

Education for Sustainable Living Program  
**Action Research Teams: UCLA Recycling**



**The Jerry and Jane Weintraub  
Center for Reconstructive Biotechnology**

**Lab Directors:**

*Ichiro Nishimura  
Neal Garrett*

**ART Leaders:**

*Janeline De Lao (Simple Waste)  
Edward Murphy (Hazardous Waste)*

**ART Members:**

*Kim Sanders  
Lisa DeMarco  
Pooja Verma*

## **Introduction**

The Action Research Teams working with the Weintraub Medical Center were contacted and established in the center's effort to become the first lab on the UCLA Campus adhering to sustainable and environmentally-friendly lab practices. To do this, the lab directors Ichiro Nishimura and Neal Garrett established a set of modifications that could be readily made to the lab in the interests of Energy Conservation, Environmentally-friendly Purchasing Practices, and Waste Diversion. The directors of the lab then approached the Academic Sub-Committee on Sustainability and the newly formed project of the Education for Sustainable Living Program, the Action Research Teams and determined that a student-based research project would affect the most change with the lab by looking into the Lab's Waste Diversion practices.

After a primary introduction to the Lab and some discussion with the Lab Directors and the Team Leaders, Edward Murphy and Janeline De Lao, it was established that due to the volume of waste produced in the Lab, Janeline would focus her Research Team on diverting and recycling the Simple Waste within the lab (the waste not requiring any treatment or sorting before disposal), and Edward would focus his Research Team on the Hazardous Waste within the lab (that waste which is prohibited from being placed directly into the waste bin due to contamination). The general introduction to each project is below.

### **Simple Waste**

The Action Research Team researching and handling simple waste at Weintraub Center was led by Janeline De Lao with team members Lisa DeMarco and Pooja Verma. The project was initially developed with the vocalized interest of the Lab Directors of the Weintraub Center as they expressed their concern about the great amount of plastic waste generated in the lab. The project was formed in the interests of 'Greening' the Lab by diverting the waste stream through recycling the non-hazardous waste produced by researchers. The project focused on ultimately implementing a recycling program for simple waste without influencing the environment the lab and integrity of their research.

### **Hazardous Waste**

The Action Research Team assigned to researching the diversion and recycling of the Hazardous Waste within the Weintraub Medical Center was lead by Edward Murphy with Kim Sanders as the sole research team member. The project was largely centered on trying to establish some form of recycling for contaminated waste while respecting the integrity of the lab and all of the regulations in place over the entirety of the UCLA Medical Center. Though these firm restrictions on Hazardous Waste exist, it is still the feeling of the Lab and ART project that some modification could be made to divert this waste stream from disposal. The project was thus focused on aiming for this very tight space between regulation and the need to divert waste.

