

**Project Invoice and Summary Report**  
**6.1.2014**

**Annina Ruest**  
**479 Moody St. Apt H**  
**Waltham, MA 02453**

<b>Already Ordered Material</b>	
RobotShop M100RAK V2 Modular Robotic Arm Kit	██████████
Lynxmotion SSC-32 Servo Controller	██████████
Shipping	\$██████████
<b>Anticipated Material Needs until 06/30/2014</b>	
2 Arduino Mega	██████████
2 MegaShield Kit for Arduino	██████████
Lynxmotion Wrist Rotate Upgrade	██████████
Lynxmotion A Style Gripper Kit	██████████
Misc Electronics	██████████
Access to Lasercutter, CNC machines.	██████████
PlexiGlass or other construction materials	██████████
<b>Work Space Rental</b>	
Studio space rent (month 05/08/2014-06/30/2014)	██████████
<b>Fee</b>	
Artist fee	██████████
<b>Total</b>	██████████

## SUMMARY REPORT 6.1.2014

### Technical

I researched robot arms both hobbyist and industrial. I found that industrial robots are too expensive for my purposes and for my budget. I looked for a while at second-hand industrial robots both on ebay and on the website of the company that Ken suggested. The hardware/software configuration of the eligible candidates looks very corporate, application-specific, and not transparent to me. I also don't want to have to hire a specialist to help me figure it out (as Ken Goldberg suggested that I do). However, I also realized that I don't necessarily want to continue modifying more of the \$40 hobbyist robotic arms that I have worked with so far. The reason for this is that with three motors and five sensors per arm, they are the path to madness. They also make setting up an exhibition very tedious. And, last but not least, they require a lot of soldering and gluing.

So I found the M100RAK V2 (<http://www.robotshop.com/en/robotshop-m100rak-v2-modular-robotic-arm-kit-no-electronics.html>), a robotic arm that is the size of an industrial robot. In terms of cost (USD \$ [REDACTED] for the basic setup), it is cheaper than educational industrial robots (those start at \$ [REDACTED]). It fits my specs in terms of reach and the load it can carry (500 grams). I can easily connect it to a vacuum cleaner to do the "paper pie chart on pie" setup that I have previously worked with. However, I think that it is accurate enough so that I can also try out forward kinematics / inverse kinematics in an attempt to make it draw/paint a pie chart onto a pie (for example on marzipan covering).

So I will be buying the following items as soon as they become available (June 10 for the robotic arm). I don't think it will ruin me in terms of budget.

RobotShop M100RAK V2 Modular Robotic Arm Kit	[REDACTED]
Lynxmotion SSC-32 Servo Controller	[REDACTED]
Lynxmotion Wrist Rotate Upgrade	[REDACTED]
Lynxmotion A Style Gripper Kit	[REDACTED]
<hr/>	
Total	\$ [REDACTED]

### Data Collection

- As you already know, I will be writing a blog post about the feminist protest against the original art and technology program at LACMA. I talked face-to-face with Jessica Gambling about obtaining newspaper clippings, the letter from the women of the Women's Building at Otis etc. I will send an email to her once I am done with the is email (you will be cc'd).

- I am also planning on starting the quantitative data collection soon with Robyn and Jessica.

- As I understand, there were other Art+Technology programs at Bell Labs and

elsewhere going on at approximately the same time as the LACMA program. I am interested in collecting gender ratios from those programs.

- I obtained Chris DeFay's PhD thesis but have not started reading yet. Also, I will be asking Max/Chris for more info on the group at Google that does Sociology research on the Google Workforce. Not sure where it will lead.

- During one of the meetings, either with Robyn, Jessica, or Amy, somebody brought up the question whether it would be possible to tell how many women artist were shown at LACMA and compared with how many images of naked women were shown during the same time span. When I prepared for one of my talks at UCSD, I found out that the Guerrilla Girls had done exactly that. Here is a picture from the 2012 Boston version of the project <http://www.guerrillagirls.com/posters/BostonNaked.shtml>

## **Workspace**

I was not able to rent a space in Artisan's Asylum because their wait list is about six months long. Instead, I was able to rent a space in Industry Lab (in Cambridge) for \$ [REDACTED] per month. I have been renting the space since May 8.

