if this was one of those big cardboard homes built just before the 2008 financial crisis. Everything about it seems cheap but it's surrounded by a nice park and your particular street is decorated with 5 Series models and the like. You download *Pit Bull: The Battle over an American Icon* by Bronwen Dickey so that you can follow through with a recent book recommendation from a family friend you met in Boulder. It was your intention to read at least one book all the way through during your Anaheim stay. You manage to fall asleep in the awful heat.

### 3 Saturday

On Saturday you wake up happy that you managed to snatch 8 hours of sleep before your first day. You tend to experience sleep anxiety, so you hope to keep this up throughout the week. You pack your slim messenger bag and are soon walking out the front door to the Uber driver stopped in the middle of the street. There was literally one car available at 7:30am near your neighborhood. Leaving the cul-de-sac, you hope your 6 mile Uber commute won't become a problem throughout the week, as you now rely on the service. The dollars spent on the commute are nothing compared to the cost of a nice hotel within walking distance of the convention center. You tip well to maintain your rating, and because you should tip.



The Anaheim Convention Center.

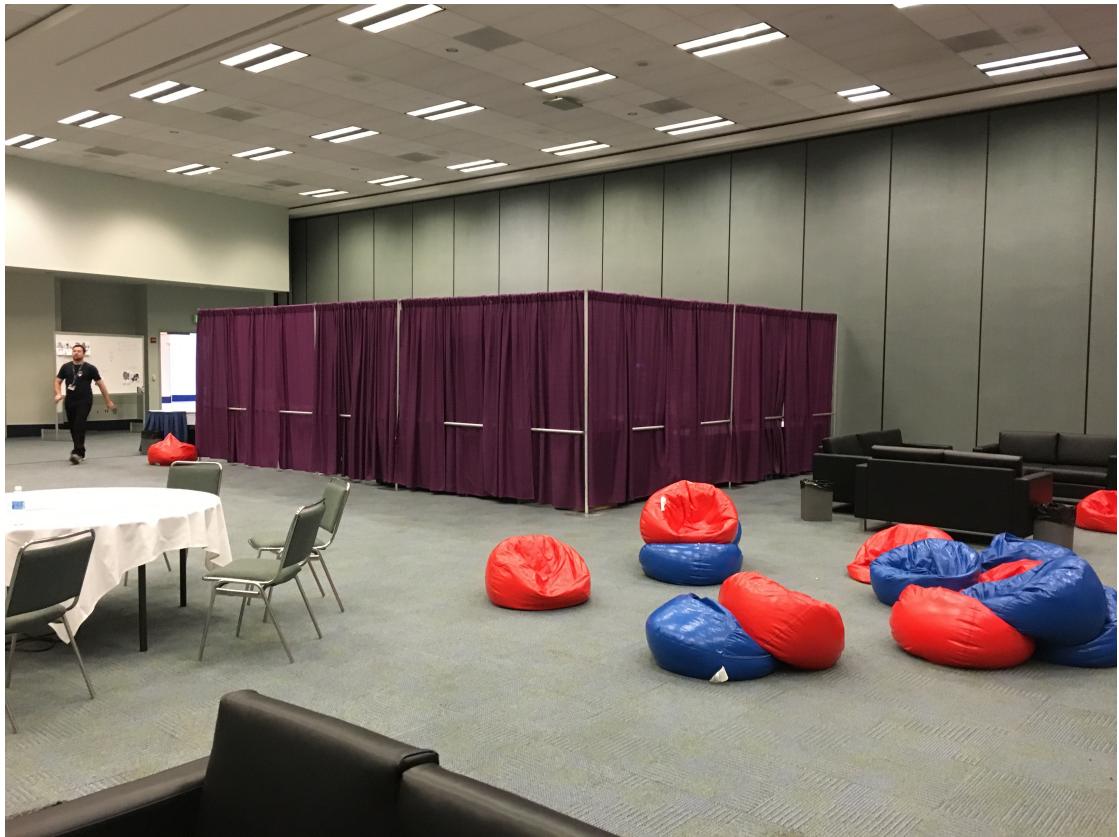
You snacked instead of eating a proper dinner the previous night. After overdoing it with breakfast at Park 55 just down the street from the Anaheim Convention center, you make your way to the second floor's makeshift Student Volunteer office, where you plop yourself down on one of the many bean bag chairs in the back of the large room and continue working through *Pit Bull* to pass the few hours that remain before

noon check-in. You are not quite sure what security will be involved throughout the week and are a bit surprised that you could just walk into the building and into the SV office. Actually, from what you recall of your online training, many SVs will be end up *being* the security. You are quite early. Other SVs will be getting off the plane and booking it to the convention center for check-in, which is mandatory and if missed may result in forfeiture of your badge. But you are way early. You hold off on diving into introductions with the few other SVs lounging about, keeping to yourself.



A view from inside the Convention Center. Second Floor walkway.

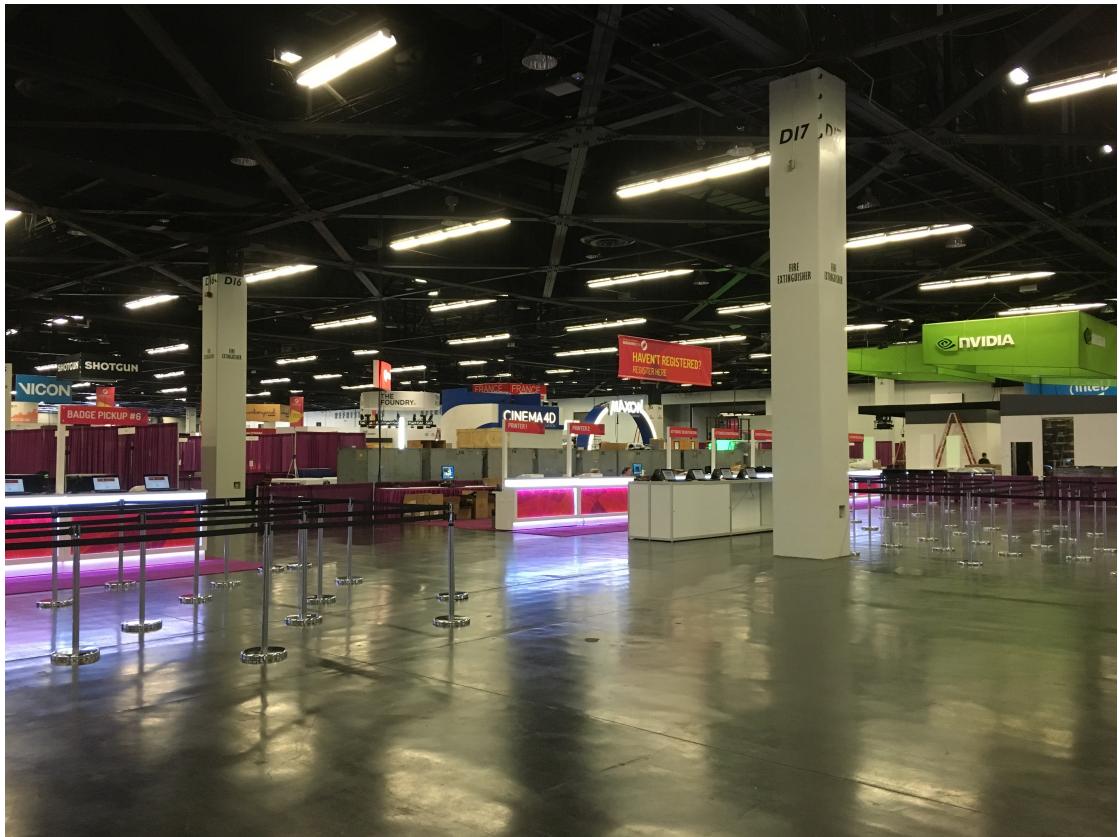
Before long, you are recruited to help out on the main showroom, guided by a *Team Leader* wearing a purple Dreamworks shirt (sporting the newly designed logo) and holding a clipboard and a walkie talkie. You worry about missing your prime spot in the registration line, but you know the name of the game here is to say yes, so you gather your bag and assemble with a handful of other early birds to lend a hand downstairs. For the next two hours, you load a couple thousand packets of papers and other goodies into tote bags that will be handed out to attendees. Each has on one side *SIGGRAPH 2016* and this year's slogan: *Render the Possibilities* over the tessellations and network symbology used for this year's promotional graphics. *NJIT* is printed on the other side.



Student Volunteer Office.

This tote-bag-assembly line forms in Exhibition Hall, where companies will tout their products as well as recruit technical and artistic talent later in the week. It also houses registration tables, a merchandise corner for all things SIGGRAPH related, and an area where tickets for exclusive events may be swapped throughout the week. Cardboard boxes containing merchandise and miscellaneous equipment abound. The job fair is not set to open until Tuesday, you are told, and security guards dressed as valets stand around to make sure you don't wander too far back into the staging areas where companies are setting up booths. You saw Maxon, Nividia, and Intel banners when you first walked into the huge showroom floor. You begin feeling the excitement that must come at the very beginning of big conferences, before the weariness sets in.

You are more than happy to keep your hands busy, as this will be a day of sitting and waiting interspersed with standing and waiting. You chat with other students as you fall into the rhythm of collecting papers in order and stuffing them into a tote before flopping it on a *done* pile. Some of other SVs you chat with are still in school studying animation or computer science; one is established at MPC, working on pipeline tools related to rendering. It is at this point you sense the tension that naturally exists between the



Exhibition Hall.

students rearing to go into industry and the folks who are fortunate enough to already have jobs. The overwhelming majority of folks you meet are students either headed towards the job hunt or beginning to grow frustrated by the post graduation struggle. You consider yourself among the fortunate, hoping to never come across as standoffish as the one girl who's job was admittedly about as good as one could hope for in this industry as a student fresh out of college. You swap contact info and ask her to send you some book recommendations related to rendering, since she mentioned she is rapidly trying learn the necessary fundamentals for her work along the way. Her business card is fancy, but not nearly as creative as the ones you will receive from budding artists you meet throughout the week. You feel dumb for not printing business cards even though you are not looking for a job. Small oversight. As noon approaches, you excuse yourself to head upstairs for check-in and registration. You didn't arrive several hours early just to be late.