## Objectives

### **Simple Waste**

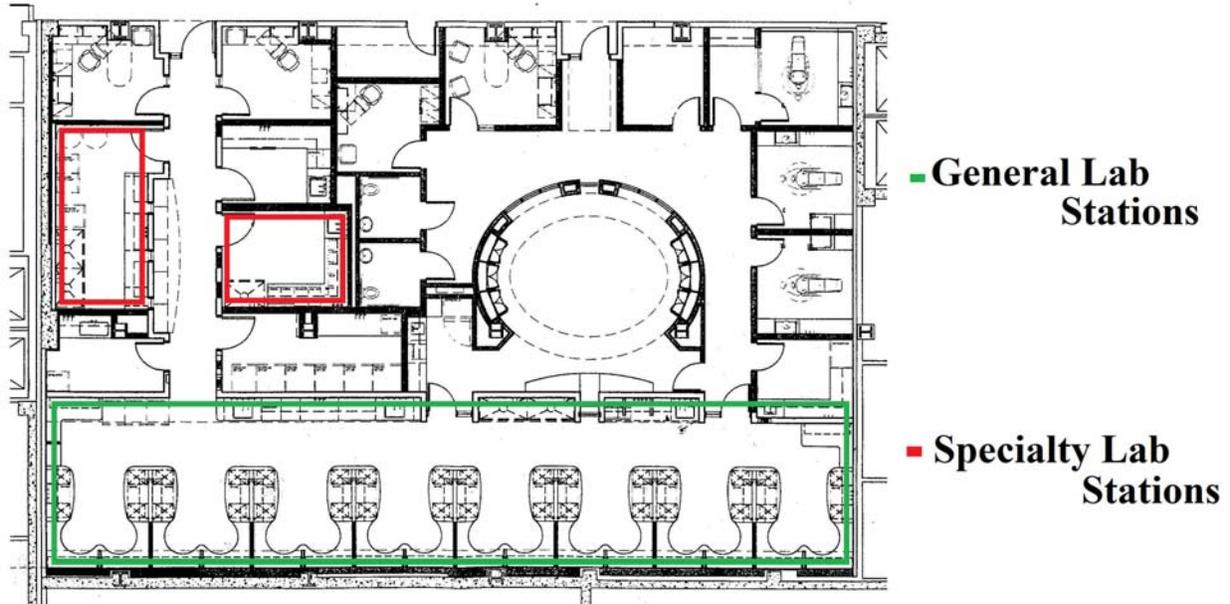
- Identify the non-hazardous waste stream inside and outside the lab.
  - Distinguish recyclable materials
  - Research possible simple recycling solutions.
- Establish alternative practices with the collaboration of lab researchers in order to ensure the most appropriate and useful recycling program
- Establish a recycling program that can be adapted and implemented in other medical labs.
- Help the lab implement a recycling program to effectively divert simple waste.
- Identify and bridge the information gaps regarding the waste stream, waste diversion, and life cycle of materials used in medical research.
- Operate with a high level of Research Transparency in order to provide future Action Research Teams with the ability to revise and improve upon our Research

### **Hazardous Waste**

- Identify the Hazardous Waste Stream, including the location of the waste collection bins (in the lab), the hazardous materials used, and where the waste travels after its departure from the lab
- Identify the Protocol for Treatment so that the waste could be treated and reused or recycled;
  - This includes identifying the Relevant Regulation and needs for Compliance
  - The educating and enforcing entities on campus for Hazardous Waste
- Establish a means for the Medical Lab to more directly manage their own Waste, especially their Hazardous Waste Treatment and Diversion
- Divert, as much as possible, the Hazardous Medical Waste from sheer disposal
- Identify and Bridge the Information Gaps regarding the Waste Stream, Waste Diversion, and Life Cycle of materials used in Medical Research
- Establish alternative practices with the collaboration of the Lab Researchers in order to ensure the most appropriate and useful recycling program
- Operate with a high level of Research Transparency in order to provide future Action Research Teams with the ability to revise and improve upon our Research

