**Inorganic Chemistry research at University of Cincinnati - Freshman**

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**Title of Project:** Inorganic Chemistry research at UC - Freshman

**Thematic Area:** Research

**Expected Project Start Date:** January 8th

**Expected Project End Date:** April 27th

**Background:**

This research project is, no doubt, one of the most important things that happened during my first year at University of Cincinnati. I am an international student come from a developing country and therefore my chance to do research in high school is zero. I have no research experiences and I have no idea what do I have to do as a research assistant in a lab. The only thing I have is in depth knowledge about chemistry in both theories and lab techniques. With that as my only thing I have, I decided to do a really crazy thing. I decided to ask for permission to join a lab right in my first week of college. I know that I have disadvantages compare to other students but I still believe with my knowledge about chemistry I can persuade a professor to let me do research in a lab. I started my journey with a firm determination and a bit worry because this is the first time I have ever done anything like this. I came to the door of a lot of professor and try to persuade them that I have enough passion to learn although I am just a freshman. I came in and talk about their project with my knowledge and discuss about their project as I understand. After a lot of rejection, mostly because they think that I don’t have enough experience in lab although my knowledge is good, I was finally accepted to work in Dr.Connick’s lab. I was so happy that day and I know that this is the turning point of my life.

So what is the motivation for me to be so eager for research? Why do I have to work so hard for it? Well it is a procedure that started since I was in secondary school. When I was 14, my mom gave me a chemistry book and told me to read it because in my country we have to learn chemistry in grade 8th. I was so into it right at the first time and I read it a lot of time. My mom found out that I have a great interest in chemistry so she gave me more books to read. This is the first step that leads me to success in my high school. I was chosen as one of the 10 best chemistry candidates in competitions in Ho Chi Minh City. I was also chosen by the city to compete in the national Olympiad in chemistry. My passion for chemistry grew stronger and stronger throughout each competition and therefore I decided to continue my journey with chemistry in college. I understand that my chance to do research in Vietnam is almost impossible so I took the most risky decision in my life. I decided to go to US to make my dream come true. I can say my decision to do research is clear, it is a goal that I have already set since the beginning of my journey in US. That’s why I work for it, tried to overcome my lack of experience to seek for knowledge. With a strong background in Inorganic Chemistry, I decided to do research in this field with a project about Platinum, a really interesting metal that I have always like to study about.

The primary literature that I used to read before I start this project come from my mentor and I also read paper from scifinder. The part that I did is the mechanism of Pt when it change from Pt(II) to Pt(IV). Here are some paper that I read:

Chatterjee, Sayandev, Krause, Jeanette A, Oliver, Allen G, & Connick, William B (2010). Intramolecular NH···Pt interactions of platinum(II) diimine complexes with phenyl ligands. *Inorganic Chemistry*, 49(21), 9798-808

Chatterjee, Sayandev, Krause, Jeanette A, Connick, William B, Genre, Caroline, Rodrigue-Witchel, Alexandre, & Reber, Christian (2010). Interaction of SbCl5(2-) and thioether groups at the open coordination sites of platinum(II) diimine complexes. *Inorganic Chemistry*, *49*(6), 2808-15

These are important papers that I have to read about in order to understand the project that my mentor is doing. The mechanism when Pt change from Pt(II) to Pt(IV) is still not clear to researcher. It is a procedure in which Pt loses 2 electrons to Pt(IV). This is a really essential mechanism because my mentor’s project is about 2 electron transfer, which is a very interesting process. You know that photosynthesis is a process in which a single photon excited an electron and this electron will be used to drive a desirable chemical reaction. Scientists are really interested in duplicating this process to double the amount of product that we can get. It is such a really interesting topic that I was able to contribute and work on with my mentor.

**Experience and Learning:**

I was able to gain essential experiences and knowledge that will lead me to success in the future. These are the two outcomes that I think are really important for me after this research experience.

**Possess a well-developed awareness of literature in the field**

During this research project, I was able to read a lot of interesting papers that helped me to understand the project as a whole. The most two important paper are, of course, the papers that Dr.Connick published in 2010.

Chatterjee, Sayandev, Krause, Jeanette A, Oliver, Allen G, & Connick, William B (2010). Intramolecular NH···Pt interactions of platinum(II) diimine complexes with phenyl ligands. *Inorganic Chemistry*, 49(21), 9798-808

Chatterjee, Sayandev, Krause, Jeanette A, Connick, William B, Genre, Caroline, Rodrigue-Witchel, Alexandre, & Reber, Christian (2010). Interaction of SbCl5(2-) and thioether groups at the open coordination sites of platinum(II) diimine complexes. *Inorganic Chemistry*, *49*(6), 2808-15

These two papers described the goal of our lab and also the path that Dr.Connick want to go. I also a lot of paper on Scifinder, a really powerful tool for chemist.