During check-in you fall in with a group that develops out of the people who happen to be standing in line near you—a line containing a few hundred student volunteers that will take nearly 2 hours to deliver you to a table where you are handed a conference

badge, two orange Dreamworks Student Volunteer shirts, and a whiteboard on which you write your name before having your mugshot taken. As you snake in from a lobby along the long wall of the hall where badges and other items are distributed, showreels on smart phones and clever business cards come out. You are impressed by this work, especially the 2D drawings that every artist seems to have in their scrollable portfolios. What you see is breathtakingly imaginative—a whole other world from what you are used to. Frankly, you’re a bit envious, because to sit and dream and render on the page what comes into your mind seems a skill that you desperately need in your life. In fact, it is not the skill you wish you could develop—you just wish you could communicate the things you see alongside words. You wish you could express yourself in this way, let alone draw something interesting. What you see isn’t just an example of technical skill. You see raw creativity in these shared portfolios and it is exciting to see someone’s personality and hard work right in your own hands as you cradle their phone, swiping, pausing, and swiping again. You make a point to tell anyone whose portfolio you see what exactly stood out to you and why. In terms of visual output, the only thing you would be proud to share is your street photography, via Flickr. And you have shared this with friends, and it is a vulnerable thing to share your work. You know how much it means to you when someone actually engages your work, rather than acknowledging that you *made a thing*. If there’s one thing you can say, it is that despite your humble artistic abilities, you do know how to engage someone’s work and explain what you think. You are hungry for experiences like this, and the time in the line passes quickly.

You hear a lot of discussion on the topic of 3D modeling and recognize the bandwagon everyone seems to be clamoring to hop onto. You sense a lot of this effort is misguided. One girl has taken up an interest in motion graphics in the sports entertainment industry—EA is a company she is gunning for. Another girl is interested in Naughty Dog, their art style apparently something she feels she is a good match for. Another guy has been spending his time modeling hospital tools and you think he doesn’t really have much direction to his work; he is now desperately trying to flesh out a portfolio in the hopes of finding a job. You are not an artist and cannot help but be humbled by both the incredible talent and the daunting challenge of actually entering the industry your fellow student volunteers aspire to join. Again, you feel fortunate for your line of work. You continue to take pride in introducing yourself as a software engineer now living happily in Boulder, beginning to get acquainted with the CAD industry and spending your free time reading and riding your bike in the mountains. You’re a recent grad for whom your academic track is at least proven somewhat: you have a job and your job is an interesting one where you can continue to learn. That counts for a lot. You are grateful for your current station. You understand that this isn’t always comfortable for those still searching to hear. Like you several months before SIGGRAPH, they may be wondering how in the hell they will take what they feel to be a decent amount of experience and parlay that into a real job doing something related to what they love or happen to be skilled at. They feel like they can do great work, and yet

they are still searching. The angst is as palpable as the BO that will creep up on you in the crowds at SIGGRAPH throughout the week.

Perhaps some write you off as just a technical guy, on account of the engineer buzzword popping up. You don't hear others introducing themselves as an engineer. Ok, that one girl who works at MPC and a guy you will befriend who knows a thing or two about game engines. But other than that, everyone here does art—some tout the latest and greatest in tooling and others cling to their notebooks, but their work is *art*. You don't really have anything flashy to show, save a neat animation or two from your projects developed during Chris Tralie's course. You are proud of what you have done recently, but you see the slight culture mismatch and understand that not everyone will be impressed by what you do. It is nice to hear many are familiar with the product you help to develop. A lot of the shop names people will toss out are unknown, or at least not household names. One girl from your school is working at Dreamworks, but that is not the norm. You grow bored of conversations centered on the current suite of tools each student is trying to learn and efforts to expand portfolios in the months following graduation. Eventually you get your badge and stop fretting over whether you will be swimming in your medium-sized SV shirts. Your uniform: tucked in orange Dreamworks shirt identifying you as a SV, neon green Nvidia Lanyard, messenger bag, Field Notes in the back pocket, and a mechanical poking out of your pocket.

Between check-in and orientation in the late afternoon, you are free to kill some time. You join several of the people you were talking to in line and grab mediterranean food near Harbor Boulevard and Katella. Out of this particular group, you get along well with a woman who is 12 years her sister's senior. She is a special education teacher in Oklahoma. You bend her ear with your thoughts on education and the two of you get along well. After hearing your own story describing your motivations and acculturation throughout high school, she seems quite fond of you and tells you she is going to use your story. You appreciate talking with people like her. She is decidedly the adult among the other students and although she is only visiting throughout the week while her younger sister serves as a SV, you feel a draw towards hanging out with people like her instead of the overly eager students you have encountered so far. You know why this is: you aren't here to get a job. You are here to see some cool shit and learn about things that you didn't know existed before. You want to sit down and talk with adults, not play Pokémon Go during downtime with the other SVs. You feel you have matured over the last few months and understand that a relatively small group of the Student Volunteers are at a similar stage of life as you. Many of the students are on a timeline one year behind you. That's okay, but in that one year a lot changes. Fortunately, you find a group later on in the week that you feel comfortable with and in which you feel you can talk about the things you currently care about.

Orientation itself is a matter of sitting in a large hall and listening to various officials introduce one another for a little over an hour. This isn't painful, because Christian Wittorf, the Student Volunteer Program Chair, happens to be a tremendously funny

speaker. You review various protocols describing how to interact with attendees and where to find critical information or how to swap volunteer shifts through a large powerpoint and call-out-the-answer responses. After a Q&A session, you are all shuffled out to the main fountain in front of the Convention Center where a picture is taken. As you are assembling on the fountain you run into a girl who just graduated with you from your school and happened to be in two of your classes during your last semester. She just started working at Dreamworks out in Los Angeles. During the commotion you meet several other students. After the picture, there is pizza, and you feel awful after a few slices, but you couldn't resist.



Group picture in front of the Anaheim Convention Center.

As is the nature of big events, pacing yourself can be difficult, and several students organize a party to follow the pizza somewhere in Downtown Disney. You learned of this from the Facebook group: an event had been made and the number attending seemed promising. You don't want to be left out, so you end up walking a mile with a group of other attendees to a place where you expect to eat and possibly grab a drink. Along the way, you continue a conversation with a girl you met earlier. You both talk about favorite books and your writing experiences. She studied English in Oregon and

is in a masters program at the The University of Edinburgh, where she has developed several video games that you will end up playing upon your return and completing surveys for. You both seem to respect each other's love for tech and the humanities. You talk for a while about her storytelling efforts in her games which, again, you swear you will play and in fact not only play through, but complete surveys for when SIGGRAPH is over. This young lady is incredibly impressive, writing the scripts for her games as well as programming them in Unity. You are maybe just a little bit smitten by the end of the walk from the Convention Center to the meetup that has been advertised on the Facebook group.

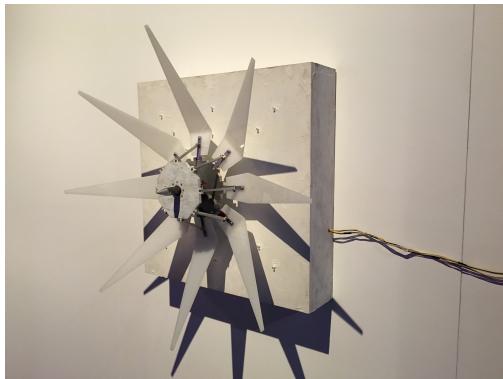


Cards Against Humanity in the middle of Downtown Disney.

Arriving in Downtown Disney, you are disappointed to find the wait time is nearly forever and the only actual activity the person who had created the Facebook event has planned is to hand out many decks of *Cards Against Humanity* (and *Crabs Adjust Humidity*) so that groups of a dozen or so SVs can sit down on the pavement outside a restaurant off the main throughfare of the park. To play cards. You had hoped to actually have a drink and continue picking your new friend's brain. The game quickly wears on you, with English as a second language students more or less butchering any fun to be

had in Cards Against Humanity's references. And you *love* Cards Against Humanity. You end up leaving with a group of students who will eventually become your main crew for the rest of the week in search of a dive bar to post up in. It's time to socialize and make friends, and that was not happening during the card game. Or at least the friends you were hoping to meet were the sort of friends who would get up in search of something else to do in Downtown Disney, as these SVs had done. So you tag along. For some reason you feel tonight is the night to create some bonds for the rest of the week. Failing to find a bar after being led astray by an assumed leader of the pack, you are all treated to fine display of the daily Disney fireworks from the parking lot of an Anaheim restaurant.

You all decide to try again another day and you have an Uber take you back to your host's house a short 15 minutes away. You hadn't really been after a drink, but rather a place less *Disney* than where your journey had taken you. You love to talk with people to really get to know them, and you hope the rest of the week will let you get closer to some of the people in your group who were similarly disappointed. A lot of the SVs remind you of your experiences with the People to People program. You have changed a lot since you went abroad back in middle school, but today has brought you back to those weeks spent among similarly aged students with matching shirts and lanyards bumbling as an awkward herd through new sights and places. You fall asleep like a candle had been snuffed out.