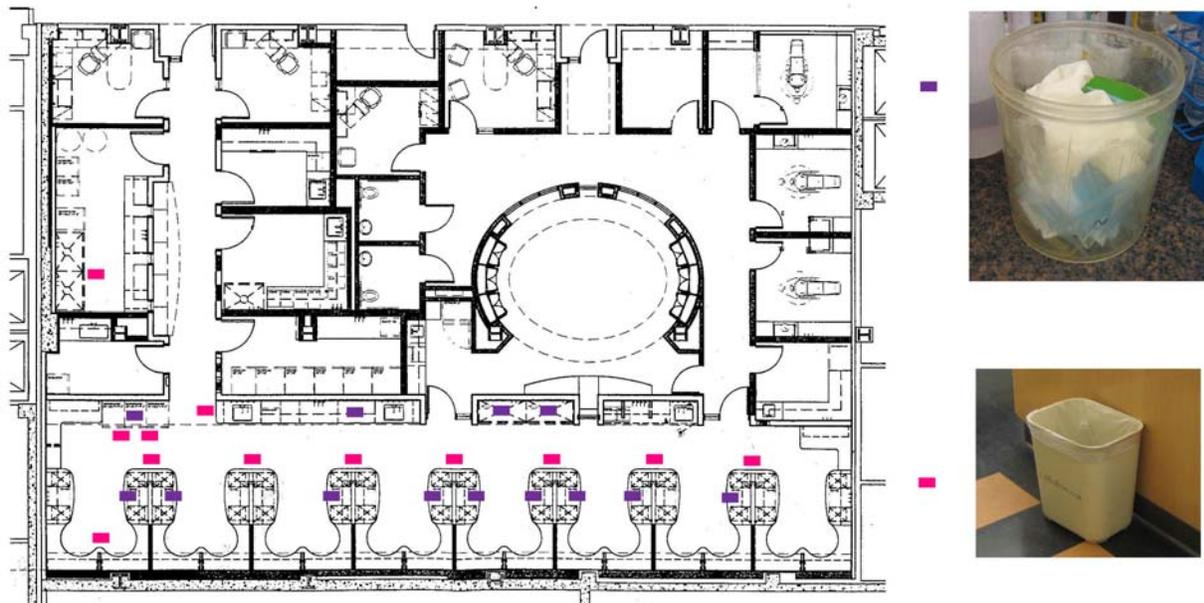
## Lab Baseline

### General Lab Layout



- Based on our observations, the physical research portion of the lab is divided between the General Lab stations and the Specialty Lab stations, which itself is made up of the Radio Isotope Room and the Viral Room.