Reductive Elimination from Platinum(IV) Aminotroponiminate Dimethyl Complexes Promoted by Sterically Hindered Lewis Bases - [Elise Traversa](http://pubs.acs.org.proxy.libraries.uc.edu/action/doSearch?action=search&author=Traversa%2C+E&qsSearchArea=author), [Joseph L. Templeton](http://pubs.acs.org.proxy.libraries.uc.edu/action/doSearch?action=search&author=Templeton%2C+J+L&qsSearchArea=author), [Hiu Yan Cheng](http://pubs.acs.org.proxy.libraries.uc.edu/action/doSearch?action=search&author=Cheng%2C+H+Y&qsSearchArea=author), [Megan Mohadjer Beromi](http://pubs.acs.org.proxy.libraries.uc.edu/action/doSearch?action=search&author=Mohadjer+Beromi%2C+M&qsSearchArea=author), [Peter S. White](http://pubs.acs.org.proxy.libraries.uc.edu/action/doSearch?action=search&author=White%2C+P+S&qsSearchArea=author), and [Nathan M. West](http://pubs.acs.org.proxy.libraries.uc.edu/action/doSearch?action=search&author=West%2C+N+M&qsSearchArea=author). *Organometallics*, 2013, *32* (6), pp 1938–1950, March 5, 2013

This is a really interesting paper that I found by myself. I realized that to understand the mechanism when Pt(II) change to Pt(IV) I will have to understand it in both directions, forward and reverse. After reading these papers I believe that I have a good knowledge to explain for someone who do not know anything about this project and make them understand the goal of this project. To me, this project has opened a whole new world of knowledge to me. I have never thought that Pt could be such a power fool element. I have always thought that it is just like gold, hard to find and just suitable to be a jewelry but now I really think that it is a powerful element. This is like a turning point in my education. Everything I learned in high school suddenly pop-up and linked together in a really interesting way. With the meet of new knowledge and what I have already had I suddenly understand the work that scientists are doing right now. I understand what is it like to be a scientist in this field and I felt really excited. With this project I believe it is going to be a very important key for our future because we will be able to produce twice as much product as we are producing right now in the farm. This will benefit people lives in so many ways.

**Ability to think beyond the just completed research and articulate how your world view has been impacted by the experience**

Every time I come to this lab I always feel excited about our project. Why am I so excited? Because this project could be a great discover for developing country because they are still depending on the farming industry to develop. My country for example is a country that totally depends on the farming industry to develop. We have a lot of paddy field to grow rice and this rice is the main source that helped our country become better and better every day. With the development of this Pt project, I believe we can double the production of farming product in near future. Every time I come to the lab, I always try to do my best to help my mentor figure out the mechanism behind the transformation of Pt(II) to Pt(IV) because I know it is a really crucial part in our project. My mentor showed me a whole new world of science where we can apply what we learn to our life. This is the reason why even when my research project is complete, I still try to read a lot about this aspect because I want to help my country someday. I think that Pt is an expensive metal to do research on so I am thinking about changing Pt into a more well-known metal with a cheap price like Copper. And then we can actually study Mg in Chloroplast itself so that we can actually use this research on the farm. This is the aspect that I think beyond the just completed research. I think that this will open another possibility in the future.

During this research project, I was able to take up a lot of skills that I have never thought that I would have a chance to do if I was still in Vietnam. My main work is to make a complex of Pt(II) so that we can use it to study the transition from Pt(II) to Pt(IV). Then when I have enough Pt(II), I make a lot of reaction between Pt(II) and different substances. When the reaction occurs, I will then take it to the UV machine to take UV picture to see the speed of reaction. Different substances will have a different speed in this reaction so by comparing the speed and evaluate the structure of the substances that we used we can propose a mechanism for this reaction. I had the chance to work with differents tools in the lab and it was such a valuable experience. Dr.Connick has showed me what is real research like and I love it. Spending hours in a lab just to do something again, again and again sometime sounds really boring to a lot of people but I love it because I understand what I am doing and I know that I am contributing to a great thing in a future. That is what research about. And to a freshmen like me, it was like a turning point in my whole career. Now thanks to Dr.Connick, I have now set my mind for research career and I am ready to follow this hard path. It opened a whole new world to me.