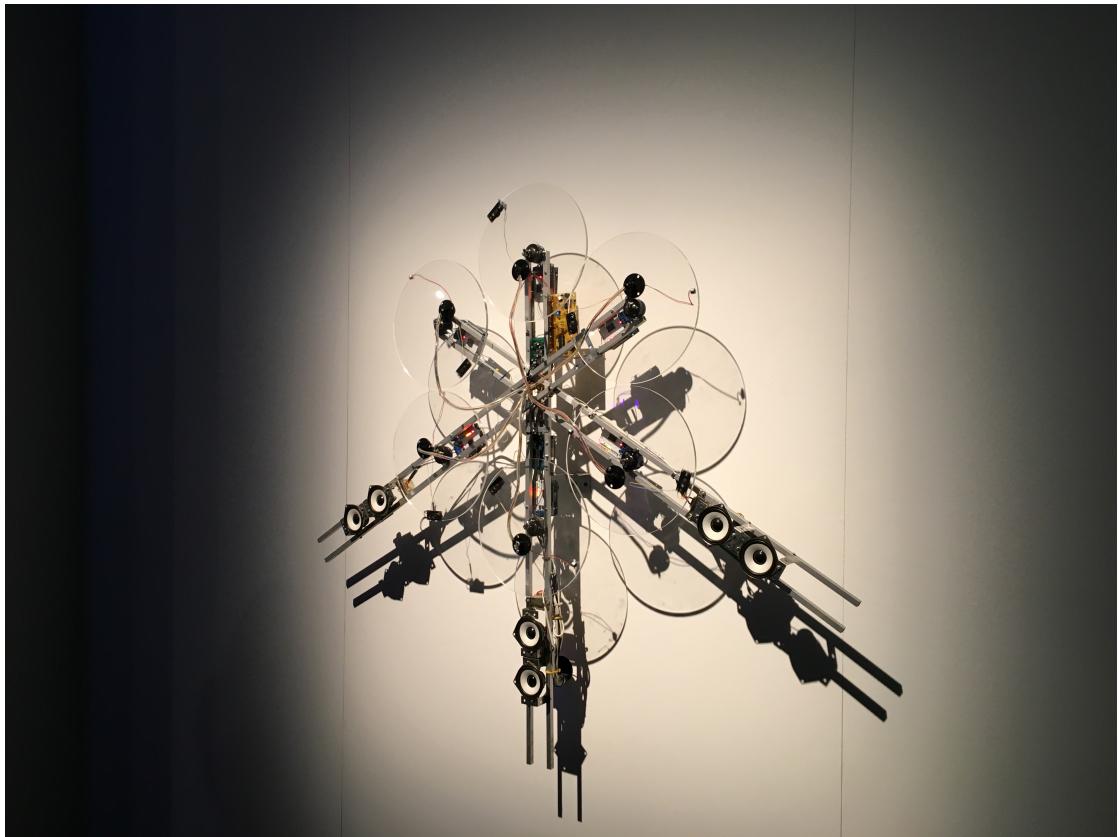
Art installations greet attendees as they move towards the vendors.

## 4 Sunday

Today is your first shift. You show up to check in with your Team Leader, who will be responsible for placing you somewhere in the massive *Experience Hall* with one of the vendors. Experience Hall is dark and reminds you of walking into a house of mirrors as you enter through one of the dozen or so doors leading into the enormous room. The first thing you see is a seating area where people with couches scattered across a large rug sit and look at their phones. Then there is a barricade of SVs standing an arms width apart to visually inspect badges walking by them. Remember, these badges are expensive and anyone can walk into the main lobby off the street. Beyond this barricade is a labyrinth of vendors with black curtains between stations and black tablecloths covered with posters, handouts, business cards, and whatever demo equipment each vendor has brought. On either side of a booth is a large poster illuminated from beneath by a spotlight which provides an abstract for what you are looking at.

You express an interest in haptic technology as your pack of SVs lead throughout the showroom like flock of geese by your leader. You are checked off on the clipboard for your first shift and introduced to couple of researchers from the Koji-Lab. This lab is based out of the University of Electro-Communications in Tokyo, Japan. Quickly, you realize your chief responsibilities will be greeting attendees who walk by, encouraging them to try the technology laying on the table alongside you as you explain the gist of the pamphlets being handed out. The researchers do not speak english very well.

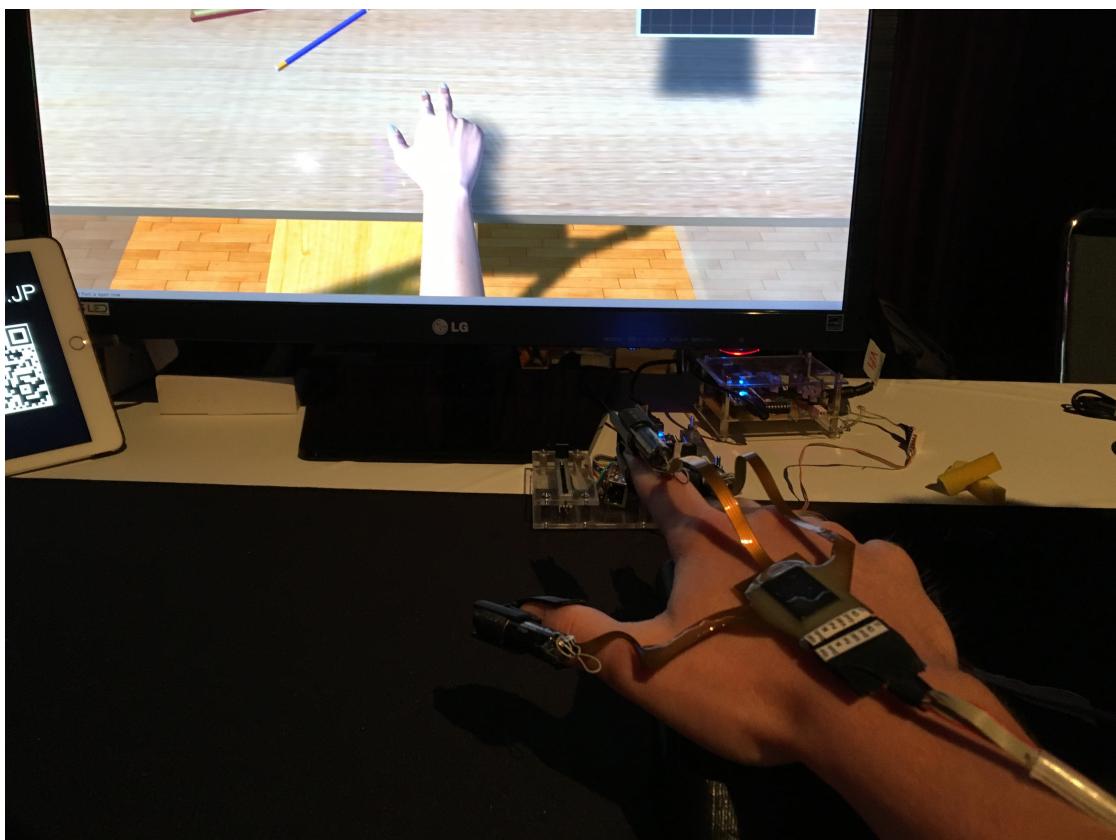
What this particular team has brought to the convention center is a device which attempts to produce sensations of texture as you move your virtual hand through a Unity simulation. Before you can begin explaining the demonstration to curious attendees, you must try it out for yourself. The researchers carefully tuck your thumb, index, and middle finger into sensors in the way a finger pulse oximeter is usually clamped to a digit. In front of you is a monitor showing a real-time rendering of a wooden desk covered with a book, a metal grate with ribs and spirals, a Poké Ball, a pencil, a



This installation responds to ambient radiation.

translucent ball, and a wooden cube next to a square hole. You see an outstretched hand that moves with yours as you push a platform serving as a mouse. The platform that has been built around a mouse is designed to hold your hand with your palm down and fingers outstretched, as if you are trying to hover over the virtual objects on the virtual desk without picking them up.

After calibrating the device attached to your fingers, you begin moving your hand (and your virtual fingers) about the scene, the high and low vibrations and small electrical current tricking your fingers into sensations of texture. It was not without some trepidation that you encouraged a researcher to continue dialing up whatever they were controlling, them asking you if you felt a *sensation* yet. Though the sensations are odd and do not correspond with any real-world texture, they do permit relative differences in perceived textures among the various items on the virtual desk. You can feel differences between the book's cover and the metal grate as your hand glides over it; the latter in fact exerts patterns of sensations which do suggest invisible "currents" and gradients which have orientations in space similar to what you imagine one would feel if they were acutely sensitive to ambient electrical fields produced by household



The University of Electro-Communications in Tokyo, Japan contributed to several booths during SIGGRAPH 2016.

appliances and mobile computing devices. The sensation is not painful, but you can imagine it would be uncomfortable over an extended period of time.

For the next three hours, you describe to attendees patiently awaiting their turn to sit down and have the *Fingar*, as it is called, strapped to their hand that what they will experience is a sensation similar to what one feels when their arm falls asleep—except on their fingertips. You emphasize the relative differences rather than absolute fidelity to real world textures that they may find particularly interesting. Some are blown away by their experience, while others are visibly nonplussed and even disappointed. Not having had a chance to explore Experience Hall yet, you wonder if this is among the less polished and perhaps less impressive of the emerging technology on display. As it turns out, the particular section of the hall you are working in is referred to as *E-Tech*. Emerging technologies. You joke to some attendees when you see they are not impressed that this is perhaps on the more raw end of *emerging* technologies. You're embarrassed when some attendees seem to read your name tag and assume you are not student volunteer, but instead representative of this lab. After all, you will be associated with

some less than stellar technologies throughout the week, and attendees can be a critical bunch.