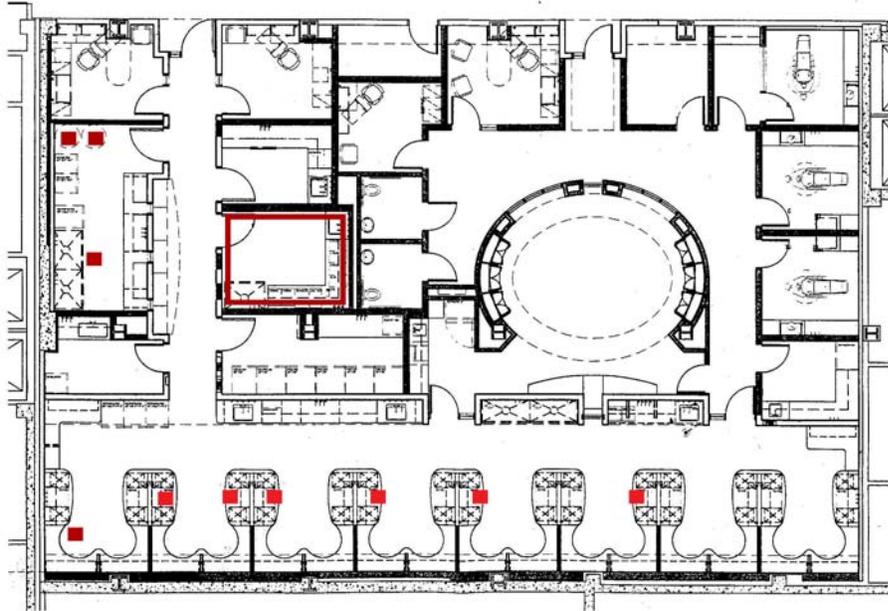
### General Waste Bin Distribution



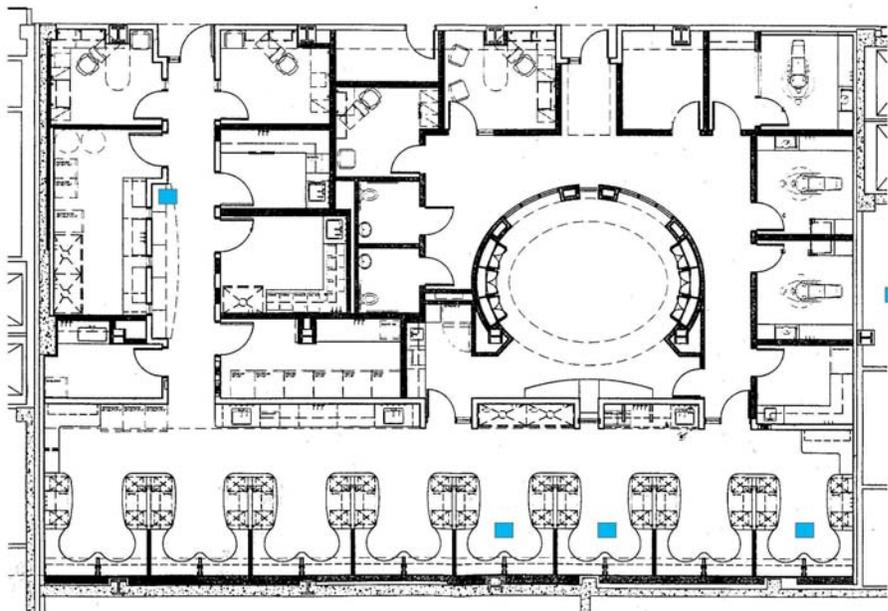
- Small containers, indicated by purple squares, are located on almost every station for research convenience and efficiency. Whenever the containers fill up, usually at the end of the research day, they empty the containers by disposing of the waste in the regular trash cans indicated by pink squares which are at the end of every station.

## Lab Baseline

### Hazardous Waste Bin Distribution



- In looking for the Hazardous Waste within the lab, we found that the Waste containers are predominantly localized to three places; the radio-hazardous room (which we never entered for safety purposes), the viral room across the hall, and the lab station at the far left side of the general laboratory. Each workstation also has a receptacle for sharp objects, which also constitutes Hazardous Waste



- The only recycling bins found within the lab are four small blue bins for white paper only. One of them is placed by the printer in the hallway, and the rest is randomly distributed throughout the lab.

## Lab Baseline

### **Campus Recycling**

In the course of our Research into the Medical Waste Stream in the Medical Center and at UCLA, tracing where it develops from Source (the researchers within the lab) to Vendor (the company responsible for picking up the waste), we found that the waste stream is extremely muddled, and ultimately divided. For standard and recyclable waste produced in the Medical Labs, as with anywhere else on campus, the responsible vendor is Athens Disposal. On the other hand, all of the Hazardous Waste produced in the lab, including radio, chemical, and biologically hazardous waste is collected by Stericycle. This fact alone made the tracing of the Waste Stream extremely difficult and the discovery of the various recycling and reuse programs were therein a larger task.

After clarifying these basic points of the Waste Stream and the Vendors responsible for picking up the waste, we were able to establish a baseline Understanding of the Waste Stream at UCLA. Athens Disposal picks up many kinds of plastic, paper, and other recyclable metals in accord with their agreement with UCLA. As part of that program, UCLA subdivides its waste pickup between White Paper, Mixed Paper, and basic Plastics. There are staff members under the Maintenance Department responsible for picking up this waste and bringing it to a centralized pickup location on the campus, where Athens then picks it up.

For Hazardous Waste, due to standardized regulations governing the handling and disposing of that Waste, there is a single vendor responsible for picking up and disposing of the waste, Stericycle. In order to be qualified to handle the waste while it is on campus, the Environmental Health and Safety Office requires students and researchers to become certified in waste handling and safety. Also, to assure compliance with all of the regulations governing hazardous waste, some of the waste material is sterilized before it is disposed of and then placed into the Hazardous Waste Containers. All materials are dated and identified, placed in the bin, and the bin is then picked up for collection. All of this is done to ensure that no contamination occurs on campus at the hands of the researchers.

When Stericycle finally receives the waste, they treat it according to California Medical Waste Management Act codes and regulations, and send the leftover material to various trash dumps for disposal. As part of their sorting of the waste they collect, they remove the Sharps Containers from the general Waste, treat and clean them, and return them to various waste sources for reuse in waste collection. This moderate effort from Stericycle demonstrates waste diversion interest at the Vendor level, and shows that recycling on some form is possible after it has left the hands of the Waste Source.