**Project Invoice and Summary Report**  
**7.16.2014**

**Annina Ruest**  
**479 Moody St. Apt H**  
**Waltham, MA 02453**

Anticipated Financial Needs until 08/30

**Electronics**

Lynxmotion AL5D 4 Degrees of Freedom Robotic Arm Combo Kit (No Software)	
Misc electronics	

**Anticipated Material Needs until 08/30/2014**

Misc construction materials	
Printing piecharts	

**Work Space Rental**

Studio space rent [REDACTED]/month 07/01/2014-08/30/2014)	
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**Fee**

Artist fee	
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**Total**

[REDACTED]



## Report 2

### Work done during the first milestone:

#### Technology Development

I assembled and tested the M100RAK robotic arm and documented the results on my blog. The post includes some simple Python code that I used to do the tests:  
<http://www.anninaruest.com/pie/2014/06/new-robot-arm/>

Physicist Yaouen Fily wrote me a set of functions in Python implementing both forward and inverse kinematics. The forward kinematics function is mainly used to create a 3D simulation of the robot arm in vPython. This is useful for testing. The inverse kinematics function takes a set of xyz-coordinates. For each of those coordinates, the function generates a set of angles that I then converted into motor positions in the same Python script.

I first tried robot drawing on paper using a Sharpie pen, then on white chocolate using a food color marker. The white chocolate did not work because the chocolate is too soft (especially in hot weather) and clogs the pen. I will try again using royal icing and/or rice paper.

Yaouen and I documented the math (trigonometry) that Yaouen used to write the functions. The blog post has illustrations and goes back and forth between equations and code as much as possible. My target audience are people who code but are not necessarily very familiar with trigonometry (like myself). The main goal is to have them understand the math in the code without necessarily being able to produce such a thing themselves.

<http://www.anninaruest.com/pie/2014/07/inverse-kinematics-and-the-m100rak/>

#### Research and Data Collection

I have written a blog post on feminist data collection, analysis, and visualization for the LACMA blog. The research done for the blog post helped me put my work in an art history context. It also helped me plan my own data collection for the project.

I decided that I will primarily collect gender ratios from within Art + Technology. This means that I will be scrutinizing the exhibition histories/archives of well-known Art+Technology venues such as Eyebeam in New York, ZKM in Karlsruhe, Edith Russ Haus in Oldenburg etc. etc. I will contrast those with the early Art + Technology programs like the one at LACMA and Bell Labs. I will also find comparison data in today's technology companies such as Google (a company that recently published their workforce gender ratios). As well as in more traditional art venues.

So far, I have manually collected about 75% of the gender ratios from Eyebeam's archives in a Spreadsheet.

## **Work to be done during the second milestone:**

### Conceptual

As previously mentioned, I started collecting gender data on Eyebeam Art and Technology Center and will continue to collect gender ratios on other well-known art and technology centers the second milestone. I will also collect data from the corporate sector within technology and possibly creative technology and from within art. Google recently published gender statistics. It got the impression that intellectuals within the art world reacted indignantly to the statistics. I am therefore even more curious to find out whether things are really better within the spheres of Art as well as in Art and Technology and to then interpret the data that I find.

In terms of technology, I was able to develop the project further than I thought, mainly due to the help of Yaouen Fily who helped me get Forward and Inverse Kinematics to work. This has also changed the conceptual direction, albeit not by much. I have decided to make two projects out of one. The first one is technologically similar to the version of the project that I made for the exhibition in Bern in Fall 2013. It uses the M100RAK to pick and place the paper pie charts onto a pie. Conceptually, I like the combination of household machines (vacuum cleaner) and robotics and this seems to be something that the audience tends to react well to.

The second project will draw the charts directly onto the pies. It will be more compact and hopefully allow me to travel easily with the project because it will be lighter and easier to set up. I am thinking that this version of the project could be shown at short-term events both in art and technology such as Maker Faires and other types of 1- or 2-day festivals and thus reach more people beyond a gallery audience. I could also change the content of the pie charts more easily and cheaply.

Conceptually, the second machine is similar to the larger one in that it will also be a Rube Goldberg contraption that automatizes a household task combining industrial aesthetics (robot arm) with household tasks (decorating pies).