Near the end of your shift, you notice one gray-haired gentleman in khakis and a polo shirt who appears to be in his forties. He is standing near the display, scanning the materials on the desk and reading all of the provided literature on the spotlit posters. You ask him if he would like to try the demo, as you have repeated to hundreds of attendees before him.

"So its electrical and mechanical stimulation?"

Yes, you say, and you confirm the use of low frequency, high frequency, electrical stimulation, and mechanical pressure as the four forces that are weighted together. Straight from the information card.

"Hmm. I thought electrical stimulation had gone out of favor."

You look at his badge and see it says Apple, Inc. below his name. He proceeds during his turn at the controls to pepper the engineers with requests for various switches to be turned on and off on their Arduino as he carefully assesses the simulation and as far as you can tell, the construction of the device. The researchers comply, and you think to yourself that you are watching a gruff Apple hardware engineer prepare to eat this lab's lunch while the gracious researchers unwittingly reveal much of their device's specifications. This probably happens pretty often.

After your shift ends, you check the SIGGRAPH app on your phone and find a Pixar rendering talk to attend in a little over an hour. This is your first talk of the event. It is held in an upstairs conference room that will host many technical talks throughout the week from companies like Pixar, Autodesk, little boutique animation shops, and Nvidia. While waiting for the show to start, you are stuck by the culture that seems to belong to various companies. For example, the Nvidia guys all seem uniformly robust and smart looking, overwhelmingly German and more often than not dressed in all black with designer jeans. Perhaps these folks are not representative, but its an interesting pattern, nonetheless. The Pixar guys are decidedly less intimidating, often donning cool red tracksuit sweatshirts with *PIXAR* written across the back. Often, unlike the Nvidia guys, they can be seen wearing shorts.

During the Pixar talk, you are treated to live demos of the Universal Scene Description (USD) workflow for managing tremendous numbers of objects and literally billions of triangles. You watch a scene from the animated film *Finding Dory* rendered in Presto in real-time, where fine-grained effects can be layered in to provide animators with a great sense of effects like subdivision surfaces, caustics, and depth of field in real-time. The phrase you hear said again and again is *blasting triangles*. The talk impresses upon you the exciting nature of pipeline engineering, for the shear amount of data and assets in a film like *Cars* or *Finding Dory* necessitates clever ways of chopping up information and allowing for collaboration and thoughtful management of instances, all of which may not necessarily need to be worked on at a given time. You intend to spend some time pouring over the USD documentation to better understand how USD revolutionizes

Pixar's workflow. A quick glimpse shows you that it is indeed well documented and even if you never use it, you might learn a thing or two about abstraction and software architecture from its design considerations. USD is just one of many tools or open standards that you will first hear of while attending SIGGRAPH. Some you can forget, but others you think worth investing in.



NVIDIA Best of GTC Talks: Real-time Graphics for Film Production at Pixar

One of the most impressive demos during the Pixar talk involved a rigged Lightning McQueen from *Cars* whose face was manipulated in real-time in front of the audience. It was pointed out that riggers need to be able to operate on a smaller number of points than the ones produced in real-time by subdivision surfacing. You witness millions of triangles being blasted onto your screen as speaker contorts Lightning McQueen's face into a hilarious pout. "I'm not an animator," he says as the audience laughs.

You aren't quite sure what to see after the Pixar talk ends. After getting a bite to eat, you head to Hall B to see *Technical Papers Fastforward*, a presentation from 6 to 8pm which gives speakers roughly one minute to talk (or stand silently) while their presentation plays out on a 30 foot screen. Each presenter alternates speaking at podiums on one side of the room so that while a presenter or group of researchers are talking, another

presenter may prepare at the opposite podium. Some of the presentations maintain an air of mystery about them, hinting at a worthwhile discussion of discrete differential geometry to be had on such and such day at such and such time later in the week. Many of the presentations are tongue in cheek. Some of the most entertaining are the poorly translated videos which make use of an artificial intelligence system to bridge the language barrier. It's hard to know how competent these presentations will be when their one minute preview is similar to bad used car commercial. The guy from The Hebrew University of Jerusalem sitting next to you types each of these papers out on his laptop to keep track of the ones he would like to go listen to. You understand roughly 10 percent of what you hear and feel it will be worthwhile to attempt reading a few of the papers that are available online.



Technical Papers Fast Forward, shown in Hall B

After the event, you meet up with your newfound crew and proceed to be driven around cramped in the back of a Chevy Sonic in search of a place to eat. Despite your efforts to use Google Maps to find a walkable area to hang out with your new friends, you all wind up a few miles from the convention center at a greasy taco joint with green painted iron bars over the windows. It's decidedly *not a nice part of town*, so you all eat

and head to a sports bar where you finally have the chance to catch swap some stories and bond as recently graduated (or at least soon to be graduated) SVs. One girl named Jen is interning for Hasbro. Thomas is student at School of the Arts Institute of Chicago. The third is a Belgian student named Diede who just finished his technical training at a vocational school for game development in the Netherlands. Diede you find particularly entertaining; his articulate english delivered in a deep Dutch accent os not the least of his appeal as a cool cat within your group. He's funny and quite sharp, as are the others in your new SV crew.

You are happy as you pitch in for a pitcher that you have started to make some friends. This feels like you are doing SIGGRAPH the right way, letting the information soak in and then reflecting on the day as you swap stories in the evening. After an hour or so you all part.

An Uber is hailed and you are soon heading home to post the day's pictures and check your schdule of shifts for tomorrow. You are asked to be respectful in not requesting shift swaps within 24 hours of your assigned time slot. Likewise, the SV committee tries their best not to swap your slots within this same courtesy window. It is entirely possible—likely, even—that the most important SIGGRAPH event, whatever you feel it may be, will coincide with a shift that you had not even seen when first checked your online portal on Sunday morning.

## 5 Monday

Your shift doesn't start until later in the day. You wake up and run a couple miles around the park which envelops your neighborhood. You figure the key to feeling great throughout SIGGRAPH is to take a break and keep to your normal routines. It feels a bit like you're running through real-life GTA5, on account of the Sothern California vibe. It's freaking hot during this heat wave and you turn back after a short jog down South Beach Boulevard.

Once at the Convention Center, after standing in line for 20 minutes to get your daily Starbucks bento box, you attempt to sit through Nvidia's Vulcan presentation. From the website:

Vulkan is a modern cross-platform graphics and compute API currently in development by the Khronos consortium.

It sounds cool when you read *Vulcan* in your little schedule. Perhaps this will be your first technical talk that stretches your brain a bit. You're ready for some mental gymnastics. This is the kind of thing you were hoping for. Food for the brain. A lecture that will introduce you to something you can take back with you and investigate further. You meet a coworker seated behind you and settle in for a technical talk which you figure may introduce you to some GPU fundamentals. You are mistaken. Instead, you are treated to slides averaging no less than 200 words, not counting the ones which literally show hundreds of lines of unintelligible source code. Okay, perhaps for some in the audience what is presented makes perfect sense, but you feel the creaking and sighs of folks shifting in their seats around you and you can almost imagine the wheels in people's heads grinding and thudding to a halt. This is *bad*. This is not how you present, you think to yourself. You actually think back to your last semester of undergrad, during which you had the privilege of taking a public speaking class, which you adored. You gave a TED talk to your class about your attitude towards math and three mentors who had a big impact on you. This is what you daydream about as the speaker drones on. *This* is what you were warned against. No matter who your audience is, this cannot possibly be the best way to impart technical knowledge. This is torture. You are presented with diagram after diagram, none of which make any sense to you. You excuse yourself after 40 minutes of this to head down to VR village after wondering about Experience Hall. It had been your intention to spend less time looking at the smoke and mirrors in Experience Hall and more time pondering the material of the technical talks. You'll have to study the programming a bit more next time before you waltz into another talk like this. On your first day at SIGGRAPH, you worked with the Japanese haptic technology lab. Now you would like to experience Emerging Technology (E-Tech) from an attendees perspective. A walk through Experience Hall lets your brain cool off after the Vulcan meltdown.

You try the HapticWave demonstration at the Oculus booth, which is stationed next

to the booth you were at the previous day. The Oculus demonstration is wholly more convincing and polished than the work done by the Japanese lab you assisted during your first shift just one booth over. While standing in line you read the two page handout which attempts to outline the main advancements made by this particular haptic technology. A thin metal plate sandwiching a ring of magnets will trick you into perceiving a ball's position as it bounces around a virtual table in front of you. This is the first time you have ever tried an Oculus headset, let alone their latest model sporting higher resolution and fewer visual artifacts thought to detract from the immersive experience. Despite the obvious technical advancements being demonstrated throughout a large portion of Experience Hall, you can't help but be less than enthusiastic about all of this VR stuff. Here's why: there's no emotion. Most of these demonstrations are technical and do not incorporate cute characters, interesting plot, or convincing human interaction.



HapticWave demonstration at the Oculus booth.

You then wander about the rest of the Experience Hall, growing increasingly jaded with the new technologies. You decide what you want out of SIGGRAPH are technical talks pitched at an appropriate level and the opportunity to hear *behind the scenes* talks from the folks who know how to tell stories. The technology fest in E-Tech is simply overwhelming and does not seem to be worth investing your time in. That being said, your next shift has you helping a researcher named David Zielinski who works at the

college you just graduated from. You recognize him and are happy to help out with a virtual archeology simulation which lets people explore a site in Spain simply by looking down at a virtual clipboard in their hand and searching for items which satisfy the checklist it maintains. This simulation happens to be created by a collaboration between your alma mater and University of São Paulo. The user interface is far from perfect, with attendees often getting lost or confused as to how they should proceed. Everyone who tries the simulation, yourself included, is absolutely amazed by the display. You begin to see the educational value of VR and appreciate the natural beauty of the virtual site, which was created not by talented modelers, but instead by photogrammetry from high resolution photos taken of an inaccessible site with archeological significance.