## Methods

### **Observation**

Both Action Research Teams spent the first two weeks of the research observing the lab and gathering general background information. This process included picture taking, note taking, and shadowing the researchers asking basic questions of clarification. Without any previous knowledge on medical lab supplies, we first became familiar with the environment of the lab by taking pictures and learning the names of different materials used in the lab. We then identified both waste streams and gained a better understanding of the lab by shadowing specific researchers and asking more detailed questions. After thoroughly taking notes during each visit, we shared newly obtained information with each other to keep every member informed.

### **Interviews**

As this our research project is largely focused on adjusting and diverting the Waste Stream from inside the lab, and establishing a recycling program that could function without compromising the research within the lab or the Researcher's space, it was important to meet with several of the lead Researcher's to understand their impressions of our project.

During our Interview process, we met with eight of the lab researchers to simple discuss and go over what their impressions were of standard lab practices, apparent wasteful procedures, and their general interest in recycling. We also aimed to understand what the researchers felt was their role in establishing a recycling program, and how it felt it might impinge upon their work. All of this culminated in a 15 minute interview with some discussion between the Action Research Team Members afterwards to clarify what was said.

### **Background Research**

#### **Simple Waste**

Although observation in the Weintraub Center allowed us to comprehend the waste stream within the lab better, we also found research outside the lab necessary to acquire more background information. For instance, we examined the website of Athens Services, UCLA's chief waste management and recycling vendor, to become knowledgeable about their recycling program on campus. In that process, we learned that Athens Services recycle plastic materials from #1 to #9 including most general plastic materials.

#### **Hazardous Waste**

To understand all of the definitions and regulations governing Hazardous Waste, it was important to contact all of the governing and enforcing campus offices and bodies to understand how, if at all, we can manage it ourselves. After being handed pages of documentation with very little in the way of navigation, the difficulty of our task began to show. These documents include the California Medical Waste Management Act, the UCLA Waste Regulations, and the Environmental Health and Safety Office at UCLA.

#### **Outside Sources**

In the course of our research, we learned of other labs that have taken on similar tasks, making an effort to contact them and share information. Most importantly, the Green Lab at UC Santa Barbara and Katie Maynard provided the most useful information

## Data

### *Quantitative Data*

#### **Frequently Used Materials**

- Pipettes (10 ml & 25 ml)
- Pipette tips (10JII, 20JII, 100JII, 200JII, 1000JII)
- Microcentrifuge tubes (0.6 ml, 1.0 ml, 1.5 ml, 2.0 ml)
- Conical tubes (15 ml, 50 ml)
- Cell culture plates (6 well, 12 well, 24 well, 96 well)
- Tissue culture dish (100 mm)
- Tissue culture flask (10ml)

As we carefully observed the waste stream inside the Weintraub Center, we were able to identify the main plastic materials that were used and disposed of as either simple or biohazardous waste. Among the materials listed above, pipettes, pipette tips, microcentrifuge tubes, and conical tubes comprise the majority of the lab's simple waste. While such products have either simple or biohazardous use, since they are disposed of according to the type of research they are used for, cell culture plates, tissue culture dish, and tissue culture flask are always biohazardous just as their names indicate.

#### **Hazardous Materials**

In our observations and interviews, identifying the hazardous waste stream and its contents, we established three major categories of hazardous waste for treatment and recycling, even conservation where possible. The largest category of hazardous waste produced by the lab is Chemically hazardous waste, involving the high use of Ethidium Bromide to run testing experiments in the lab. Other chemicals are also present in this category of waste, but because of the uncertain disposal protocols for Ethidium Bromide, it was identified as prominent in our further research.

Second to Chemical Wastes are the biological components of the hazardous waste stream including the cellular, viral and bacterial, and animal remains and wastes. The cellular wastes are significant as they are often attached or contained in a plastic vessels or petri dishes and need to be separated so that the plastic wastes can be recycled. The remaining organic matter, along with the animal remains that are produced in the lab, are not easily diverted from the waste stream of the lab, and upon further investigation, are incinerated (the heat produces energy which is then recycled back for use). The viral and bacterial wastes are the most difficult part of the waste stream, as they present the strongest and most dangerous possibility for contamination. After a short but difficult period of background research and consultation, the obstacles preventing standardized on-site treatment proved to be too difficult to surmount in our project.