### Technology

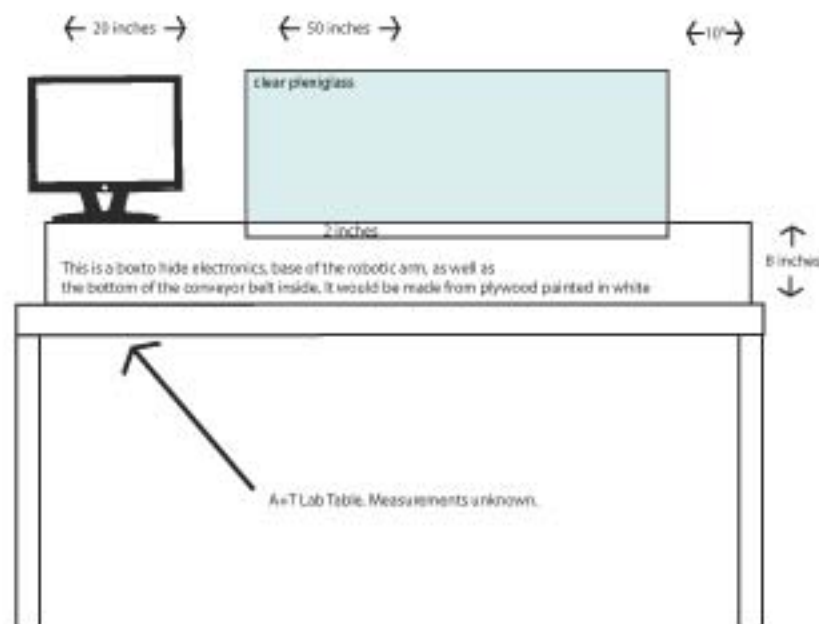
I have already ordered a second, smaller robotic arm from [Lynxmotion](#). The arm is smaller than the M100RAK. To lift itself, as well as a 500 gram payload, the M100RAK requires large, coarse gears to increase torque. However, this also makes the drawing inaccurate. I am hoping that the smaller, lighter robot will be more

accurate because it is not geared as much for torque as the M100RAK. The weight of the M100RAK may also distort the drawing and I am hoping that this might be less of a problem with the lighter Lynxmotion AL5D. I also discovered a [Python library](#) adapted to the AL5D arm that does Inverse/Forward Kinematics in a drawing context. If it does not work, I will return to the code that Yaoen wrote and adapt it to the new arm.

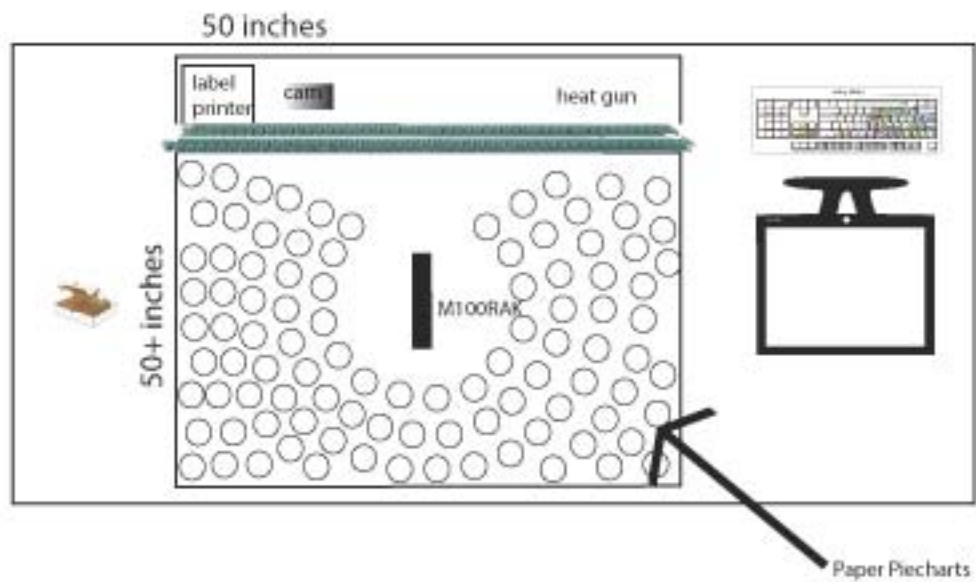
### Setup for Exhibition

Here is a plan for how I could imagine the project being set up in the A+T Lab space. I figured out a construction mode that would require me to ship less construction material and possibly look less awkward than the setup for the show in Bern (in Fall 2013).

