

**NSF US-China IRES Program:
Summer 2008
Student Report**

Students

Robert "Mike" Ballou
Robert Lu
Israel Ramirez
Margaret Ukwu

Faculty

Prof. Albert Wang

University of California Riverside
Bourns College of Engineering



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NSF US-China IRES Program

Background

In the past decade technology has always been the foundation of the China. More and more advanced technology development in China has contributed to its economic growth for the past few decades. It is necessary for those engaging in engineering field to have international experiences in their early stage of career.

Sponsored by NSF (National Science Foundation) under IRES (International Research Experience for Students) Program, Professor Albert Wang in UCR (University of California, Riverside) is holding a three-year program, recruiting students mostly from UC campus to have international internship experiences in China. Each year, four candidates will be selected from the pool and be granted with all the cost of traveling.

Under the connection between Dr. Wang and the universities in China, this program facilitated each student to overcome the possible cultural differences between Asian and Western culture. Furthermore, this program also provided all kinds of possibilities to explore the profound depth of Chinese culture in Foods, living, life style, and cultural values.

In 2008, four candidates from UCR were selected: Israel Ramirez, Mike Ballou, Margaret Ukwu, and Robert Lu. This internship took place in Tsinghua University and the University of Electronic Science and Technology of China (UESTC) for three weeks respectively.

Goals

- To expose the selected students to a highly competent microelectronics research environment in China for unique research experience under international collaboration.
- To cultivate all selected students to properly appreciate the all kinds of exotic foods, clothing, and values in a foreign environment.
- To develop independent and critical thinking when confronting unexpected scenarios and conflicts in China
- To offer a unique chance for local students in China to directly experience different cultural source from US
- To increase the mutual understanding between the students in China and America
- To develop all selected students an open-minded attitude in dealing with foreign environments.
- To spur a positive attitude for students from both sides to accept different ideas outside their country
- To let all selected students have the first contact with local people and gather unique life experience.

Pre-Departure

Technical Orientation

As part of the program, we were required to attend a two-week program at Professor's Wang laboratory, LICS, Laboratory for Integrated Circuits and Systems. In the lab, we had the opportunity to familiarize with the tools and the vocabulary used in research. Lin Lin, a graduate student in LICS led the technical orientation. We had hand-on-experience with equipment used on the testing of semiconductors. We were able to use the oscilloscope and explore the different functions.

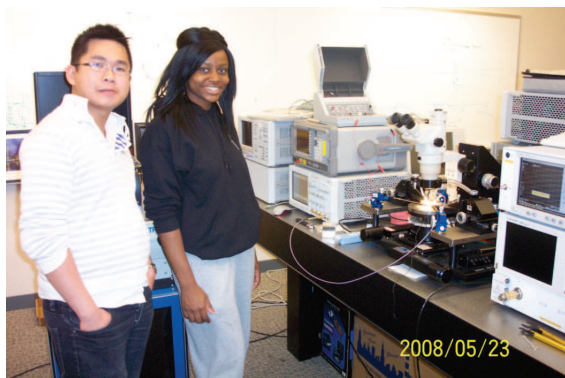


Figure P.1: Robert and Margaret familiarizing with the equipment used in research.

We all found this technical orientation very helpful. Especially, once we arrived to China because we were not completely unfamiliar with the equipment used there. Moreover, we were given a brief overview on the semiconductor production process that we found helpful in China, because when we were talking to students there, we knew the basics about the subject.

Cultural Orientation

As part of the pre-departure activities, we also had a cultural orientation seminar. Mr. Jun Wang, Professional Development Officer in Bourns College of Engineering, led this seminar. During this seminar we were given a good insight about Chinese culture and costumes. We learned basic Chinese used in every day situations. Also we were given a handout with Chinese currency (RMB) because, according to Mr. Wang, fake bills are somewhat common in China.



Figure P.2: Cultural orientation led by Mr. Jun Wang.

Something that we found really useful, once in Beijing, was a handout with Chinese phrases, and it's pronunciation. This paper helped us many times we were around town, because whenever we would forget how to say something, we would look at our paper.

We were really appreciative that we had this pre-departure orientation. We got to learn a little bit about Chinese culture, so we would not unintentionally act disrespectful. Also, it gave us an idea, of Chinese phrases we had to familiarize with in order to be able to interact with non-English speakers in China.

Beijing

Arrival to Beijing

Once we had all arrived at Los Angeles International Airport, we realized we were all very excited and early! We all checked into Air China and sat down waiting to board. After boarding then sleeping through a 12-hour flight, we finally arrived at the Beijing Capital International Airport in the People's Republic of China. We were taken aback by the size and grandeur of the building. Once there, we met up with two host students and Professor Wang from University of California, Riverside.

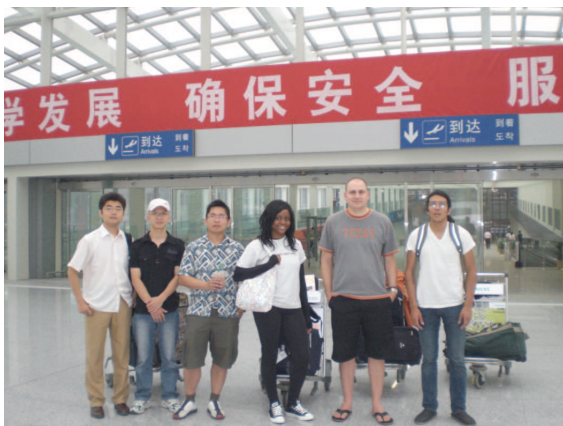


Figure B.1: Our host students received us at the Beijing airport.