This is a really valuable experience because it connects my knowledge with real life experiences. Back then in high school I cannot imagine a work of a chemist would be so interesting like this. I was always do everything on paper and imagine the way that molecules contact with each other. After joining the lab, I now understand how they contact with each other and I was able to actually observe it via UV machine. It was a really interesting experience when I took my first UV picture with my mentor. Everything I learned become so clear and so real right in front of me. That was the time that I decided to be a researcher so that I will be able to see magical things like these. This experience is really valuable for my future pathway and also for my study at the present.

During this project I was the person who collects data from the UV machine so that my mentor can give a conclusion upon my reaction. That doesn’t mean that I am just a collector. Every time I obtain data from UV machine, Dr.Connick always show me what does it mean and why it not work or work. He is the best mentor that I can have in my first year at UC. He taught me how to read data and how to give a conclusion upon my work. I also borrowed books from his lab so that I can read during my free time and have a better understanding about inorganic chemistry. This lab has a great amount of books that I don’t even need to go to the library anymore. Therefore after 1 month I was able to give my own conclusion upon my work and explain it to Dr.Connick.

There was some obstacles happened during my research project and those were valuable lessons that I would have never learned if I did not join this lab. First obstacle happened because I forgot to write down things into my notebook. It was a huge mistake because I only type down things into my computer so when my mentor read my notebook he was so surprised that I did not write down my working procedure. I had to explain to him that I typed everything into my computer and then I had to write them down into my notebook to make sure that there will not be any conflict in the future when we publish our research. It was a crucial lesson because ownership in doing research is one of the most important things. In the future I would be in trouble if I do not learn this lesson today. It was one of the most important things that I learned in the lab. The second obstacle that I met was when I messed up a really important sample. It was the reaction between Sodium hypochlorite and Pt(II). I weight out the wrong amount of Sodium hypochlorite so the result keep coming wrong every time I took UV data. The peak supposed to be higher but then it always come flat every time I take the picture so me and my mentor have to sit down and review everything all over again. It was a hard time for us because it took a lot of time to look back at everything. Luckily we was able to see what was wrong with our project so we was able to solve it. The lesson I learned from this is that we have to be really careful in everything single step we make because one mistake can ruin everything we achieved.

**Moving forward**

I was not able to share my research in any poster session or presentation because I was only freshman and I don’t know much about these events but I made myself a blog in a word file to keep every single experience I learned in the lab for my future career. In this word blog I wrote down not just data for our research but also my feeling for the research and my ideas for future projects. I also try to express my feeling in this blog to make it a colorful picture so that when I look back I will be able to see if it was a good experience for me or not. The most important thing that this experience brought to me is that I know I want to be a chemist in the future. It also gave me a great start for my college and because of it I was able to won a scholarship and a good research position in children’s hospital. I will always appreciate everything that I learned from this lab. It was a great start for my future.

My next research experience is about Stem Cell and I am going to work at Children’s Hospital with Dr.Huang. This is completely different from this research project because I want to try to do research in different field to see which one will suit me best. As I am still a freshman, I believe this is the time for me to discover myself and to try everything to find out the place where I am truly belonged to. I am going to work in the medical field this summer because I think that it is a great thing to bring my chemistry knowledge to do something that benefit patients in the Children’s hospital. The world of chemistry right now is turning toward application that can be used for medical field so I want to involve in this excited area to learn even more.

My advice for peers who are preparing for undergraduate research experiences is that you guys should not wait at all. Go out there, knock every single door and grab your chances. It is never too late or too early to start doing research if you truly want to be a scientist. As an undergrad student, you have the right to discover yourself in different field so do not hesitate to change your research area if you do not feel like it is the field that you want to work on. Just try, try and try and once you find the one that you love, stick with it and work as hard as you can for it. Also do not forget about the previous research that you did. Although it is not the one that you like, it will benefit you in a lot of way that you cannot even imagine. I am still doing self-research on the photosynthesis topic and I believe it will benefit me some ways, somehow in the future.

Although this experience is actually not the one that I will follow in the future but it clarified one thing. I want to be a scientist. I love every little detail in our research and I believe being a scientist is a right path for me. I will continue to involve myself in medical field to see if it is the right way for me. Again, this experience clarified my love for chemistry, my passion for science. I will continue to work in different area of chemistry to find out the field that I am truly belonged to.

**Research Advisor:**

William Connick – Chemistry professor at UC

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**Hours:**

3 credit hours during Spring semester – 9 hours a week