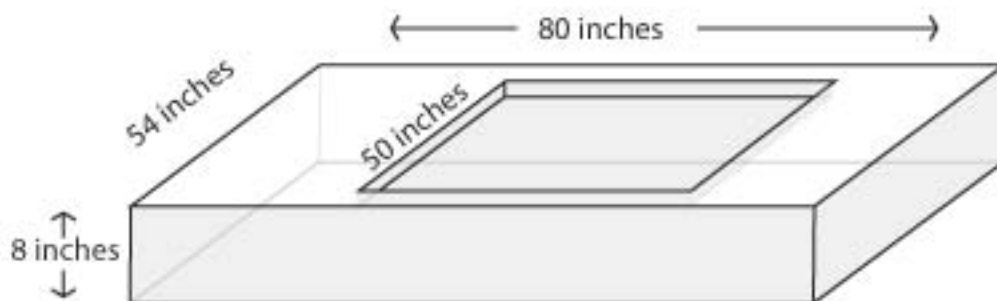
Instead of having a pedestal built for the project, I would be interested in setting it up on the A+T lab tables themselves, in order to not interfere too much with the layout of the lab itself. This would require a box to be built in order to hide the electronics. The box would be in plywood and painted in white and have one or two doors to access the electronics in order to start up the installation (shut down can be done via computer). See top view and side view below. I also made pseudo a 3D view (isometric view) of the box.



Side view. The vacuum cleaner would hang above.



Top view.



Pseudo 3D view. This shows just the box. A square area of 50" x 50" would be 2" or 2.5" lower than the rest of the top of the box. This would be where the base of the M100RAK and the non-conveying parts of the conveyor belt would be hidden. I



would bring/ship appropriately cut plexi sheets supported by wooden beams to cover the 50" by 50" area in the areas that are not taken up by electronics. This would then also be the display area for the piecharts.

It would be ideal if the fabrication unit of the museum could construct the box. If I need to set aside some of the budget, please let me know how much.

Anticipated Financial Needs until 08/30

**Electronics**

Lynxmotion AL5D 4 Degrees of Freedom Robotic Arm Combo Kit (No Software)	
Misc electronics	

**Anticipated Material Needs until 08/30/2014**

Misc construction materials	
Printing piecharts	

**Work Space Rental**

Studio space rent (month 07/01/2014-08/30/2014)	
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**Fee**

Artist fee	
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**Total**

Project Summary Report 3  
Annina Ruest  
05/09/15

This report describes the public presentation of the project. A few weeks ago, I returned from Los Angeles where I installed the LACMA edition of *A Piece of the Pie Chart*. In the past few months, I focused on finishing the installation and planning two events on the topic of feminist data to accompany the project's display at the LACMA research library. I also created a "Desktop Edition" of *A Piece of the Pie Chart* along with Yaouen Fily and displayed it in the context of the festival "Critical Make" at Haus der elektronischen Künste in Basel, Switzerland. The Desktop Edition is a smaller version of the project where the robot arm does not place pie charts onto pies. Rather, it draws them directly onto the pie. Below I will describe the development of those three aspects of the public presentation of the project in more detail.



## The Installation

I revised my concept for the data component of the LACMA Edition of the project in February when I started working again after my parental leave. As stated in the second report, I initially wanted to compare today's gender ratios in art and technology with those from historic art and technology programs such as the artist residency program at Xerox Parc, E.A.T. (Experiments in Art and Technology), and of course the original Art & Technology program at LACMA. However, I realized that for the installation, I needed "actionable" and therefore more recent data.

I also realized that I had been spending a lot of time collecting data in-depth rather than more broadly. For example, I had been collecting gender data from Eyebeam, an Art and Technology Center in New York all the way back to 2004. What I realized was that gender ratios did not change much over this period of time.