Before leaving the airport, we did not know what to expect with the weather, people or place. The moment we left the airport, we were hit with an explosion of heat. Luckily we quickly entered a van waiting for us and departed to our residence: Tsinghua University. We were not ready for the size of Tsinghua University. Once we arrived there, we all agreed we were completely lost. As the van made twists and turns and followed different road paths, we tried to keep but felt lost. Eventually we arrived at the

Foreign Dormitories. That first day we accomplished so many tasks! We managed to register at Tsinghua University and receive our rooms. The rooms were completely identical and neatly arranged. There was a twin-sized bed, TV, closet, desk, telephone, sink and little bathroom. It was a perfectly sized one-person room. After depositing our suitcases in our rooms, we walked over to the bike lot and rented bikes. We were all excited to experience Chinese culture and immerse ourselves into the country. We felt that by doing what the Chinese did, we would fulfill our dreams that way.



Figure B.2: Riding our bikes with students from our university in a different program.

Beijing Culture

Next we rode our bikes to obtain cafeteria cards. Fortunately for us, we were all extremely hungry by this time and since the cafeteria was close by, we simply walked over to it. We learned it was the oldest cafeteria in Tsinghua and considered small. We learned there were many more on the campus and some that were even four stories tall. We considered it a big cafeteria and were excited to see the dimension of the others. The cafeteria had many stationary chairs and tables where

anyone could sit. Guests were meant to walk the stalls of food displayed by cafeteria workers behind windows and decide on what they wanted to eat. Once we all did, we sat down and enjoyed our first meal in China. We noticed that everyone there used chopsticks so those who did not know how to use them quickly learned that day. After the delicious meal, we visited a bank on campus to change our American Dollars into Chinese RMB. We were all able to change our money relatively quickly. After the stop at the bank, we left back to our rooms to rest until dinner.



Figure B.3: Learning how to use chopsticks

When it was time for dinner, we all contacted each other on our room telephones and met downstairs. We happily rode our bikes to the restaurant where we met up with Professor Wang, and a new host student Jane. That night we ate traditional Peking duck and it was a consensus around the table that it was delicious! That night we experienced something new. We were impressed with the dinner style. The table had a spinning glass plate in the middle of the table where dishes were placed. If anyone wanted a dish on the other side of the table, they would spin the glass until the plate arrived

in front of them. On top of the impressive table and beautiful surroundings, we tried completely new dishes we had never seen or heard of before. We left the restaurant happy and full and went to bed jetlagged but content and ready to familiarize us with China.



Figure B.4: Certificate of the ducks we had for dinner

Assimilating Chinese culture

The next day we gained a better understanding of how vast the Tsinghua campus was. We rode our bikes around the campus and stopped at a phone shop so some of our members could obtain phones. We found that it was much cheaper to just buy a SIM card and put it in our American phones than to go through any other method. Once we completed our task there, we left to a student store to buy some necessary effects. We had learned in America that many public bathrooms did not have tissue paper so we made sure to buy some. We also bought other necessities such as bottled water, shampoo, and more. At the checkout stand, we were able to use our limited Chinese in trying to figure out the amount needed to be paid and give it. After leaving the student store, we truly realized how important our bikes where. Everyone at Tsinghua had a bike

and there were bike locks and bike streets all around the university. We felt very thrilled to be a part of the university culture. We rode our bikes to the Main Building and were able to see where we would be doing our labs.



Figure B.5: Biking around Beijing

Sightseeing around Beijing

Fortunately we were able to find time outside of lab to travel the city. We were able to visit the Forbidden City, Tiananmen Square, old and new Summer Palaces, Wangfujing Plaza, Great Wall, China Central TV Tower and a Hutong and Tea House.



Figure B.6: Amazing architecture and botanicals at the Old Summer Palace.

One of our favorite places was the Great Wall. When we went to visit the Great Wall, we underestimated how much walking we would do that day even though

we knew the Great Wall winds up and down across deserts, grasslands, mountains and plateaus. Once we arrived, we were amazed at its beauty and immediately proceeded to walk up the wall and follow the path. Before arriving in China we learned that the Wall had been built as a defense but it had been destroyed in some parts and what we were seeing was mostly built in the Ming Dynasty.



Figure B.7: Beautiful scenery at the Great Wall

We also knew men had guarded these walls and if there was pending danger, a messenger had to run the stretch of the wall to proclaim the warning. What we did not know was how steep the wall could get at parts. We found ourselves breathing heavily and taking many breaks as we trekked the amazing world recognized monument. Once we reached high ground and were able to see our immense surroundings, we were fully able to appreciate the architecture and structure of the Great Wall. Unfortunately by the time we were all extremely tired so we decided to take a cable car to the bottom.



Figure B.8: Bright lights, signs and paintings at Wangfujing

Wangfujing

Another favorite place we frequented was the Wangfujing Plaza. We met many other foreigners there who always wanted a rich experience of China. We visited the stores in that area and took in the beautiful lights and images there. After walking around for a while, we discovered a street in that area with a multitude of different foods. We walked down the whole street taking in the smells and admiring the brazen people eating the mysterious food. We loved Wangfujing Plaza because we were able to learn more about Chinese cuisine meet more Chinese as well as foreign people and have a good time doing so.



Figure B.9: Margaret trying unknown meat

The whole time spent in Beijing was informative, helpful and inspiring. We learned more than we thought we ever would about Chinese culture, food, architecture, hospitality and more. After a great time in Beijing, we were sad to leave but excited to visit a new city, Chengdu.