The last major grouping of hazardous wastes in the lab is the Radio-hazardous waste, composed primarily of experiments run in their Specialty Lab. Because of the delicate nature of this research and of the requirements of those dealing with this waste at all, this particular topic was left of our inquiry. The needs for Radio-hazardous Waste Treatment are great, and it will be a recommended ART project for the future.

## *Qualitative Data*

### **Background Research**

As our project was largely focused on identifying the waste stream and all of the individuals involved in handling what moves through it, we made contact with as many of the campus entities involved in that stream as possible. This includes contacting everyone from Campus Maintenance (EJ Kirby) to find out about the waste and recycling program, to contacting the Environmental Health and Safety Office (Rowelle Enriquez and Michael Spicer) to understand what needs to be understood about hazardous waste. Also, in working with establishing a recycling program, we contacted the building and department coordinators for the Dentistry School and the Weintraub Center so that we can work with them in implementation.

In working with Environmental Health and Safety Office, we were introduced to all of the regulations and rules governing the treatment and handling of medical waste. This included a review of the California Medical Waste Management Act as well as UCLA's own Medical Waste Regulations. As we are thoroughly versed in reading Medical and Scientific Regulation, Rowelle Enriquez and other members of the EH&S Office helped us to understand the basic tenets of the documents. There are also a number of certifications and classes required for handling hazardous waste, and a thorough going through of all of those classes might be helpful in future projects aimed at understanding that process.

In observing the lab and all of their inner workings, researchers hold the lab to the highest level of integrity, carefully monitoring compliance (and in some place be over compliant) with all of the regulations to make sure they do not create any possibility for contamination. We as a Research Team were actually required to obtain security code access to the lab, while also having our picture taken and posted outside the lab so as to certify and allow for our presence in the lab.

The last major part of our Qualitative Data involved meeting with and interviewing many of the lead researchers in the lab to get a sense of where they thought recycling belonged as a program dynamic of their lab. We organized the meetings with Ichiro and sat down with eight of the researchers asking them questions involving the current recycling program, what they thought could be improved, how they would like to help, and what they thought we should know given their scientific perspective. They were very forthcoming and comfortable, and in places where there was a language difficulty, the conversation lasted longer so as to clarify the message passed between the lab researchers and ourselves. It is our impression from these researcher interviews that the lab is ready and eager to establish this program and push it further in the interest of creating a truly sustainable research lab.

## **Key Findings and Conclusions**

### **Complexity of Waste Stream**

As pioneers of the Action Research Team program, we inevitably faced a number of obstacles throughout the research. An unexpected difficulty that affected our project, however, was the complexity of waste stream at UCLA. Given ten weeks to begin and finish the project, only the first two weeks were scheduled to lay out the waste stream within and outside Weintraub Center. Yet, it eventually became a six week task. For instance, it was not until sixth week that we learned about Stericycle managing hazardous materials instead of Athens Services.

Each internal organization on campus had information available for our team, but there was a significant disconnect among them. No single organization seemed to be able to understand and thus have information on the entire waste stream at UCLA. Such complexity and disconnect appear to be a result of communication issues that we constantly encountered. Without a recycling coordinator in position and with UCLA being a very large institution, there is a clear communication gap among different entities on campus. Despite great sustainable efforts and interests from different parts of the campus, a lack of communication will ultimately place a limit on the outcome.

This problem has made the task of hazardous waste treatment and diversion impossible in the scope of our research project. Too many people have too many different answers on how to deal with hazardous waste outside of vendor pickup, that much more time needs to be spent on identifying and streamlining other possibilities for treatment and diversion.