After this shift with David, you are preparing to get a ticket for the Monday Computer Animation Festival. Also known as *Electronic Theater*, this show will be run twice during SIGGRAPH on both Monday and Wednesday evening. When you went to the Student Volunteer office in the morning to check in for the day's first shift, you inquired about getting your free ticket. Unfortunately, you were informed that only a Wednesday ticket is available. You take the ticket and hope to swap with another student, making a desperate post to the SV Facebook group asking for someone to bail you out. By the time the showtime rolls around, you are intending to try your luck at following your friend in line and hoping the SV responsible for checking tickets doesn't bother to read the date on your ticket. You are not this lucky when you are denied entrance by a fellow student volunteer at the entrance. After waiting in line for 20 minutes, you are instructed to leave the line that is now about 700 deep to run to the opposite end of the convention center to swap your Wednesday ticket for a Monday ticket. And you do run. You eventually make it inside and, hilariously, end up being ushered to a seat in the second row. This will turn out to be one of the most visually impressive places to experience the show, as well as the most acoustically traumatic. The bass literally blows your hair around throughout the show. You find this both uncomfortable and totally awesome.

The Computer Animation Festival is truly a special event. Lasting from 6 to 8pm, you are treated throughout to award-winning student films, reels by companies like MPC showcasing their state-of-the-art rendering, and finally shorts by Disney and Pixar that truly steal the show. Disney's short called *Inner Workings* is being exclusively shown at SIGGRAPH, so you are eager to see a glimpse at work that is not available to the general public. The full rundown of CAF is as follows:

1. *Accidents, Blunders and Calamities* — a hilarious depiction of inventive ways for animals and insects to meet their demise.
2. *Tea Time* — A grandma and her robot. Very French with an odd art style.
3. *Alike* — One of several shorts aimed at showing how much work and failing to march to the beat of your own drum can be a real drag.
4. *Tokyo Cosmo* - A dreamlike sequence for a young girl living in Japan.

5. *Glass Half* — Absolutely phenomenal animation by the Blender Foundation. A clever, colorful 2D cartoon using nonsensical vocalizations in the voice acting to push the audience into constant fits of laughter.
6. *Citipati* — A dinosaur and a meteor. Lifelike rendering.
7. *Natural Attraction* — The drama of a volcanic eruption unfolds in fantastic detail. Highly realistic physical rendering. Like watching an IMAX movie of a real eruption with impossible timelapse cinematography and angles, all done with CG. I felt chills watching this.
8. *League of Legends: Project Overdrive* — The art style was bananas.
9. *Solar Superstorms* — An example of animation based off fantastically complex simulations. This demonstration emphasizes a need for real-time data-visualization used for physics simulations, a topic that will be presented at a Nvidia talk at the end of the week.
10. *Mafia III* — Video games are getting pretty (gruesome).
11. *Lichtspiel* — A mindblowing intro sequence for a film festival .
12. *Terminator Genisys* — MPC showing off.
13. *Behind The Magic: Warcraft* — Industrial Light & Magic showing off.
14. *Les marmottes: Mariachi* — Hilariously placed between other longer shorts. 10 seconds of marmottes playing instruments, uh, realistically.
15. *Behind The Magic: Marvel's Captain America: Civil War* — Layered effects.
16. *Crabe-Phare* — Best Student Project award winner and my absolute favorite film that wasn't Pixar's *Piper*.
17. *Shell V-Power Shapeshifter* — A really involved automotive commercial with a behind the scenes look at the monster that was created for the TV spot.
18. *Borrowed Time* — One of those films that raises the bar for story telling in animation. Winner of Best in Show.
19. *Escargore* — Slugs. Funny in the way *Accidents, Bludners and Calamities* was refreshing and full of physical comedy. Lots of smashing, burning, chopping, and exploding.
20. *Cosmos Laundromat* — The soundtrack alone gave me chills. This is part of work in progress that is strangely released under Creative Commons by the Blender Foundation. You watch this a few more times on Youtube after returning from SIGGRAPH.
21. *Taking Flight* — Good like *Toy Story* is good.
22. *Moana* — Sneak peek at an upcomming Disney film.
23. *None of that* — Ringling College of Art and Design.

24. *Inner Workings* — I've got a poster of this short at my desk at work.
25. *Piper* — So cute. The rendering is as mind blowing as the elegance of the story. No dialogue, just a little bird that overcomes fear.

After Computer Animation Festival, you make your way to a reception held out in front of the convention center. With your ticket, you are allowed as much food as you want from the dozens of food trucks parked on either side of tables and chairs lined along the pavement between palm trees. With your new friends Jen and Diede you make your way around the food trucks and head towards the beer and wine dispensaries to use your free drink ticket. While in line for your Anaheim Gold, three of you start talking with a nice gentleman in line behind you wearing a shirt with *Google* formed by a tessellation of triangles. As you get to talking, you find out that he works as an engineer on self-driving cars in the Mountain View office. Specifically, he works in graphical tools and rendering for user interfaces that will be found in the cars. Before you know it, your friends have floated elsewhere and left you to talk for 20 minutes with the engineer from Google. His badge says *Philip Nemeć*. As it turns out, the product manager working on self-driving cars that you met at a summer writing program—the very same woman who kindly submitted the internal candidate referral which saw you pass a coding test and then complete a phone screening with Google before politely withdrawing your candidacy to accept your current job—well, it turns out she sits two desks over from this gentleman. He's amused to hear Min Li Chan's name come up and you figure this alone may guarantee that you might hear back from him should you reach out to him after the event.

The two of you talk and you ask him a new favorite question to pose to people like him: people who have been there and done that and might be willing to put down some sign posts for you. You prefer to ask not what he studied in college (computer science at Carnegie Mellon), but instead ask what he studied in the years right after college in order to bridge the gap between his formal education and what he needed to start moving towards what he is currently working on.

Philip stresses the importance of picking little projects to dive deep into, using the example of becoming really knowledgeable about, say, typography and kerning. He also encourages you, with respect to your continued math education that you suggest you will pursue in a self-study capacity for now, to learn more about probability and statistics. You show him a recent screenshot from a geometry library you wrote and talk about how as humble as that project really is, it was still complex in comparison to anything you had done before and taught you a great deal about organizing a big project into small, bite-sized pieces. In total its 1,000 lines of code, but from those 1,000 lines you learned some patterns which you figure might help you in projects of much greater scale. You tell him that you're biggest concern as you start out as a software engineer is becoming more mature in your approach to tackling big problems. You see this as a *meta* skill which envelops other sharpened abilities which you might pick up from studying,



SIGGRAPH 2016 Reception

say, discrete math or analysis or topology. There's learning to think logically—that's programming. Then there's learning to think translationally—that's what Justin Curry, Paul Bendich, and Chris Tralie have gotten better at by doing math. And then there's the ability to create organization from chaos which you imagine a high level software engineer has learned to do where other smart folks have the horsepower, but not the foresight and experience to do the same.

How would one go about starting to build a CAD program from scratch? You mention your having read *The Autodesk File* by John Walker, and Philip writes this down in his notebook while you are standing there besides the outdoor bar. You haven't a very clear idea of how to break significant, open-ended research problems into a maintainable codebase. Rather, you have some inkling, and you have seen bits and pieces of how it might be done, but you have not yet had your hands on such a project. How would you go about laying out the groundwork for a self-driving car's core artificial intelligence codebase so that it might develop as painlessly as possible over the next decade? It is the ability to write code which might be reasoned about in a mathematical way and which might inspire confidence in its ability to provide lasting solutions long into the future



Jen and Diede

that you intend to develop over the next few years. This isn't what they teach you in school—at least not at your school. You're going to have to learn this on the job and by continuing to follow bright folks who manage to both pave the way and show the world how they did it. What you learned on your own went beyond what you considered to be a more near-sighted goal in your academic program. Michael Abrash and Mike Bostock come to mind. You will continue to find resources and attempt to dive deep. You are on the search for prolific writers who wrote code and did math.

Philip takes a picture of your badge and hands you a business card. Again, your small oversight in not printing your own is mildly embarrassing. You plan to reach out to him to ask him for some book recommendations, at the very least. He promises to tell his colleague that he ran into you. You have that warm fuzzy feeling of realizing how small a world it is, feeling satisfied that you managed to talk with someone during the reception. Thank goodness some confusion and long lines for booze sparked a friendly comment that turned into a conversation. Finding the rest of your friends after wandering about through the crowd, you learn that they too had just gotten wrapped up in conversations like the one they left you to. The reception is winding down, so you

bounce around a few more food Truck windows to complete your proper dinner.



Crashing the Khronos party.

It is truly a great night and join your friends in the lobby of the Hilton just next to the reception that has ended, surrounded by perhaps 200 other attendees buzzing around the bar who were attending a party for Khronos Group. This is a great end to evening. You learn in these last couple of hours of the day what exactly is involved in an art curriculum at a school like SAIC. You are interested in hearing the Beligan explain how his interview went during the job fair earlier today, and you certainly enjoy the company of the girl working for Hasbro. It's damn fun to hang out at a your little table tucked beneath a grand staircase. You all take pulls from your beers and laugh as the other guests come and go, laughing and taking up tables all throughout the lobby. You spot some folks here and there with their Nvidia lanyards and conference badges visible, while others are dressed up in suits and dresses, possibly for another event. A few people are indeed wearing Khronos shirts, with the new *Vulcan: Industry Forged* shirts appearing to be particularly popular here and during the next day at the Convention Center.