Figure B.10: Famous Mao painting at the exit of Forbidden City

Seminar on Microelectronics at Tsinghua University by UC Santa Barbara Professor

As part of the activities organized by the IRES program, we had a speaker from the University of California, Santa Barbara, Professor Patrick Yue to talk about his research. We invited Tsinghua University students related to the field of Microelectronics to join us and we had a great response. We all learned about ongoing research at UCSB and, especially, at Dr. Yue laboratory, and the developments. After the seminar, there was an open time to ask questions about the research and related material to the field.

We found this to be a great way to give something back to the host students and students in the department of

Microelectronics. They seemed interested on what other people in the same field are working on. Also, they had the opportunity to ask questions about the challenges and possibilities to pursue their doctoral degree in an American Institution.

After the seminar was over, some of the students and us decided to go to lunch and have a good time, where we had more time to answer questions about how the higher level-school system works in America, if they ever decide to apply.



Figure B.12 On our way into SMIC foundry



Figure B.11: Seminar on Microelectronics at Tsinghua hosted by IRES program

We learned that the company is headquartered in Shanghai, and has fabs in Tianjin, Beijing, Shanghai, and soon to be open, in Chengdu. The Beijing foundry has the technology to produce 12-inch wafers, the first of its kind in Mainland China. The integrated circuits technology that they produce ranges from 350 nm to 65 nm. We also had the opportunity to find out about the different companies that buy integrated circuits from SMIC to fabricate different components, such as, mixed signals/RF CMOS, high voltage, DRAM, flash, and EEPROM components, amongst others.

Visiting SMIC semiconductor Foundry

Thanks to Dr. Wang's networking with the Chinese industry, we were able to visit SMIC, Semiconductor Manufacturing International Corporation, foundry. We were well received by the people at SMIC. Before going in we had to wear covers for our shoes to prevent contamination of the actual clean rooms. First we were taken to a conference room, where an engineer and a human resources employee gave us a presentation about SMIC. At this presentation we learned that SMIC is one of the leading semiconductor foundries.



Figure B.12: At the main lobby of SMIC

Once the presentation was over, we had a tour around the foundry. We were not allowed to take any electronic devices

because of confidentiality issues; nevertheless, it was an amazing experience. We got to see, how the mass-production of wafers is done, which is different from the way it is done at research level. We were truly amazed by the cutting edge technology that is used to mass-produce wafers. As we were walking around the foundry they mentioned us the incredibly large sum of money that is paid to open a foundry, which a huge portion of it, goes to buying the machines.

After visiting SMIC foundry we felt like we gain an insight on fabrication, as far as in the industry world. We found this really helpful because now we know the difference between how things are done in the industry and in research.

Laboratory at the Institute of Microelectronics, Tsinghua University

Tsinghua University is a university in Beijing, China. The university is internationally and nationally known as a top university in China. Its school of Information Science and Technology is highly prestigious because of its competitive program and research facilities. The IRES students were accepted as visiting students in the school of Information Science and Technology in the department of Microelectronics and Nanoelectronics in the program of Microelectronics and Solid State Electronics.

Our initial project, at Tsinghua University, was to design and fabricate semiconductor structures for RF and mixed-signal integrated circuits. But due to the Olympics activities, new government laws controlled the use of certain chemicals used in the fabrication of semiconductors. Nevertheless, we gain an insightful understanding about semiconductor design

and measurement technologies used in the fabrication process of semiconductors.



Figure B.13: Learning about the lab!

Getting to know the laboratory

We were all excited to visit the lab because we don't have clean room facilities at our school. We learned that a clean room has a controlled level of contamination. In other words, it has a particular number of particles per cubic meter. This is vital in the manufacture of semiconductors.

We had to wear a jumpsuit that covered all our clothes and our head. Before going into the clean room we had to take an air shower. This shower is in between a double door connecting to the lab.

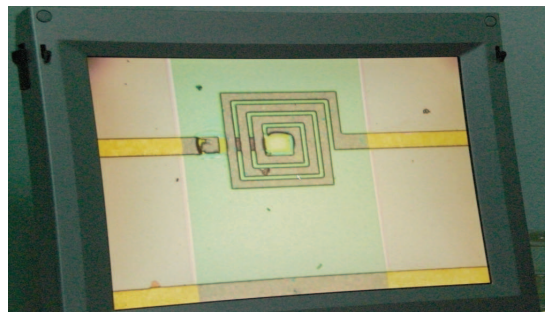


Figure B.14: An ongoing research on capacitors on an integrated circuit

Integrated circuit fabrication process

Our host students walked us through the whole process of making a wafer. A wafer is a thin slice of semiconductor material used in the fabrication of integrated circuits. We learned about all the chemicals that are used in the process and their health risks if they're not handle correctly. After this we went to the room where photolithography is done. This room uses ultraviolet light. Photolithography of a wafer works very similar to photography developing. You lay the wafer that you want your integrated circuit on, put the blue print on top of the wafer and turn on the aligner that emits light. The light only goes through where the blue print is not blocking the wafer.

After the wafer has been patterned using photolithography, etching is the next step. Etching removes layers from the surface of a wafer using chemicals. Etching entirely removes the top layer of a multilayer structure. This must be done without damaging the layers underneath.

We also learned about doping. Doping is a process where impurities are intentionally introduced into an extremely pure semiconductor. The reason this is important is to change the electrical properties of the semiconductor.