*Pie charts depicting gender data from the Eyebeam Art and Technology Center's exhibition archive*

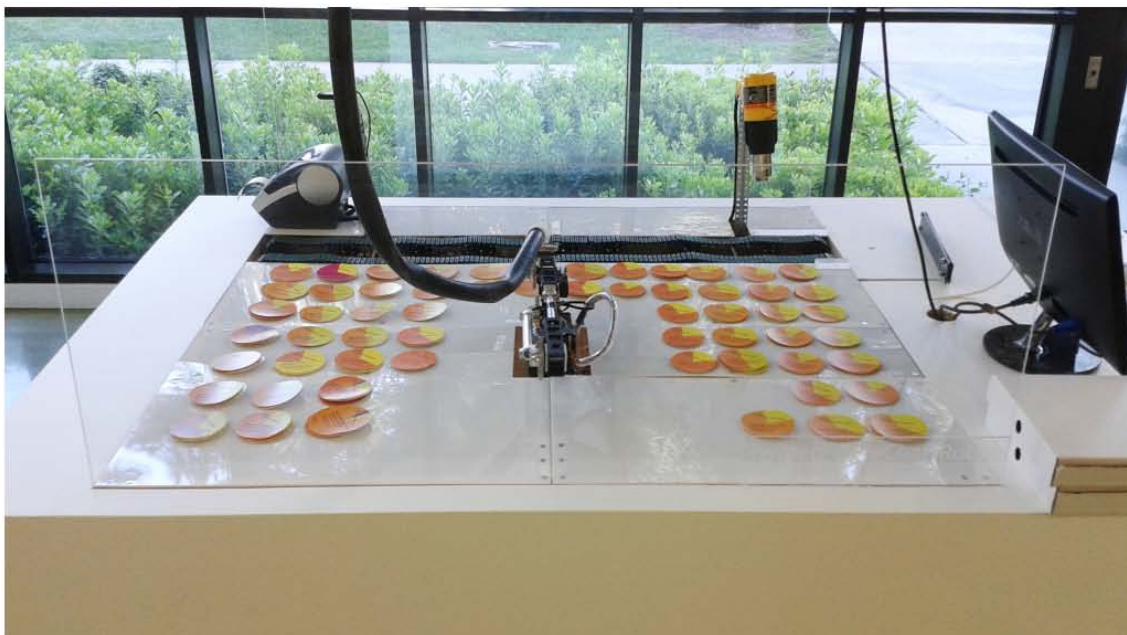
I therefore changed my direction and started collecting data more broadly. I entered all my data into my Internet database project *A Piece of (In)equality* (created in 2014) to archive it beyond the exhibition period. *A Piece of (In)equality* is a database project anyone can enter data to be displayed as a pie chart on an image of a pie. Beyond publically archiving data, I was also able to directly export select data from the Sqlite database on the Internet to the computer driving the installation.

For the final data display, I arranged gender ratios from art and technology venues on one side of the spectrum and gender ratios from tech companies on the other side. The space in between is occupied by art and tech grants and prizes, as well as festivals and events both from the art and technology domain as well as more specifically technology focused events and conferences such as Microsoft Ignite, and the O'Reilly conferences.