## 6 Tuesday

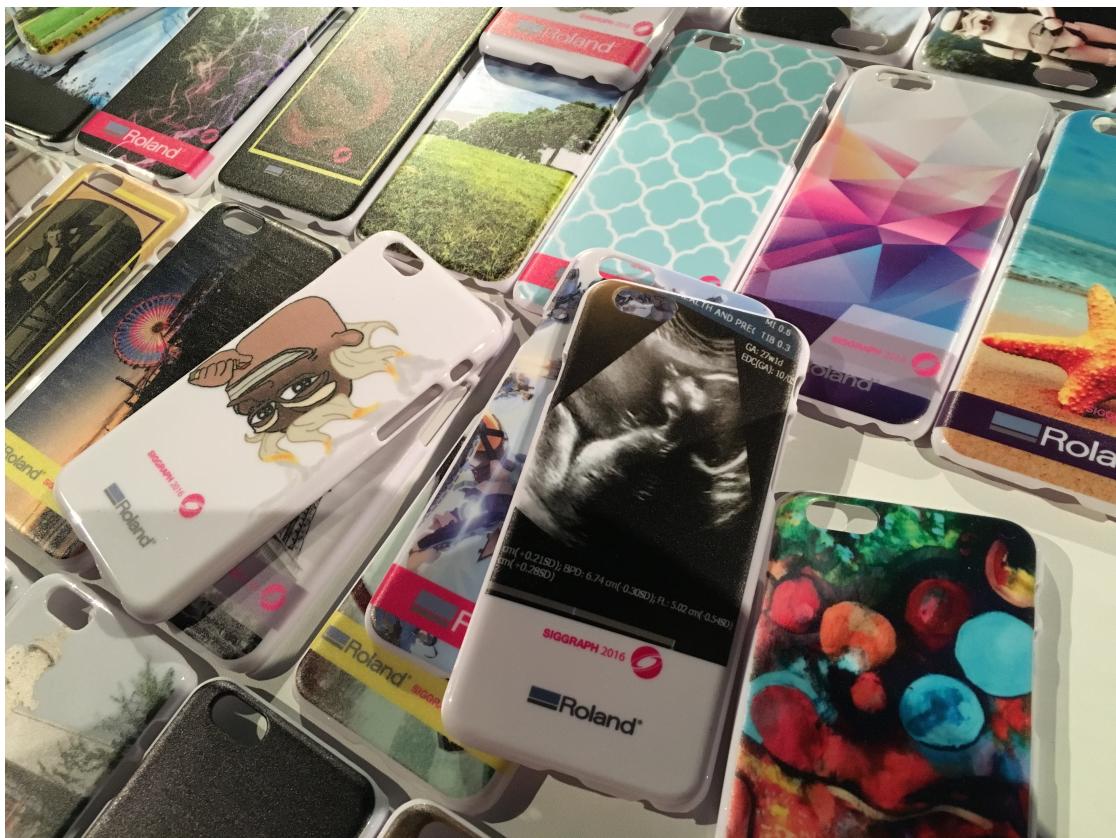
You knew you had to check-in at 9 am for your first of two shifts today, so you were sure to get back the night before and get plenty of sleep. Nonetheless, you push it when it comes to making it to your first schedule so that you can get some extra sleep. Although you are supposed to show up for staging in the SV office 30 minutes before your shift, you end up catching your Team Leader mid-flight with a group of volunteers being lead into Experience Hall for their placements. You check in and are rightfully chastized for showing up when you do. A 15 minute Uber ride with a driver who got lost, followed by a long line at the Hilton Starbucks next door made you late. You could have been responsible and showed up for your back-to-back shift on time, but then you would have arrived at 3 pm without having eaten breakfast.

Where you are placed happens to be another booth in E-tech that is run by the same Japanese lab with the Haptic finger apparatus that you tried on Monday. These fellows do not speak English and you are unimpressed by a keyboard that vibrates being billed as a high quality instrument for musicians. You have seen hungover undergraduates do better than this during a weekend spent in the lab back in college. You are annoyed that their advertisement materials have typos and their equipment constantly requires intervention from one of the students restore its functionality. It is not the case that you are simply being too hard on these guys: several attendees have walked up, pressed a key or two and walked right off again, and more than one attendee walked away without trying the device after hearing you explain that it is a keyboard with speakers in the keys which help give the sensation of various percussion instruments as you press each key. Okay.

This emerging tech strikes you as clumsy and poorly thought out. Its obvious that the students associated with the lab have simply taken their passion for music and what hardware knowledge they had and put the two together to create an instrument that ticks the "haptic" checkbox. You resent representing a product that people so clearly do not care about. For all the hype surrounding SIGGRAPH, this stuff just seems silly. You would like to say that everything at SIGGRAPH was just absolutely mind blowing, but your experience in Experience Hall once again suggests that only certain parts of the convention are worth investing your time. Then again, perhaps a keyboard that vibrates is more interesting to folks encountering it for 30 seconds than it is to someone who must explain what it is for 3 hours straight. The fact that most of the novelty to be found in Experience Hall can wear off so quickly is indicative of what one ought to concentrate on. Probably the production sessions, even over the technical talks, if one were to pick and choose. Not every attendee is here for the long haul. There are day passes.

Following this shift, you then have another stressful shift working with Rolland, during which you handle a constant stream of requests to print emailed images onto tote bags. You gain an appreciation for what working in retail must be like and are humbled by how difficult you found the 3 hour rush to process the print request with

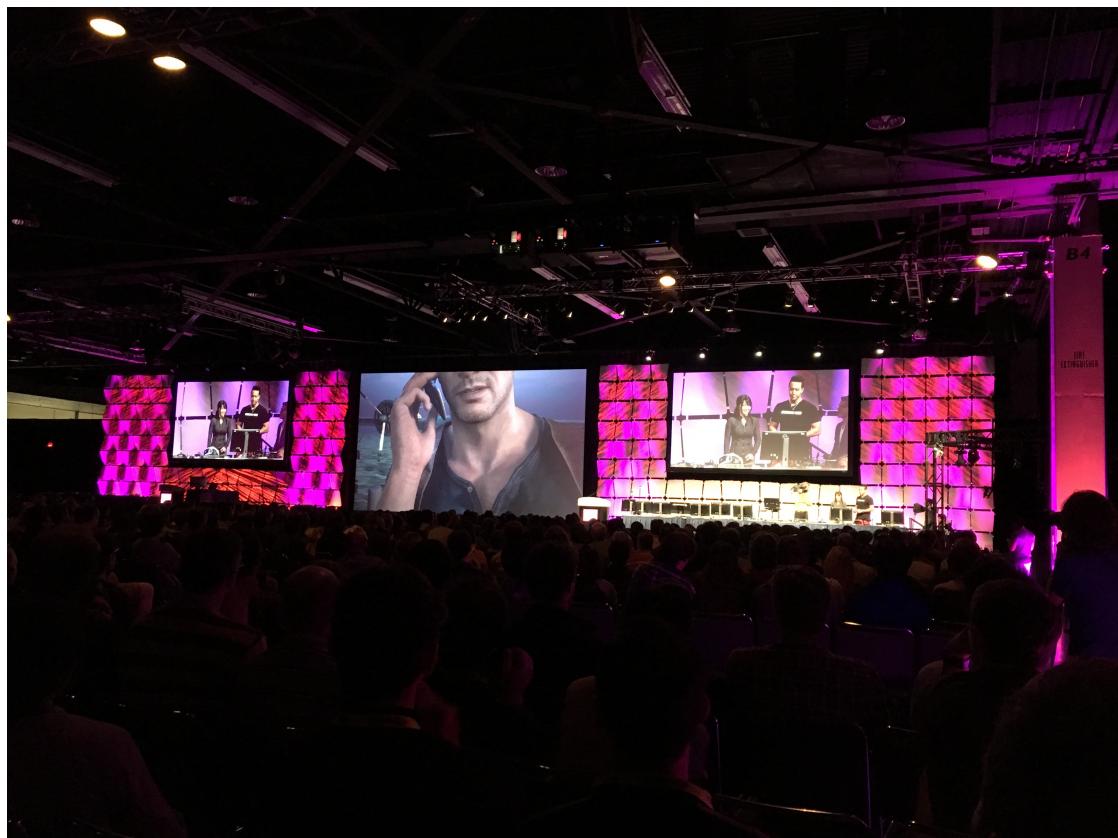
attendees standing behind you, managing your work as you fumble around with Adobe Illustrator templates. Frustration builds as requests pile up and for some reason the gosh darn mask won't clip the images. One kind attendee helps you fix the layer hierarchy to get you moving again. To your left another SV does a similar job, except for emailed images meant to be printed on iPhone cases. You feel badly at your own behavior when a tiny crack appears in your dike of patience after a lot of nagging from one attendee in particular. This lady practically throws a fit as you struggle to positon her photo on your screen. You simply scoot your chair back and point at your keyboard, gesturing for her to draw up her free design as she wishes. When your shift is over, you realize how much you have taken for granted a life free of working in *retail*, with *customers*.



Roland prints quite a few phone cases designed by attendees. Taste ranges.

During the afternoon you manage to catch a wonderful presentation in Room 207 D, where companies like Autodesk and Nvidia present various talks, some of which have been selected as "Best of" talks after being shown at other gatherings. The speaker is Matt Silverman, a designer, animator, director, and entrepreneur who now runs the scrappy company Swordfish out of a hip San Francisco. Swordfish is unique in its completely cloud-based rendering workflow. The talk discusses how Swordfish uses a Google

Cloud Platform to pay for large amounts of computer power on an as-needed basis to complete their commercial work. The talk covers how Matt grew his company by carefully buying equipment only as new employees came onboard, picking up Mac Pro desktop computers off of craigslist to amass a small in house renderfarm while choosing when to pay a few thousands of dollars here or there to spool up servers in the cloud which crunch thorough their renders—all without the tremendous upfront investment made by other larger companies in hardware. You see several commercials he has made and are treated to a well told story of the arc of his company. This was a story of how the little guy pulled off big feats in the animation world. David and Goliath, where Goliath is the oppressive cost of computing power for state-of-the art rendering.