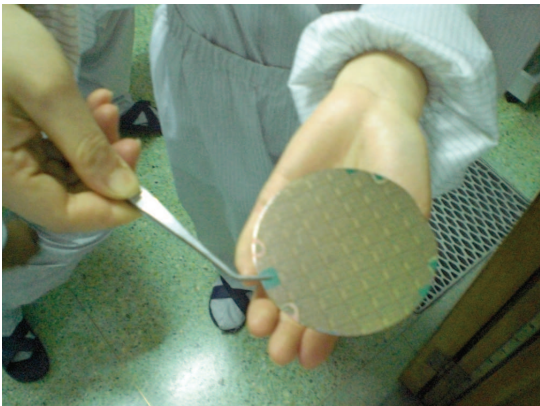


Figure B.15: Looking at different wafers

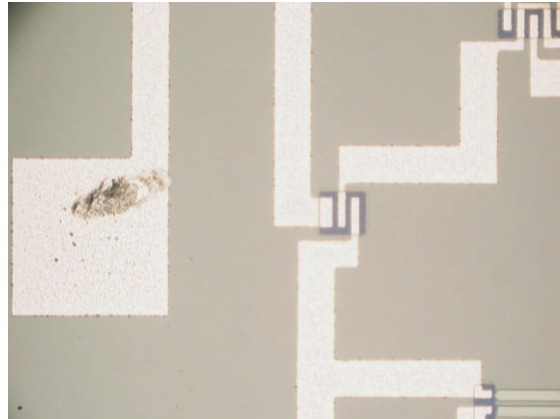


Figure B.17: MOSFET pad (Actual IC that we tested)

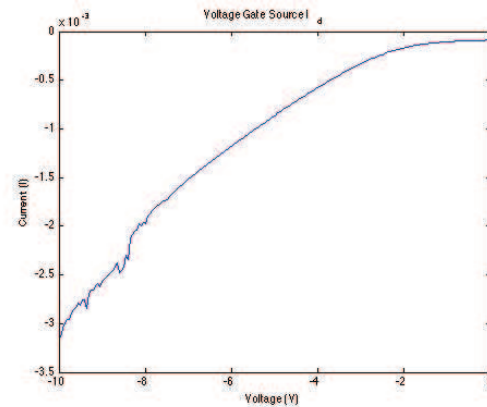


Figure B.16: Result for Drain current vs. Voltage-Gate Source of a MOSFET

Testing MOSFETs and DIODES

As part of our lab activities we tested different MOSFETs. MOSFET (Metal-oxide-semiconductor field-effect transistor) is a very common transistor used in both digital and analog circuits. The main purpose of this device is to amplify or switch signals. MOSFETs have three different operation modes, these are: cut-off mode, linear region, and saturation mode. Cut-off mode, according to the basic threshold model, means that the transistor is turned off, that is, there's no current

between the drain and source. MOSFET operation on the linear region means that the transistor is turned on. It basically operates like a resistor. In this region, the current is controlled by the gate voltage, this is proportional to the source and drain voltages. Saturation mode happens when the linear mode has been reached allowing the current to flow between the drain and source.

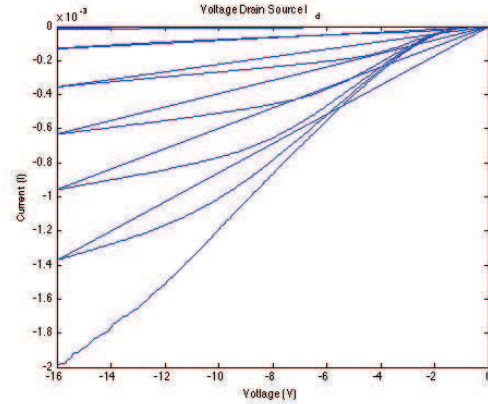


Figure B.11: MOSFET #2. Drain current vs. Drain-to-source

In this part of the lab we learned how to use a pulse curve tracer, which traces the voltage through a circuit on a wafer. At first, we found this rather difficult because you need to look through a microscope in order to see the pads on the wafer. Moreover, it is even more challenging to get the probes to make good contact with the pads.

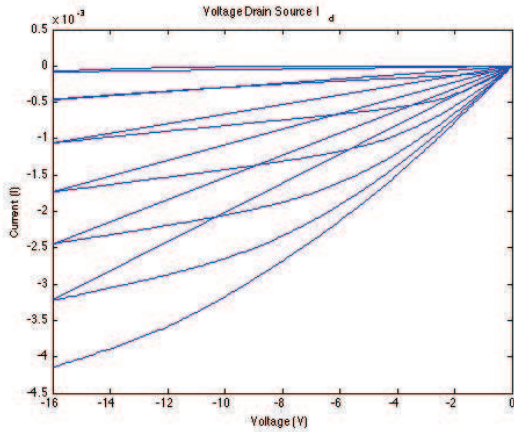


Figure B.9: Graph of MOSFET operating in the linear region. Drain current vs. Drain-to-source