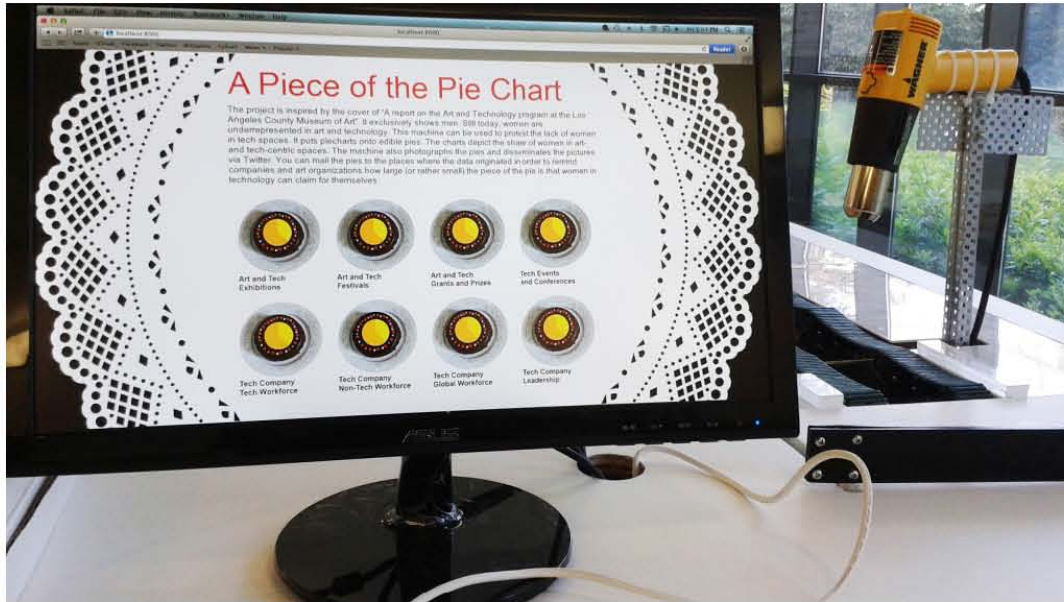


*This image is a sketch of the data arrangement that I worked with when planning the installation. The space in the middle is left open for the robot arm. I used images generated through my database project "A Piece of Inequality".*



*The above image shows how the data was arranged in the exhibition at the research library.*





*The user-interface of the pie machine shows the different categories of data in the form of pie charts that can be selected by the user for pie decoration.*

The technical aspects of the installation had been in place since August. When I returned from my parental leave in February, I spent some time reconnecting the electronics. Since I had not written a manual for myself, this took a few afternoons (and evenings, and nights...). During the install phase at LACMA, I needed to fine-tune the different areas within the installation. The installation worked well during the exhibition phase.- however, there are a few improvements to be made to the conveyance of the pies so that pies of differing sizes can be transported. The robot arm was working well, but, there were some inconsistencies that will need to be addressed should the project be displayed again.

## **Feminist Data Events**

In my LACMA Unframed blog post on feminist data published in June 2014, I wrote about the project Gallery Tally, a crowd-sourced project directed by Micol Hebron with a large following on social media. Gallery Tally collects and visualizes gender ratios of artists exhibiting at commercial art galleries. I had several Skype conversations over the first three months of the year related to our projects. These conversations culminated in a shared artist talk at the Art+Tech Lab at LACMA and a Data Collect-A-Thon event the following weekend.

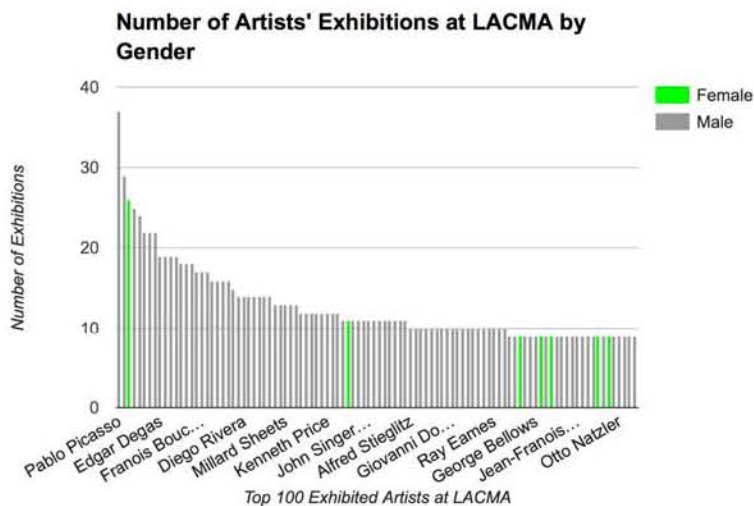
The Data Collect-a-thon made my stay in LA better than I could have ever imagined: Many years of feminist protest were re-united in the person of participant Ann Isolde, an artist and activist who had participated in feminist protest in the 1970s through to today. She was able to provide a rich context to the few historical

artifacts that I found in Internet archives. The history she provided brought the research that I had embarked on almost a year before full circle.

The participants of the Collect-a-thon collected data and made a diverse set of visualizations. Some of these are displayed below. I was able to access the gender data from LACMA's database thanks to the collections database team led by Robyn Sanford. Participant Misha Rabinovich created a visualization based on this data. However, the participants mainly worked on their own data either alone or in groups of two. The exception was a group project re-enacting a 1981 protest in front of LACMA that I initiated.