### **Current Practices**

In observing the lab, some very clear trends emerged in the habits and practices of the researchers themselves. On the one hand, many of their practices seem very unsustainable and wasteful at first sight. They use a large number of pipette tips, tubes, trays, dishes, etc that seem to be not necessary. They also treat their hazardous waste before throwing it away, effectively doubling the efforts unnecessarily. But on closer inspection, after learning all of the background information relevant to their actions, we realized that they are doing everything well within what we would consider sustainable. They reuse pipette boxes, clean and reuse a lot of their lab equipment and supplies, and conserve where possible. The treatment of the hazardous waste before it is disposed of is to ensure that they are not responsible for any contamination outside of the lab, and this is to further minimize their impact on the environment itself. Thus, while it seems like the researchers are acting unconscientiously, they are in fact doing the best they can.

### **Eagerness for Change and Collaboration**

The most excited part of our ART projects was to meet, work, and collaborate with the lab researchers themselves. The Weintraub Center has been welcoming of our project from the first outset, and have extremely supportive the whole way through. Many of the researchers are from different parts of the world where recycling in the labs is second nature, and to see it fostering in a new setting is clearly exciting to them.

That said, the strongest resource for implementing a recycling program in the Weintraub Center is the people. Their own knowledge and eagerness has shown itself to be what can make the greatest change, especially considering the most efficient form of waste diversion is source based. Future ART projects and other initiatives should note that the people are willing to make the change, if the proper resources are applied to them.

## **Recommendations**

### **Immediate Implementation**

(see following page on next steps)

### **Education and Information Sharing**

The largest difficulty that our ART project ran into, and the lab itself runs into, is a problem of information. The waste stream from the lab to the pick-up vendor is not clearly defined in any one place or by one authority, and the alternatives to producing this waste such as conservation, reuse, treatment, and recycling are not heavily vocalized or even suggested. There are processes and treatments available, but the access to that information is not clear and there is little to no promulgation of alternatives. Thus, one of the largest recommendations that we can make to minimizing the waste stream is to educate both the researchers themselves and the campus entities responsible for waste. There is already an education requirement for handling hazardous waste, and it is the position of this ART project that there needs to be a conservation education requirement. This would help labs and other sources of waste help themselves in reducing the waste stream.

### **Resolving Communication Issues**

In order to facilitate a larger and faster diversion of waste from all campus sources, the medical labs especially, is to open and clarify the information gaps present on campus. Much of the difficulty that our ART project faced was the lack of communication between the sources of waste and the stream itself (as there are people involved at all of these levels) and streamlining communication would resolve many of these issues. Currently, there is no recycling coordinator for the campus, and this has created its own obstacles, but when that position is filled, it is recommended that the first task they tackle is the communication issue. Should a lab or other office choose to change the way they process waste themselves, there should be one person and one resource which they can contact to help them in their efforts. This would help in building the recycling program at UCLA immensely, and future efforts would surely have a greater effect.

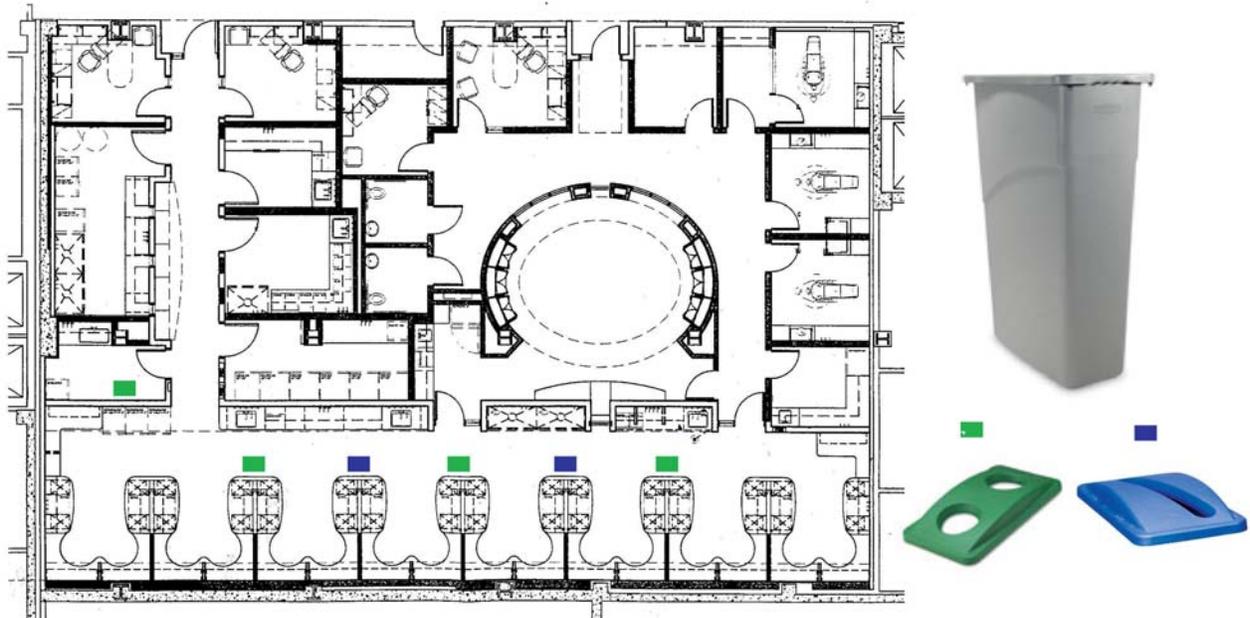
### **(Long term) Purchasing Considerations and Waste Pickup Vendor**