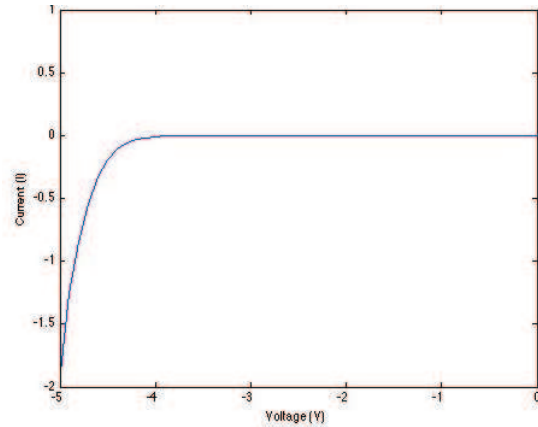


Figure B.12: I-V curve of a diode operating on reverse bias

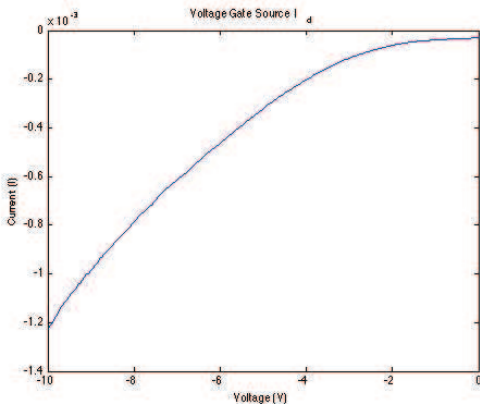


Figure B.10 MOSFET #2 under testing. Drain current vs. Voltage-Gate source

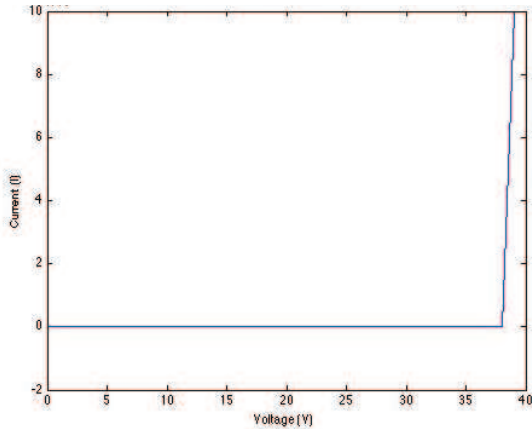


Figure B.13: I-V curve of a diode operating on forward bias.

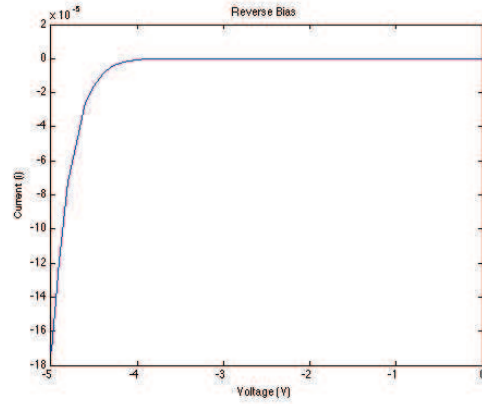
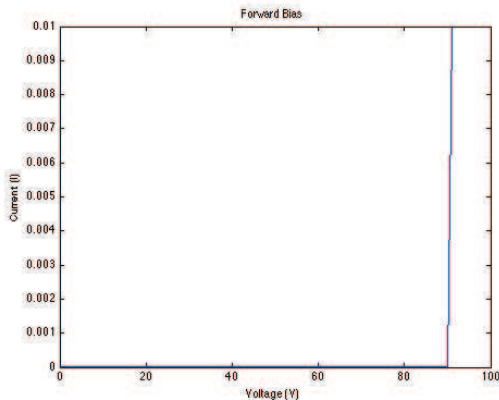


Figure B.14 (a & b) Correspond to Forward and Reverse Bias, respectively.

Once we got comfortable using the pulse curve tracer, we tested a diode on an integrated circuit. We tested this diode on the two operations: forward and reverse bias. We obtained the diode's current-voltage characteristic, also known as, I-V curve. Reverse bias operates on the third quadrant. It starts at infinity and approaches zero. As it approaches zero, the current is close to zero, this is known as breakdown. Forward bias operates on the first quadrant. It starts at zero, and the voltage and current start increasing, though the diode is off, but once it hits a certain voltage it turns on, allowing current to flow.

The next Figures show the different results we obtained from testing another diode.



Modeling of a diode and MOSFET

As our last project in Beijing we had to model a diode and MOSFET using a computer program called Tonyplot. We had never used this program before, so it was a little difficult at the beginning. The most challenging part was to learn the commands Tonyplot uses. It was almost like learning a new programming language!

After debugging the code for a while and changing the parameters to meet our requirements we finally obtained models and simulations for our diode and MOSFET.

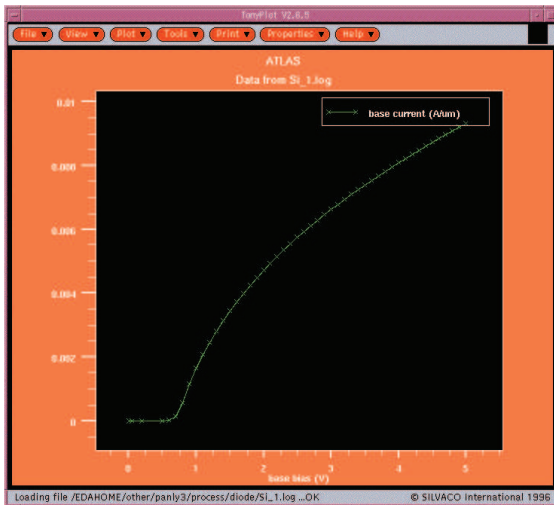


Figure B.12: Forward bias I-V Characteristic (diode)