*The above image shows Collect-a-thon participants re-enacting a 1981 protest featuring Maurice Tuchman masks. We were not protesting Maurice Tuchman, rather we were asking about the representation of women and minorities at LACMA today.*



*A visualization based on LACMA's data set by Misha Rabinovich.*



equal pay for m

equal pay for monkeys  
equal pay for minorities  
equal pay for male and female  
equal pay for man and woman  
equal pay for male and female athletes  
equal pay for male and female tennis players

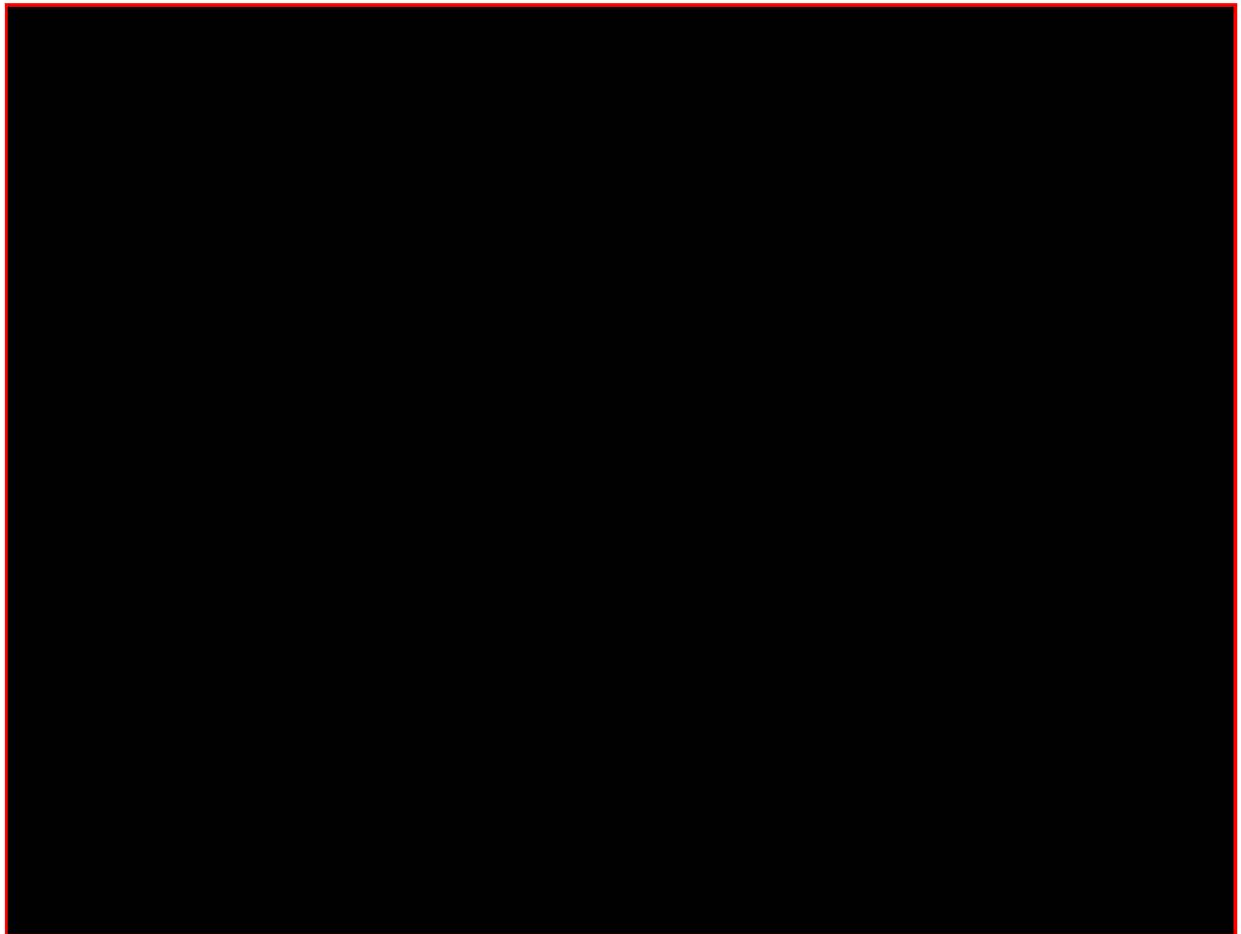
Google Search   I'm Feeling Lucky

# MONKEYS BEFORE MINORITIES.

Actual Google search on April 12, 2015

Inspired by the work of Christopher Hunt: UN WOMEN | The Autocomplete Truth

*A visualization by Lisa Fedak*



## **Conversations with Micol Hebron**

The conversations with Micol leading up to our shared artist talk helped me understand that women's participation in art as a form of work is less systematically studied than women's participation in technology work. There have been many systematic studies of different aspects of tech production over the years that have examined differences in participation of women and men in tech. In art, this has not happened in the same way. An exception to this is the research of feminist artist groups like the Los Angeles Council of Women Artists starting in the 1970s, the Guerilla Girls, and more recently, Micol and I (as well as others).