Real-time Live. "Look at how we render Drake's chest hair."

After another Starbucks bento box, you find out your friends have gone to see *Real-Time Live* in Hall B. You squeeze into a chair with only 30 minutes remaining in the show, and boy what a 30 minutes it is. On stage you watch a motion capture performance with an actress and camera crew. The actress wears a rig that points bright lights and an array of cameras at her face in order to capture every subtle change of her countenance. So far as you can see, the movement of her body in the frame of the camera is also directly

influencing the animated model that will appear in some sort of video game. What she is performing is a part of a cutscene that advances the particular game's story. A man deftly whips around her as she ducks and jumps at the camera, crouches, screams, stands, and circles the ghost of herself which she will next record. This is a brilliantly complex choreography which plays out in front of the audience. *In real-time*. There is no magic, and yet this is all magic. On the large screen, her live performance is translated in real-time to a highly detailed, photorealistic rendering of some Amazonian female warrior with scars and long dreads who interacts with a ghost of herself through a mirror. Multiple recordings are done within a mere 10 or so minutes on stage and a final cut of both the ghost and the warrior is created. A final cut is played to a roar of applause from the audience. This all took place in a matter of minutes on stage. All of the rigging was programmatic, the final cut could not be more closely driven by what the actress was doing on stage in front of you.



Walking back to the Anaheim Convention Center.

The last demonstration that you manage to catch in *Real-time Live* is a sneak peak at Naughty Dog's live character models in *Uncharted 4: A Thief's End*. Some technical problems prevent the screen from initially showing what a woman and a man standing

at the podium that intended to show. Hilarity ensues as the two proceed to *not* cope with the problem at all, acting flustered and saying random *umms* and *hmmms* into the microphone as a technician pops up out of nowhere and starts fiddling with the wires coming out of their computer.

Finally, the show goes on and the two speakers treat us to a presentation of the main characters in the game standing in a house off in the wilderness where it is snowing. The characters stand swaying slightly, blinking, and moving just enough to make them seem people and not bodies. In real-time, the presenters at the podium zoom about the scene, picking various parts of characters to describe in detail as they zoom in. We are treated to Drake's photorealistic chest hair peeking out of his collar. We zoom in on the elaborate stitching around a female character's sweater. We see various stages of snow melting on a leather jacket and the crowd *oohs* and *aahs*. You have not played too many *next* next gen video games lately, so this thoroughly blows your mind. Your definition of state-of-the art is fast-forwarded to 2016.

You watch a bit of the Tour de France back at your host's house while you upload photos to Flickr and check your schedule for the rest of the week. It is an early night tonight. You are planning to feel great for the RenderMan party at some other hotel tomorrow.

## 7 Wednesday

Today is the rough day. Your schedule is more or less blocked from noon until 10:30 in the evening. Where your previous days saw either one or two shifts totalling less than six hours of time spent repeating, greeting, or seating attendees, today's schedule has been changed since you last checked it on Monday morning. Surprise! At noon you begin back-to-back shifts in VR Village, followed by a short break before you are staffed to assist in the second showing of the Computer Animation Festival reels. This is a bummer, because you already saw the Computer Animation Festival's first showing on Monday night. Your third shift today will force you to miss the Pixar RenderMan Party for which you had already RSVP'd and expected to join your new friends in attending. You had not known about this, but like most of the events you attend, you hear about them from a friend or Facebook post, rather than a diligent studying of the schedule. It is in fact Diede who sent you a link over Facebook messenger for you to RSVP yesterday. How nice of him. This is the only time this week you have wished to swap shifts, but realize you must respect the 24 period during which you are not allowed to swap. This third shift had showed up probably 30 hours ago. Surprise.

Acknowledging you would miss most of the programming for Wednesday, you scour your pamphlet once you have arrived at the convention center to see if you can catch anything before your shift starts. You see that you can at the very least catch the first 45 minutes of a Production Session held in the large Hall B: *Under the Sea: Making of Finding Dory*. These 45 minutes turn out to be the most illuminating time spent watching in awe during the entire week.

Unlike the other technical talks hosted by Nvidia and Autodesk, this session avoided burying the audience in technical details without narrative or motivation. The Pixar team was seated on stage so that different members could come to the podium and talk as slides presented their contributions to the film. You are most fascinated by a presentation on the set design for *Finding Dory*. The gentleman who is speaking brings your attention to his first slide showing arrays of panels containing early sketches for various aspects of the film.

The first four panels show a circle, a small dot, a squigly line, and a straight line. It is explained that these four panels were a first sketch of four aspects of the underwater and water world created for Dory's adventure. The panels are an attempt to capture emotions in basic forms: the circle represents the organic coral; the dot represents the vastness of the ocean and the vulnerability of a fish isolated and small in the frame; the squigly line represents the kelp forest, which provides protection yet still feels alien and ominous; the straight line represents the hard lines of the human world, completely alien when the fish are placed within it, and related to the world that will be built for the Marine Life Institute (MLI) scene in the film. This is fascinating and a revelation to you, because this is your first glimpse behind the scenes that has exposed a logical process you could imagine employing in your own work. The playfullness of this design

process is fascinating. The next panels show iterations on these first four forms. Form and abstraction and distilled mechanics of story telling. Color is introduced: the kelp forest turns green and the institute evolves into a network of overlapping lines which turn at sharp angles much like the piping of the institute's vast duct network in the movie. MLI is marked by drab shades of gray and brown and orange.

The story's needs and camera angles determine how it's made.

When you meet incredibly talented people from places like Pixar, you're initial reaction may be one of fear—you feel insecurity and awe. But quickly you allow yourself to be inspired and set out on reading, studying, doing. The principal takeaway from this morning's presentation is that making a Pixar film is a long process which necessitates careful and flexible design during the earliest stages to ensure the tremendous attention to detail and thousands of man hours invested in the final years are aiding a worthwhile vision. Much of SIGGRAPH has to do with the latest and greatest advances in computer science which give the animator more horsepower and greater expressiveness in their tools. Pixar's presentation reminds you of the importance of the story, the importance of emotions. You have seen that much of what SIGGRAPH has to offer strays away from the *the story* that all of this technology should help to advance. You hope to find yourself closer to the story in your own work. You imagine that what this gentleman standing at the podium does for a living could hardly be more rewarding.

Another slide shows a timeline of emotions in which a line traces *emotion* on the vertical axis against the progression of the *storyboard* on the horizontal axis. Yet another abstract tool from Pixar aimed at teasing out the most fundamental essence of the story telling process. Again, this is the kind of thought process lacking in the Experience Hall, where many companies desperately try to jump on the virtual reality bandwagon without investing any serious effort into delivering a story or an *experience* beyond the novelty of wearing a VR headset and maybe feeling something on your fingers or arm as you look about. These 10 minutes devoted to the set design of *Finding Dory*, more than anything else you have seen at SIGGRAPH, reveal the difference between putting emotion and story first and letting technology distract. You recall something you heard during Sunday's *Real-time Graphics for Film Production at Pixar*. Pixar seeks any technological advancement that can help animators tell better stories. It's all about story telling. You knew this, but SIGGRAPH has shown plenty of work that loses sight of this ultimate goal, and the difference between what companies like Pixar and Dreamworks show and that of the other studios is made clear. You wonder how unfair of a comparison it is to equate what Pixar does with putting a man on the moon every few years.

Following the set designer's presentation, a lead texture and materials designer explains the physics of the aquatic characters' material properties which lend, for example, the gummy texture to Nemo's exterior under a variety of lighting scenarios. On screen, a simple diagram explains the phenomenon of diffusion scatter, and it is explained that physically unrealistic parameters are set on nearly every surface to produce gummy

and translucent characters when light would indeed not behave the way you are seeing it interact with materials on screen. Part of this texture discussion dives into Pixar's Universal Scene Description workflow for managing assets and scenegraphs—huge numbers of very large assets. It is pointed out that adopting USD and the new raytracing paradigm set forth by RenderMan RIS was a big decision for Pixar at approximately 2 years out from the film's release. It is noted by the presenter that nobody knows what RIS stands for. How about "Really Interesting Story," the presenter jokes. From the RenderMan site:

The RIS technology in RenderMan is a game-changing rendering paradigm, a highly-optimized framework for rendering global illumination, specifically for ray tracing scenes with heavy geometry, hair, volumes, and irradiance with world-class efficiency in a single pass. This evolution in technology offers best-of-class in rendering for both VFX and feature film animation. Today RenderMan is the most flexible, powerful, and reliable tool for rendering cinematic imagery.

In short, RIS is a raytracer that is really good at making scenes look like those found in *Finding Dory*. All those yummy fully ray traced caustics which are so closely associated with what we perceive to be an underwater environment. The discussion of the new rendering technology stack brings up another issue of recovering assets from *Finding Nemo*—digital archeology. This idea of diving back into past work sparks your idea to go home after SIGGRAPH and create your own journaling tools, drawing inspiration both from your instructor Chris Tralie's own logbook used as a graduate student and your love for all things Git and version controlled. You recognize your own smaller-scale need to keep your multimedia work organized (often just text) so that you can synthesize information and do any digital archeology you must as painlessly as possible. In fact, you will flesh out a working prototype during the weekend following SIGGRAPH, and in the weeks after hone in on workflows that promise to keep your daily thoughts and touched files in some sane, future-proof state. This right here is what you were hoping SIGGRAPH would do: inspire you to go out and build stuff. By now you have seen the beauty of sketching abstract forms on the way to telling a story and the intense need for organized workflow to harness all of Pixar's creative output.