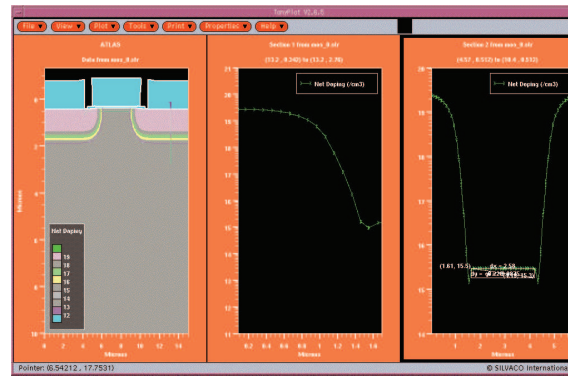


Figure B.14: Model and simulation of a MOSFET. It shows the impurity levels and the bandwidth of the MOSFET

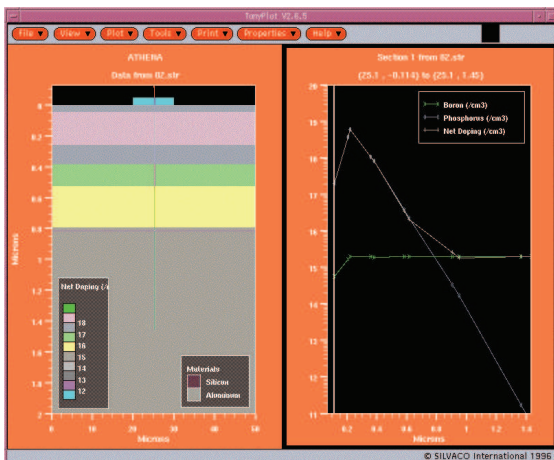


Figure B.13: Impurity levels of the diode

We learned how useful it is to model and simulate a device before it is manufacture. This helps rectify the theoretical analysis done, and gives you an idea of the characteristic you want to achieve on the actual device.

After we finished with the lab activities in Beijing, we felt like we gained a profound understanding on the manufacture, simulation and testing of semiconductor devices. We think that what we learned in these sessions is going to be really helpful later on our career, because we will have a good understanding of semiconductors at the production level.

Chengdu

Flight and Arrival

After 21 days in Beijing it was time to head off to Chengdu. Chengdu is in the Southwestern province of Sichuan about 1200 miles from Beijing. We were taken to the airport in a large van/small bus. The airport was much busier than when we arrived in China and you could see the preparation for the Olympics were finalized. Security seemed a little stricter than when we arrived although we had no problems. They were more thoroughly checking people's bags and using the metal detector wand on a lot of people.

Once we made it through security we had about an hour to waste. While waiting to board we had a coffee and caught up with Prof. Wang since we hadn't seen him in a couple weeks. It's interesting how coffee is one of the few things in China that cost the same as it would in the USA.



Figure C.1: On our way to UESTC!

The flight was about 2 hours and really bumpy, but we made it to Chengdu safely! The airport in Chengdu was so much smaller and older than the Beijing airport, but just as efficient. Our luggage was waiting for us along with our host students

when we arrived at the carousel. We had two host students, Zhang (John) Yuzhe and Wang! They were both very helpful from the time we first met them. They helped us with our bags and led us to a large van to take us to our apartments.

The drive from the airport to our apartments was very different from our first drive through Beijing. Firstly, the buildings were clearly older and not as large as those in Beijing. Secondly, along the route to the apartments there was car dealership after car dealership lining the highway. We saw dealerships for cars we never saw in Beijing such as Porsche and Mini Cooper. The last major thing that was apparent was the much lighter traffic.



Figure C.2: One of the apartments

We arrived at our apartments and were all surprised at the size of our apartments. Robert and Mike shared one apartment while Israel and Margaret shared the other. Each apartment consisted of a large bedroom with a queen size bed, a living room with futon, a computer room, a bathroom, and a kitchen/laundry room. Each apartment had a TV with cable that included 5 English-speaking channels which was nice to have.



Figure C.3: Welcome Dinner with Dean and Professor from UESTC

Welcome Dinner

After we settled in for a few hours it was time to head over for our welcome dinner. We went to a nice restaurant in a hotel about a 1/2-mile from our apartments. The dinner was held in a private dining room with the four of us, our 2 host students, Prof. Wang, and 5 other department heads/administrators. The dinner consisted of about 20 different dishes all of which were new to us. The food was quite amazing and it was nice getting to know the host students and administrators.

After dinner we walked back to our apartments and got a tour of the campus on the way back. The campus was much smaller than Tsinghua was but this is the old campus. There is a new campus which we visited later in the week. Walking back to the apartment we could see how much more green Chengdu is than Beijing. There were trees everywhere and there was a river that flows between the campus and the apartments that we stayed in. If it weren't for the heat and humidity the city would be a dream destination.

Wuhou Memorial Temple

The next day we were off to do a little site seeing. Our host took us to Wu Hou Memorial Temple. It is a memorial to Zhuge Liang a famous military and political strategist of the Shu Kingdom. He lived during the Three Kingdoms period. It was very interesting to see all the statues of the famous advisors and generals of the period. We had a tour guide while we visited the temple and she provided us with so much information about the time period and the significant of the shapes and colors of the statues.



Figure C.4: Our host students with us at Wuhou Temple

Jin Li Street

After leaving Wuhou Temple we headed over to Jin Li street which is a street that has been constructed to resemble an old Chengdu street. The street is rather touristy but was a lot of fun to see. There were lots of shops selling traditional style Chinese arts and crafts. We walked through the street checking out all the different crafts being sold and just enjoying the ambiance. We really started to notice the lack of western tourist in the city and how we stuck out.

It was interesting how the vendors in Chengdu were not as aggressive as those in Beijing were. They seldom approached you about an item unless you showed genuine interest.