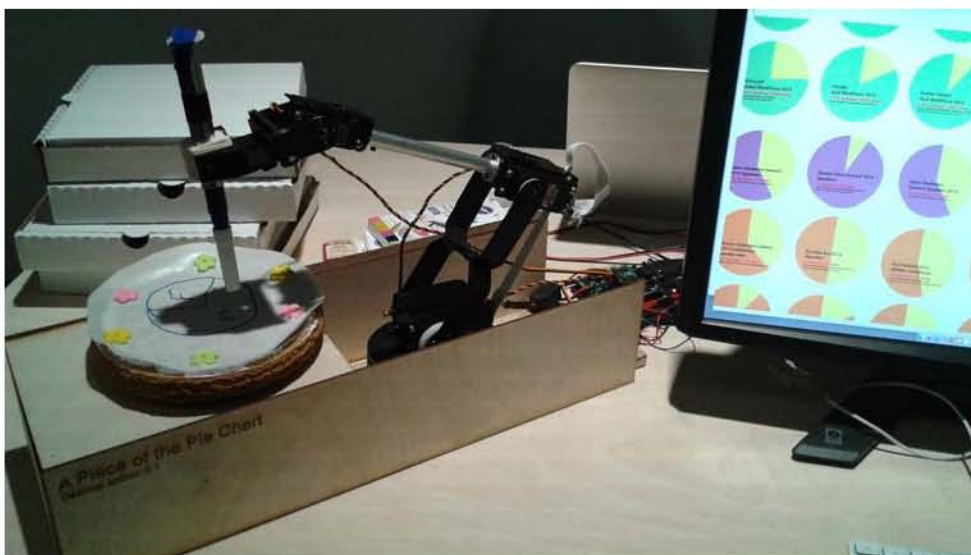
In tech, the under-representation of women (and minorities) is often attributed to a pipeline problem. An example for this is the lack of women computer science students in universities in the United States. Art, on the other hand, does not have a pipeline problem – if anything, women today are outnumbering men in art schools in the US. And this has been the case for a while: The Council of Los Angeles Women Artists wrote in their Report in 1971, that women were at the time attending art schools at the same rate as men. In the 44 years since then (almost the duration of an art career), the number of women art school graduates has steadily increased, but galleries and museums are not even reaching gender parity in their exhibitions.

Efforts focusing on getting more girls interested in computers and technology are in general positive. However, if we look at the art world as what the computer workplace could look like in terms of gender ratio, it is clear that a focus on eliminating sexism is needed not just on the educational level. I will likely examine these numbers further and offer my thoughts in the form of an article to a publication like the blog “Model, View, Culture”.

## **The Desktop Edition**

The Desktop Edition of *A Piece of the Pie Chart* is a desktop-sized version of the project that can travel in my hand luggage (unlike the large installation). It resembles the larger installation in that it also makes use of a robotic arm. This arm draws the pie charts directly onto pies with food color filled marker. Any kind of gender ratio can be drawn onto the pie. However, the machine cannot be operated automatically by the users like the larger installation. Therefore, a conversation with me, the “inventor” is needed. The project was shown recently in the context of the festival “Critical Make” at Haus der elektronischen Künste in Basel, Switzerland. The event was framed as a critical art infused Maker Faire. I brought a subset of the data that I had collected for the LACMA version of the project along to Basel, but the exhibition visitors mostly wanted to visualize self-chosen data. Some of the visualizations were gender ratios in political groups such as city and community councils. Some people visualized gender ratios at their own workplace and I encouraged them to take the pie to their work place as an object facilitating discussion about gender and the workplace.





*The images above show the Desktop Edition as it was exhibited at Haus der elektronischen Künste in Basel, Switzerland.*

## Invoice

Below is a list of expenses for the remaining milestone of the grant period.

Travel (flight and rental car)	
Artist Fee	
Materials	
-Plexi glass, wood, lasercutting	
- boxes +print materials.	
- small electronics and misc. supplies	
<b>Total</b>	