One of the first things that Ichiro had mentioned as another possible solution to the amount of waste created in his lab was to change the way the lab buys its supplies. By purchasing more environmentally friendly or reusable items, then following the item's use, it would be easier to divert it from disposal. Several of the scientific supply companies that the lab purchases from have small and developing green product lines, but not enough to allow for a complete changeover. Thus, it will be up to other labs like the Weintraub center to band together and form a demand for these kinds of products that producers can respond to.

Similarly, when considering the Vendor responsible for Recycling and Hazardous Waste pick-up, it might be pertinent to consider factors outside of immediate economics in determining the correct choice. Primary waste diversion practices, conservation programs, and reuse capabilities should certainly be considered first as a campus based action, but what waste is created should be sent to an environmentally friendly and conscious vendor.

## Next Steps

### **Immediate Implementation**



In implementing a simple recycling program in the Weintraub Center, Facilities Management provided the Weintraub Center with several bins upon our request. We recommended four recycling bins for plastic and aluminum, as well as two bins for mixed papers both of which are 23 gallons and marked by green and blue squares respectively.

Our interest was mainly on recycling plastics in the beginning of the project but we discovered during our interview process that researchers wished for a much bigger recycling bin for paper since the only recycling bins that existed in the lab were the regular sized white paper bins. The number and location of these bins suggested is preliminary as it can be changed based on the assessment and evaluation of the recycling program after its implementation.

### **Continuing ART Projects**

The Action Research Team for the Weintraub Center was developed with the expectation that future research projects will be encouraged to continue the lab's 'greening' project. Future projects will be able to focus on expanding the recycling program throughout the School of Dentistry and Medical Center as a whole. Some of next year's Action research Teams will have an option of using this project specifically as a model and implementing the program in other medical labs and offices but can, however, also remain in Weintraub Center and further the research in greening the lab since waste diversion was simply one of several objectives the lab presented to us.

## **Observation and Assessment**

Of the possible tasks for ART projects continuing their work in the Weintraub Center, one of the urgently necessary tasks is the observation, assessment, and quantification of the recycling program currently in the lab. As this project was aimed more at the behavior and larger perspective of waste management and recycling, it is the desire of the lab and researchers that specific numbers are established for comparison and improvement. Further, to accomplish this task, specific protocol for measurement and quantification both need be established so as to develop and scientifically rigorous study of medical waste and diversion.

## **Further Development of Green Lab Practices**

Our ART research was founded as part of the larger project of creating UCLA's first Green Lab, and many aspects of that task need tackling. As the Weintraub Center has already started down this path by examining waste, electricity, travel, and purchasing practices, and because they have already formed this very strong relationship with the ART program and the Academic Subcommittee on Sustainability, it is recommended that when the program comes back in the Fall and Winter quarters, next steps are taken to establish more ART Teams focused on helping the Weintraub Center reach their goal.