Figure C.5: At the entrance of Jin Li street

Pandas

Chengdu is known for being the home of the panda and so we went to the Panda Breeding and Research Center. The day was rather hot and extremely humid so we were a little uncomfortable starting out the day. It seemed that we weren't the only ones because most of the pandas were hiding away in their cages where they have air conditioning. We were only able to see a few pandas because their cages had very limited access for visitors. As we sat down for lunch the sky opened up and it began to thunder. We were planning on going to get our pictures taken with a red panda but because of the rain they had stopped the pictures for the day. We were a little disappointed because it would have been so much fun to be able to hold a panda and get a picture with one.



Figure C.6: Our group at the entrance of the Panda Research Center



Figure C.7: Pandas were indoors due to the high temperatures outdoors.

UESTC New Campus

UESTC has both the old campus and a new campus. The old campus is located in Chengdu and the new campus is located outside the city center. To get to the campus we had to take a bus for about 30 minutes. The new campus only opened in the last year so it is still a little empty of trees and such but it is much larger than the old campus. As we were walking around the campus taking a tour we noticed a lot of buildings had what looked like damage from the earthquakes. After I asked we were told that the damage was actually done by the engineers to check the integrity of the buildings after the

earthquake. They said that there was no significant damage to any of the buildings.



Figure C.8: Mike interchanging ideas with graduate students at UESTC

Cultural exchange with UESTC students

After touring the campus we met with a group of graduate students and had a little cultural exchange. We talked about our lives in the USA and asked them about theirs. It was very interesting. The students asked us to stay and go into a local town for dinner. The town was rather small and we went to one of the many hot pot restaurants. This was our first of many "hot pot" experiences in Chengdu and it was great.



Figure C.9: Eating with grad students

We ate whole fish, beef, beef stomach, pork, pork intestine, and many more types of meat and vegetable. The hot pot was very spicy but in a much different way than most Americans think of spicy. This spicy had a numbing effect on your tongue and the effects goes away rather fast after you stop eating.

Mahjong

In Chengdu you see a lot of people playing Mahjong. Mahjong is a game played with tiles but is much like a card game. Because we saw so many people playing mahjong we decided that we wanted to play. One night we went with our host to a local teahouse and learned how to play mahjong. We picked it up rather quickly and then our host suggested that we call out the played tiles in Chinese. Each tile has a number from 1 to 9 and a type so we were able to learn numbers in Chinese by the end of the night.



Figure C.10: Us learning how to play mahjong

Mount Emei

One of the main outdoors tourist attractions of Chengdu area, specifically Sichuan, it's Mount Emei. Mount Emei is about 3 hours away from Chengdu. There

are four sacred Buddhist Mountains in China, Mount Emei account for one. Among other reasons that Mount Emei is known is because of its 10,167 feet of elevation. Due to its vast cultural history, in 1996, Mt. Emei was made a UNESCO World Heritage site.



Figure C.11: Mike and Israel are about to start hiking up the mountain

Even before going to China Mike and Israel knew about Mount Emei and were really excited to hike it. Once we got to China, we asked our host students about the possibility to go visit it. The initial plan was to spend 3 days to hike the mountain up and down. After many calls to professors for permission, we were granted 2 days. Margaret and Robert decided to explore the city rather than hike many and many miles. Once we got a set date and a timetable of how much we had to walk to make everything on time, Mike, Israel, and host student, John were ready to conquer mount Emei.

We took a bus from Chengdu to the countryside where the mountain is located. It took around 4 hours to get there. Once we got there we had to take a van service to take us to the actual mountain. We did not have any time to eat, so we were eating

out of our packs. After we arrived to the actual mountain, we decided to take a popular trail because it's known that monkeys always wonder around that area. We walked about 2 hours into the mountain to finally see them. This was a very unique experience, because we were able to fully interact with monkeys. These monkeys are very smart. They know that a lot of people have food or beverages and if you're not careful about your belongings, monkeys can take them away. Fortunately, the host student, John, warned us before we got to the monkey area. We bought some monkey food, before arriving to the area, and were able to feed the monkeys from our hands. It was a once in a lifetime experience. While we were hiking on this trail we were amazed by the amount of water and greens that surrounded this trail. There were some amazing sceneries and Buddhist temples that we were able to snapshot and visit.



Figure C.12: Israel petting a monkey

Since a lot of people go visit this mountain, there is bus transportation that takes you almost to the top of the mountain. We decided that this was our best choice to be able to have time to hike down the next day. As we were ascending

we saw beautiful waterfalls and scenery that we have never seen before. Once we got to the highest point a bus can go, it was already sunset. When we got there, the temperature had dropped 15 to 20 degrees in comparison to the high temperature of Sichuan area. We proceeded to find a hotel, and the host student, John, decided that it was a better idea to go alone to find a better price for a room. This is very common in China, to inflate the prices for foreign tourists that can't speak the language. John found us a good deal for a three-bedroom room. After we checked-in we had our first actual meal of the day. It was the most delicious beef noodles that we've had! As midnight was approaching, the temperature kept going down. Luckily, we found a place where they rented jackets for very little. We all got a jacket and were ready to go to sleep and wake up early to start our hike up to the top. Before going to sleep, a very unlikely thunderstorm started and the lights went out. It was time to go to sleep.



