

AARON SAUL NEMO

die Stoel



Introduction



Our final bent-metal chair before it was scrapped



Our final design, a bent wood chair



The culmination of all our work, a metal and bent-wood lamp

In this project, we have overcome many obstacles that have pitted us against time in an effort to complete our chair, lamp, and book. We had to restart our chair from scratch half way through the project because Jeff realized that it probably wasn't going to work past the half scale model. So, he gave us a better idea of a chair that he had seen and taken a picture of while vacationing.

We created the designs, and got to work as quickly as we could on our proof model knowing full well that we were sorely behind our peers. We created our proof model in 2 days which was much quicker than the 3 weeks it took us to create our first bent metal chair. After our proof model was given the ok, we immediately got started on our full scale chairs made of wood.

Our plan was to create both faces of the chair, and connect them with wood "slats" that would hold them together. We would cap off the chair by bending wood around the outside so that the inside / hollowness of the chair would not be visible. When we had put the "super bendy" wood around the outside of our proof model, it worked just fine; but when we had tried to bend the wood around our full scale model, it snapped, and wouldn't work.

to Jeff's Class



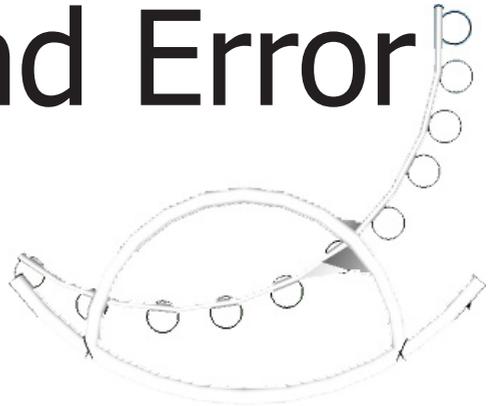
Our three bent-wood "die Stoel"s, stacked on top of each other

Jeff then suggested an alternative (albeit more time consuming) option make the wood slats go all the way around the chair. This turned out to be a very long process, including cutting out dozens of wood slats, gluing and nailing it to the chair, and the longest of all – grinding. Whole periods became consumed by grinding, covering us head to toe in sawdust that seemed to get into every nook and cranny. Everyone thought we had dandruff, but we embraced their comments knowing full well that we were working as hard as we could on our project. This book documents our journey through the twists and turns of our exploits while creating our chair, and lamp. We certainly hope you sincerely enjoy it!



Our first grinding experience

Trial and Error



When we first started the project, we had this great idea of creating this bent-metal chair, at the time we believed it to be the ultimate chair but we would soon figure out it was not so.. The idea we based our metal chair was one we found on a website. This website had many different things: designs for kitchens, rooms, and of course, our chair. Now the thing that was unique about the chair we wanted to make was that the creator of the chair we based our idea off of made his chair only using CGI technology, so in a sense the chair wasn't real. So when we had the idea for our metal chair we worked on finding something to make it our own. One thing we decided to add was a rocker to the bottom of the bent-metal chair. So now that we had this idea in our head, the next thing was to get it on paper and find the dimensions for our half scale model. So before we created our half scale model we first had to show Jeff that we knew what we were doing. One of the prerequisites was to create a google sketch-up design showing what our chair would look like. So right away we jumped on a computer and created our design. We created a chair to our specifications and in sketch-up it looked perfect. So when we finished our design we showed Jeff our design and we got the o.k. to build our bent metal chair.

We were immediately excited that we pleased Jeff with our design but what we didn't know was that getting it approved and actually making it were completely different. We right away picked what we needed from Jeff's supply of materials. Since we were making a bent metal chair and it was for our half scale, we didn't need to mess with any REAL metal so we got some 1/2in conduit for our half scale. With our material in hand, all that was left for us was to simply build and bend our conduit to our specifications, well it wasn't that simple. We figured out that it wasn't as simple as we thought to build this chair. One of the main problems we had right off