Checking the time constantly, you reluctantly get up in time to head for your noon shift and leave as a lead character rigger begins to explain the technical difficulties involved in animating the mischievous, tentacled Hank. You think as you are leaving Hall B that not being good at drawing is an insecurity you would like to dispel over the coming year.

Worn down from a day spent putting VR headsets on people's heads, taking them off, cleaning them, and putting them on again, you grab another Starbucks Bistro box and sit dazed in the SV office with the other volunteers, watching groups head off to the RenderMan party at another hotel that you will not be venturing to this evening. In



A slide from *Under the Sea: Making of "Finding Dory"*

an hour, you begin to usher a couple thousand attendees into the Computer Animation Festival's second showing from 8pm to 10pm. You figure this isn't the worst thing to happen, as you loved the first showing and your scan for recording devices during the show will let you watch most of the shorts again—some of these shorts are not even available outside this evening's showing. Realizing that the event was overstaffed, you are informed by a Team Leader part way through the show that you are free to leave or take a seat and watch the rest of the Electronic Theater. You leave your post where you walked up and down the right side of the room scanning for recording devices in between pausing to actually watch the show. It is probably too late to head to the RenderMan party, and you would honestly like to see some of Disney and Pixar's shorts again towards the end of the show (around 10pm). You find a seat next to the video game developer you met earlier who is working on her dissertation at The University of Edinburgh. Her name is Saran. On Monday she was working at the show, so both of you are seeing most of the shorts for the second time, and it is in watching things for a second time that you can appreciate the particular elements you cherished in each short. Between shorts you take turns leaning into each other to make some remark about what you've seen, or to ask which ones the other liked the most and why.

Tomorrow you plan to head to Huntington Beach after the day's shifts and programming have finished with three other friends you have joined on previous nights at receptions and local bars. You retire early to do laundry and get a good night of sleep before the next day's festivities.

## 8 Thursday

You luck out. You seem to have had a shift removed from your schedule. In the morning you help a studio responsible for virtual reality content production and distribution. You again find yourself putting VR headsets on people's heads and wiping them down for the next attendee. You're happy to kill downtime during the lulls in the last day's foot traffic by talking to the guy helping to run the booth. He is apparently freelancing for the production company who owns the music videos made for Bono that are preloaded on each of these headsets. The headsets are Sony Gear units, since they apparently come with higher end smartphones and thus will be the main target for the distribution of VR-related content, for now. This guy you are helping out graduated from UCLA recently with a degree in film; now he's working in a Venice, California office for a company called Within. He seems to have a few good ideas and you talk at length about Louie C.K.'s new independently produced episodic content for *Horace and Pete*. You have no idea how this guy is going to crack into the industry, and you feel starting in VR is possibly a bad move. Unfortunately, you don't make it over to see the highly praised 360 Google Spotlight Story *Pearl* just a few booths away. While you have been less than impressed with much of the VR stuff that made its way to SIGGRAPH, *Pearl* apparently gets the story part right, making use of VR to further the story without relying on the gimmick as so many other booths have done.

With a few hours left before setting off for the beach, you hope to hear some more technical talks. Unfortunately, when you wander up to the third floor of the Convention Center to pop into Ballroom B for a talk on meshes and fields, you last only 5 minutes before you must excuse yourself. The speaker is dreadful and like the Vulcan talk, you cannot get a foothold any point during the presentation. You walk next door to Ballroom C for a presentation titled *Mass Effect: New Earth — A 4D Holographic Adventure*. The panel doesn't exactly seem to be full of engineers. After a few minutes of marketing baloney with words like "heavy tech" thrown around, you again excuse yourself to look through the bookstore before heading back downstairs. Oh well, you feel like you have gotten a lot out of SIGGRAPH and now shift gears to gathering anyone you can for Huntington Beach.

Since some of your friends are still finishing their shifts in the final hours of SIGGRAPH, you wonder through Exhibition Hall before all of the vendors close for the day. You check out the NVIDIA demo where you walk into a trailer housing a high powered desktop computer and a HTC Vive setup. You try out an automotive application which allows you to use a controller in your hand to select options which are immediately reflected in a car parked in front of you. What you see in your virtual world is like a large garage, a shiny car on exponited shop floors. You're encouraged by the gentlemen from Autodesk standing in the room with you to walk over to the car and kneel down inside it. You do, and your mind is just about blown. You can lie down on the floor and look at the underbelly of the car, get up, and walk around it. Your physical controller



This machine is designed to recreate complex lighting situations for live filming.

allows you to point at several orbs in this world to flick between various viewpoints. Because of the cameras positioned in the NVIDIA booth which track your head in high fidelity, you are afforded a VR experience at an entirely different level of immersion than what is offered by Oculus and the Sony Gear (which utilizes a modest Android phone). You ask some questions and are put off by the overly aggressive sales pitch of the Autodesk marketing guy. He explains that he comes from the automotive industry, and you believe him.

The wrap-up for SIGGRPAH 2016 takes the form of a SV raffle held in the room adjacent to the SV office on the second floor of the Convention Center. You all gather into chairs and eye the tables at the front of the room with mugs, hats, Pixar teapots, signed posters, thousands of dollars worth of graphics cards, and other miscellaneous goodies. A guest speaker who worked at the Jet Propulsion Laboratory speaks to all of you and encourages you to make the best of such an incredible field. He is joining the Student Volunteer Program Chair Christian Wittorf and several other committee members in thanking all of you seated in the room for your contribution. Everyone is getting anxious as the prizes sit unclaimed at the front of the room. Finally, the names



The HTC Vive.

are called and you win a nice *SIGGRAPH 2016* hat and a poster for Disney's upcoming animated shot *Inner Workings*, which you will hang near your desk at work. After the raffle prizes are distributed, you also score a Pixar teapot from the extras given out for folks who missed out on the RenderMan party. Diede would have given one to you, but he was saving his second for his brother. These teapots are highly sought after (so it seems), and yours will sit proudly on your desk at work. Your group decides to stick together for the rest of the day as you walk out of the Convention Center and begin to make preparations for the trip to Huntington Beach.

After collecting people one by one at their hotels, it is Jen, Diede, and another girl named Ambar who pack into a small Uber with you and head towards the ocean. After a stop at Johnny Rockets, *because this is America*, you all find a spot in the sand 20 paces from the water. You haven't been to the beach in a while, and neither has Diede. You have all arrived later than you had hoped, only to experience the golden hour of light descend on you as Jen, Diede, and you take off running into the breaking waves. Perfect. Shivering, you all return to your burgers, pour out Heineken into little red Solo cups, and toast to *SIGGRAPH 2016*.



Huntington Beach.

At some point in the evening, you pose to the group the following question: "What are you really excited about working on when you get back?" Jen describes a vision for an art project that she hopes to complete. You also encourage everyone to go around and share their favorite memories of the past week. You say that yours was seeing the evolution of set design for *Finding Dory*. Stories of college are shared, with Diede at one point describing the fascinating a capella groups at the school he just graduated from in the Netherlands. He regales the group with stories of extreme and hilarious situations members would be placed in which might be described as *hazing*. The night winds down. You all pack back into an Uber and make your way back to a hotel. With the windows of the driver's Prius open and the cool air hitting your face, you watch the lights of neighborhoods and industrial districts wash past you while the others nod off in the backseat alongside you. It seems like a little over half an hour passes as you drive along the now empty highways.

Back at Jen's hotel you all say goodbye and wish each other well, encouraging everyone to stay in touch and not be afraid to reach out on Facebook. The week is over, but there's no reason you can't keep your world small by keeping tabs on Diede and his work and seeing where Jen and Ambar land in the coming year. You hug, shake Diede's hand, as he half-jokingly insists, and make your way back to your host so that you can pack your things. You will be tired when you wake up early for your flight, but you did nearly everything you could have hoped to do at your first SIGGRAPH. You learned

some new things, received encouragement from people like Philip Nemec, made friends, told stories, and came away humbled by the incredible talent of your fellow SVs. You also literally got your feet wet. SIGGRAPH pulls you out of your bubble and shows you of the beauty of making things and showing them to other people. You are thankful for the opportunity to attend SIGGRAPH, which would not have happened if it were not for Chris Tralie and all of the other mentors you had at Duke.

So off you go, to make things, program, and write. There is so much to learn and at least a few new books and recent papers are waiting for you to read them. What you have seen at SIGGRAPH has helped remind you that what you want to do will require more math. It will require more of *a lot of things*. You do not yet know many of the things that you will need to understand in order to create elegant software or write what you hope you can write or tell the story you think you will tell. As Chris Tralie once told you, *you should not let not knowing everything stop you from doing anything*. There's not a whole lot stopping you from using the resources you already have available to continue your education, to do math. It is easy to become overwhelmed by things you can see at SIGGRAPH, but that's okay.

You hope to not be distracted by trends, and you want to work hard to make something elegant. You have seen great work at SIGGRAPH 2016 and you had the chance to meet the people who go back when all is said and done to keep doing great work. You look forward to SIGGRAPH 2017 and other events like it because while not every aspect of SIGGRAPH may be worth the price of admission, there seem to be enough surprises and fortuitous encounters to warrant getting on a plane and spending a few days milling about a convention center in a hot touristy destination like Anaheim. Some of SIGGRAPH is silly, sure, but it is still a gathering of talented people and therefore worth attending, especially as a student volunteer, if you have the slightest interest in making dreams a reality through computer graphics. You just have to put on blinders and tune out the commercials to get the most of this event.