Figure C.13 Waiting for the sunrise at the summit of the mountain

Next day we woke up at 3:40 AM, and it was still raining. One of the most beautiful attractions at the peak of the mountain is to see the sunrise. You can see it at eye-level coming up amongst the

clouds. We were determined to see the beautiful sunrise. So this rain did not stop us from being excited about hiking up. We started hiking at 4 AM, it was still completely dark and the thunderstorm was still coming down. As we were hiking up the temperature kept going down. It was definitely a good investment to rent those jackets! After 2 hours, we finally were at the peak of the mountain! We made it! There is a temple at the top and a very huge Buddha that we didn't lose the opportunity to take a picture with it. While we were waiting we were freezing because on top of the low temperature our shoes were soaking wet because of the rain. Few minutes passed by and we caught the amazing sun coming amongst the clouds. We were ready to head down to our hotel, dry ourselves, have a good breakfast, and start hiking down for more adventure.



Figure C.14: Mike and Israel hiking down

We started our journey down the mountain with some more beautiful scenery and it never stopped. The hike down was mainly stairs. Stairs would go for meters and meters down and some very steep. On our way down we saw different temples were monks live. We also saw an interesting business there; some people don't want to walk up or down the mountain, so there are people, in partners, that can take you on a ladder-type, with a seat, on their shoulders down or up the mountain. As we were coming down, we, once again, saw a group of monkeys on the trail. These monkeys seemed less aggressive and friendlier. We couldn't waste our chance to snap some pictures with them. After 5 hours of hiking down, Mike's knee started to bother him so we decided to take the closest cable car down, which was about an hour away from where we were.



Figure C.15: Beautiful landscapes on our way down the mountain

This was definitely an awesome experience and we were all satisfied because mount Emei not only met our expectations but exceed them. Mike and Israel have hiked different mountains in California, but this was a completely different experience and scenery.



Figure C.16: An amazing natural beauty

English lecture at a Junior High School

We had the opportunity to go to a Junior High School and talk to them, during their English class, about American life. Mike and Robert went into a classroom while Margaret and Israel took over another classroom. We talked to students about our lives in the American culture and they told us about their lives. At first they were a little bit shy but as soon as they realized that we were fun, just like them, they opened more and we were able to have a conversation.



Figure C.16: Mike and Margaret talking to junior high students.

It was really interesting to see their

perception towards American culture. Particularly, it is interesting to notice the huge influence Hollywood has over other cultures and how they perceived American based on movies. Consequently, we explained them how everyday American culture is and the truths and lies in Hollywood.

Chengdu Lab

Our lab in Chengdu consisted of 4 days of 4 hours in the lab. The first three days we worked 4 straight hours and the last day we had two 2-hour sessions. Professor Li led the lab. The first day of lab consisted of building an oscillator circuit using a 555 timer. This is a very common circuit used in many applications. We had to vary the values of the capacitors and resistors to set the frequency of the circuit. We each settled with something between 3Hz and 20Hz.



Figure C.17: Everyone working hard trying to debug those pesky circuits!

We then built an additional circuit that used a counter IC to build a circuit that when combined with the timer would create a series of pins with fluctuating outputs. These outputs were used to drive a series of LEDs which we were allowed to be creative with. After debugging our

circuits we moved our circuits from breadboards to circuit boards. This required a lot of soldering, which most of us had little experience with. I don't think any of us realized how much skill was involved in soldering some of those pins.

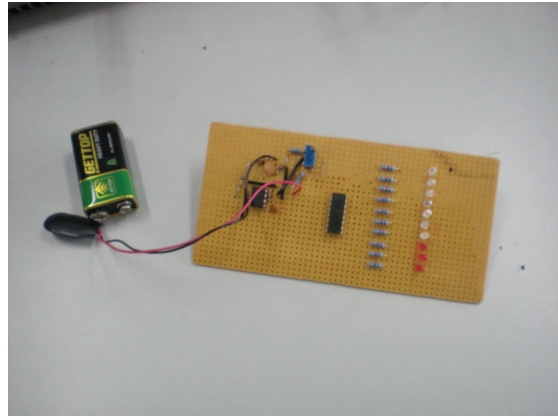


Figure C.18: One of the finish circuits on PCB Board

Each of us soldered our boards and nothing seemed to work but after a little debugging each of us got it up and running. Most of the problems seemed to be grounding issues. The lab seemed to be a little easy but gave us a little experience with some hands-on circuit building, which I think each of us needed.

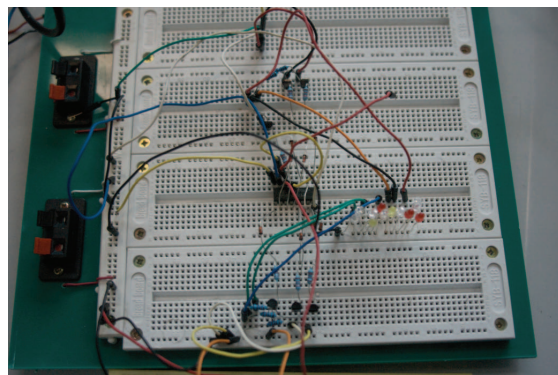


Figure C.19: One of the circuits still on the breadboard



Figure C.20: Our good-bye dinner

Conclusion

US-China IRES program had offered us a unique experience to explore the oriental world. Through technology research, we found that the researchers in China have a tremendous potential to compete with those in USA. Through cultural exchange, we found that things can be viewed from a completely angle in other community.

During the trip, we encounter all different obstacles. At first, we had some problem with the communication with local students because they could be shy or not confident with their English. Later, some of us cannot get used to the local exotic food and weather. Finally, we fell in love with China and expect to stay longer.

IRES program have profoundly broaden our horizon and gave a chance to learn from other culture.

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