Our inspiration, a piece of concept art by Paul Threadgold

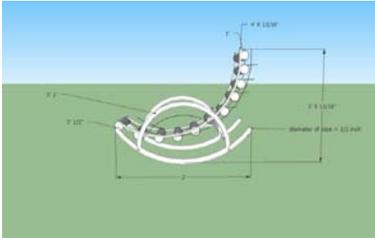
the bat was when we began building, we needed to figure out how we were going to bend the metal so it reached its assigned degree of curvature. The piece of equipment we had didn't exactly help us with this. We used a tool that we dubbed the "Hammer of Thor." The "Hammer" wasn't precise when it came to bending the conduit. Even though we had our marks on the conduit and they were all correct, the intervals of The "Hammer's" bending capacity weren't the ones we were hoping for. Also another hitch with The "Hammer" was the lack of accuracy. When we were bending the conduit we had to eye it and somewhat guess where to

stop bending it so it wasn't 100% accurate. We saw this right away when we started bending our first part for the chair, we wanted it to reach a degree of 85. When we thought we finished it and reached 85 degrees we soon saw, to our horror, that one side was more bent than the other. Right away we tried to correct our error by bending the other side more so that it looked equal to the other. Even through our efforts that piece wouldn't bend to what we wanted it to bend so we had to throw that piece away. From then on we tried to make everything more accurate by paying extreme attention to every piece we bent.

So when we were finished with bending all the pieces we showed Jeff and he approved it and we were ready for the next step, welding. We were excited that we got another step ahead in the chair building process. So the prerequisite for welding was that we had to grind off the galvanized parts of the conduit which prevented the conduit pieces from accumulating rust. Now with our freshly galvanized conduit we believed we were ready to begin welding.



A side image of Paul Threadgold's concept art. This image was made using CGI technology, meaning that our attempt to make this chair was the first



Our Google-Sketchup schematic



Saul Propp grinding a piece of metal in preparation for welding.

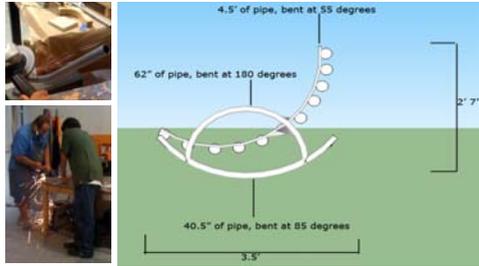


Our half-scale model of our bent-metal chair

Jeff showed us how to weld and we were excited because none of us had ever welded before and it looked interesting. So everything was going great, we were welding away, finishing parts in a breeze, with help from our classmate Collin Bautista, who had experience with metalshop. With his expertise we managed to finish our chair quite easily. So now with a finished bent metal chair the next big step was checking to see if it worked. The big moment of truth was upon us and we were excited, nervously thinking, "What if our chair doesn't work the way we hoped?" and "What will happen to us if the chair doesn't work?" So when the chair was finally placed on the floor any sign of excitement or happiness for the finished chair was sucked out of us almost as if we witness the largest tragedy of our lives, and that happiness was replaced with sorrow and nervousness for what would come next.

Since the chair didn't work the way we had hoped we had to figure out why. What our Physics teacher, Andrew, suggested was that our center of gravity was way off- something we could definitely see. Our chair rocked too far back. We thought it had something to do with the bending angle of the back, maybe we didn't bend it far back enough, but we couldn't do anything about it because the back was already welded with the metal conduit pipes going across the back. Something we did to try and fix this error was to break the back from the arm rests and move it more back to see if we could adjust the center of gravity. When we tried that, it only made things worse. Since the back was two bent conduit pieces with conduit running across it, it weighed a lot more than the other parts of the chair.

The Rock and Roller: Saul, Aaron, and Nemo



This is our plan and design for the half scale model of our chair. Now that we have built our proof model out of 1/2 inch conduit, we will build our chair out of one and 3/4's inch pipe, welding them together to form the structure. To make the cushions, we will use cut up pool noodles, as they are light, cheap, and comfy. It is our goal to create a comfortable and usable bent-metal rocking chair with a Bauhausian and utilitarian design.



Our design was inspired by this concept art, which can be found at paulthreadgold.com

A poster explaining the design of the "Rock and Roller"

Essentially the center of gravity moved even more back. So what Andrew then said was something we hoped we would never hear, he said we would have to scrap the project. Jeff agreed as well. With that the Bent Metal Chair we named "The Rocker Shocker/Rocker and Roller" died and had to come up with another idea soon because time wasn't on our side. Since this idea failed and we had to come up with a brand new one we fell far behind our classmates and had to start from scratch. With our failed chair still heavy in our thoughts, we were running out of ideas when we had to brainstorm for a new chair design and that's when Jeff approached us and something magical happened.

Divinely Curved Metal

Functionality of a Chair.

Aaron, Saul, and Nemo introduce...



The new and improved version of the Rock and Roller will be on display soon in a classroom near you.



After we were told our chair was unncepable, we drafted this advertisement

Bent Wood



After Jeff told us our bent metal chair was unacceptable, we were lost. For some time, we sat at our computers, brainstorming new ideas. Then Jeff came to our aid. He showed us a slideshow of pictures from his trip to New York's Cooper Hewitt Design Museum and within this plethora of images, we found our design. The idea was simple, bent wood chairs that stack. What followed would turn into one of the hardest journeys of our life.

Our first step was to draw out our design on paper, and then on Google Sketchup. It took us several tries, but we eventually were able to get the proportions right; instead of randomly picking values, we based the dimensions off of our class chairs. We made sure to make the width of the top equal to the width of the leg-hole, which in turn was equal to the height of the legs. With our new design in hand, we got to work deciding what was the best way to build the chairs. After much discussion, we decided to create two frames, connect them with wood slats, then wrap the entire thing in bendy-wood.

With a fresh idea and a solid plan, we got to work building our proof model. From the get-go, it was hard to make the two frames identical. No matter how carefully we traced, we always had to grind bits and pieces off. The next challenge came when we tried to connect the two halves with slats, as even a small difference in size made gluing impossible. As a result, we were forced to use a nailgun in addition to wood-glue to connect the two pieces.



Our schematic for our new chair, which was inspired by a photo Jeff took in New York



The half-scale model of our bent wood chair, entitled "die Stoel", which means "The Chair" in Afrikaans



Nemo Zaragoza putting the slats on what became our first completed chair

Finally, it was time to wrap the frame in bendy wood. Luckily, we had some experience with this, as we had previously helped other groups go through this process. This stage of our project went by with surprisingly little going wrong. We clamped pieces of wood to keep our bent wood in place and coated it in wood glue so it would dry in place. At one place, the bendy-wood cracked, but otherwise, the wood-bending process worked without a hitch. We sanded off the rougher parts, photographed the result, and moved on to our full-scale pieces.

The real chairs turned out to be much harder to make than we initially planned for. With a larger frame, there was more opportunity for error, and we spent many hours fixing the frames to make them identical.

After connecting them with slats, we ran into a problem; the chairs weren't comfortable to put your legs through unless you were very tall and very skinny. Unfortunately, this meant we had to scrap the leg rest concept. We also had to widen the gap in the middle of the chair to give them space to stack; as we had it, the hole and the width of the chair were identical, when the hole needed to be slightly larger.



Nemo proudly displaying a chair-in-progress

Aside from this design flaw, the building process went without a hitch until it became time to bend the wood around the chair. We went about it identically to how we did with the scale model, but to our great dismay, we found the bendy wood wasn't bendy enough; it couldn't handle the strain placed upon it by our larger chair. A choice was placed before us: try to find even bendier wood and continue with a bent wood approach or replace the bendy-wood with more wooden slats. Under pressure from Andrew, we went with the second approach.

The process of attaching the slats was slow, hard, and messy. Any change in length of the slats created a gap that needed to be filled with wood putty. The slats didn't quite fit in correctly, and needed to be ground down to match the frame. In order to put in a slat, it was necessary to align both ends simultaneously and keeping it in place, nail and glue the wood in place. After everything was attached, we had to fill in the cracks in between the slats and the holes created by the nails with wood putty- something made harder by the hot weather, which caused the putty to dry almost as soon as it hit the wood.

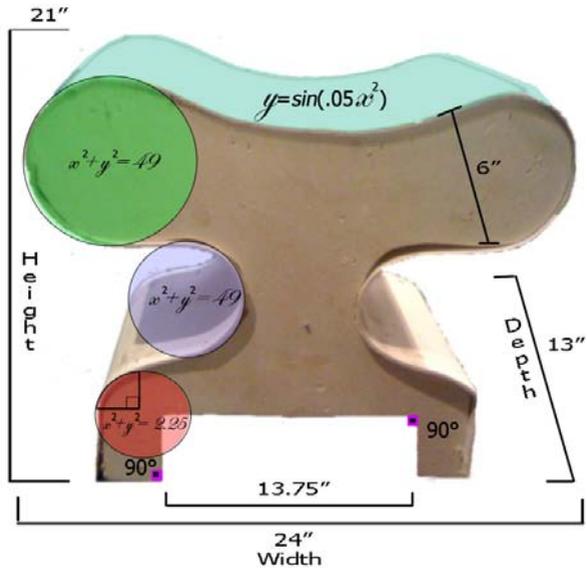




Then, we had to grind the wood down. On the day before his birthday, the best grinder in our group, Aaron, cut open his hand when his grinder slipped. As you might imagine, this set us back quite a bit. Nemo and Saul had to go through and grind the remaining wood. Then came a second wave of puttying to fill in the cracks created by the grinder.

After a final sanding, the chairs were finished. It was time to test out the fruits of our labor. Sitting in our chairs and testing out their weight capacity (which turned out to be enough for a person to stand on), we contemplated the journey we had traveled.

die Stoel



Aaron Saul Nemo

A poser we made that demonstrates the mathematical concepts present in our chair

Class of
2011
Presents:



*This beautiful chair will change your life.
Not only does it have a gentle curvature suited
to the conforms of the human body, but multiple
die Stoels can be stacked for maximum
storage efficiency. With its strong yet
comfortable build, die Stoel will
change the way you view
chairs...*

die Stoel
Brought to you by
Saul Propp Aaron Subkow,
and Nemo Zaragoza

Forever.

Our new advertisement, explaining and promoting our chair

Final Thoughts



With this project nearing its end we feel that we had gone through a grueling process to get where we are. With the failure of the bent metal chair and starting from scratch and racing against time to finish our bent wood chair in time as well as juggle our book and lamp. This showed us how to manage our time wisely, yes everyone says that but this is the truth for us. When we failed the metal chair we were stressing as to what we would do with weeks lost because of the metal chair. We managed to overcome this problem because we were able to delegate the jobs fairly and make sure all aspects of the project were covered and that nothing was left out. So when we began to work on the wooden chair Aaron and Nemo with some help from Saul would work on building the actual chairs and make sure they were done as best as possible. We also allowed Saul to work on the book. He was in charge of all things dealing with the book. So when Saul managed to finish parts that were due we would check it first to make sure it was great as possible.

With us delegating the jobs as fairly as possible were managed to get a lot of the work done and actually get stuff finished on the due dates that were given to us. Of course we have had some disagreements but managed to set them aside and collectively work toward our common goal: pass this class and make a chair that showed our hard work. It was great that we had gotten along so well because we had many headaches during the project and that we managed to overcome them and still wanted to work together showed us something about ourselves. It showed how we, great friends, managed to become greater friends through this project and manage to find our strengths and weaknesses. So in the future when we might happen to work together we would be able to help each other that much more because we have had the experience through this project.



Our three slatless chairs stacked on top of each other. At this stage, all that needed to be done was lining the chairs with slats

If there is one thing We've learned from this project, it is that art isn't really about knowledge as much as it is about skill. Anyone can come up with an idea, it takes a true artist to bring that idea to fruition. Only by utilizing their real world knowledge and experience in the workshop can a person take a concept and turn it into a masterpiece.

In our project, we mentally knew what we wanted to do. However, we lacked the skills and experience to pull it off. That's where experts like Jeff Robin and Collin Bautista come in. They help us learn the skills necessary and substitute their experience to make up for our lack of knowledge in the subject. We will never be the experts they are until we too have acquired the skills they have, which can only be done through practice.



Our three "die Stoel"s, in various stages of completion

We have grown through this project. There is a sense of satisfaction you get from building something with your own two hands. From beginning to end, these chairs are ours. We have worked hard on them, and our work has payed off. Our chairs truly are the fruits of our labor and represent the effort we put into them.



Our three group members, contemplating the project we have completed. (from left to right) Nemo Zaragoza, Aaron Subkow, Saul Propp

Sitting on the chairs we poured our time, sweat, and (in Aaron's case) blood, into