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Co-op student at Niagara Research

I am from the French high school École secondaire Confédération in Welland, a good school with a few specialties, like wood shop and cooking, though nothing in electronics aside from programming. I intend to take the photonics courses in the fall of 2011, so when I heard of this placement I thought it would be the best opportunity for me to gain experience before hand. I began my co-op placement in February. My supervisor Geoff gave me a choice; either I help in his project or start one of my own.

I had an interest in holograms ever since I saw Star Wars and Star Trek. I looked for some projects involving holography to do. Geoff found a Holo-Television paper on opticsinfobase.org and we started from there.

Process & Objective

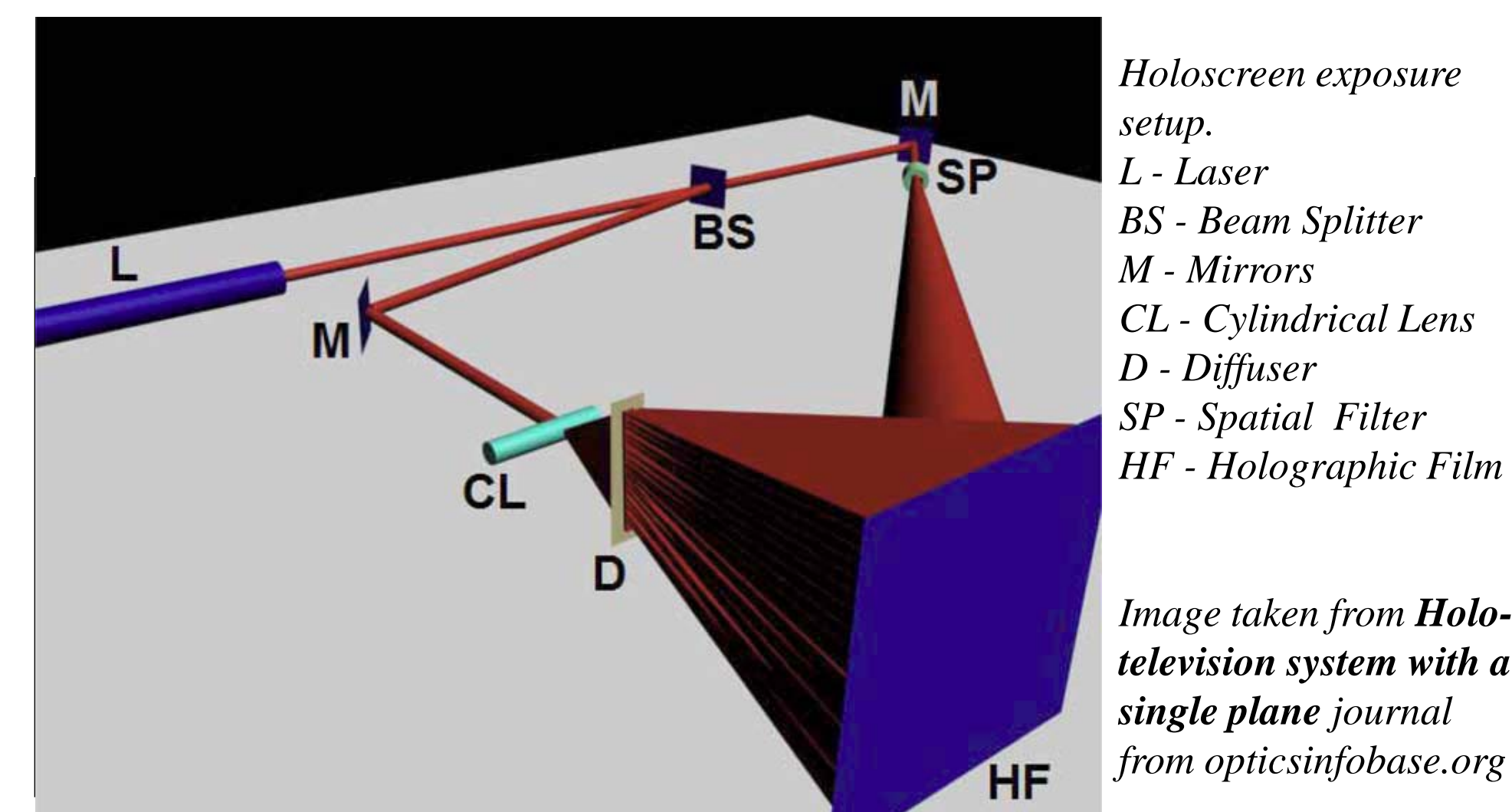
The purpose of this project is to create a projector screen you can see through when it's not in use. Virtually making the room feel less full.

During the first few days, Geoff showed me how to make 2"x2" reflection holograms. I then researched holography; reading online journals from opticsinfobase.org.

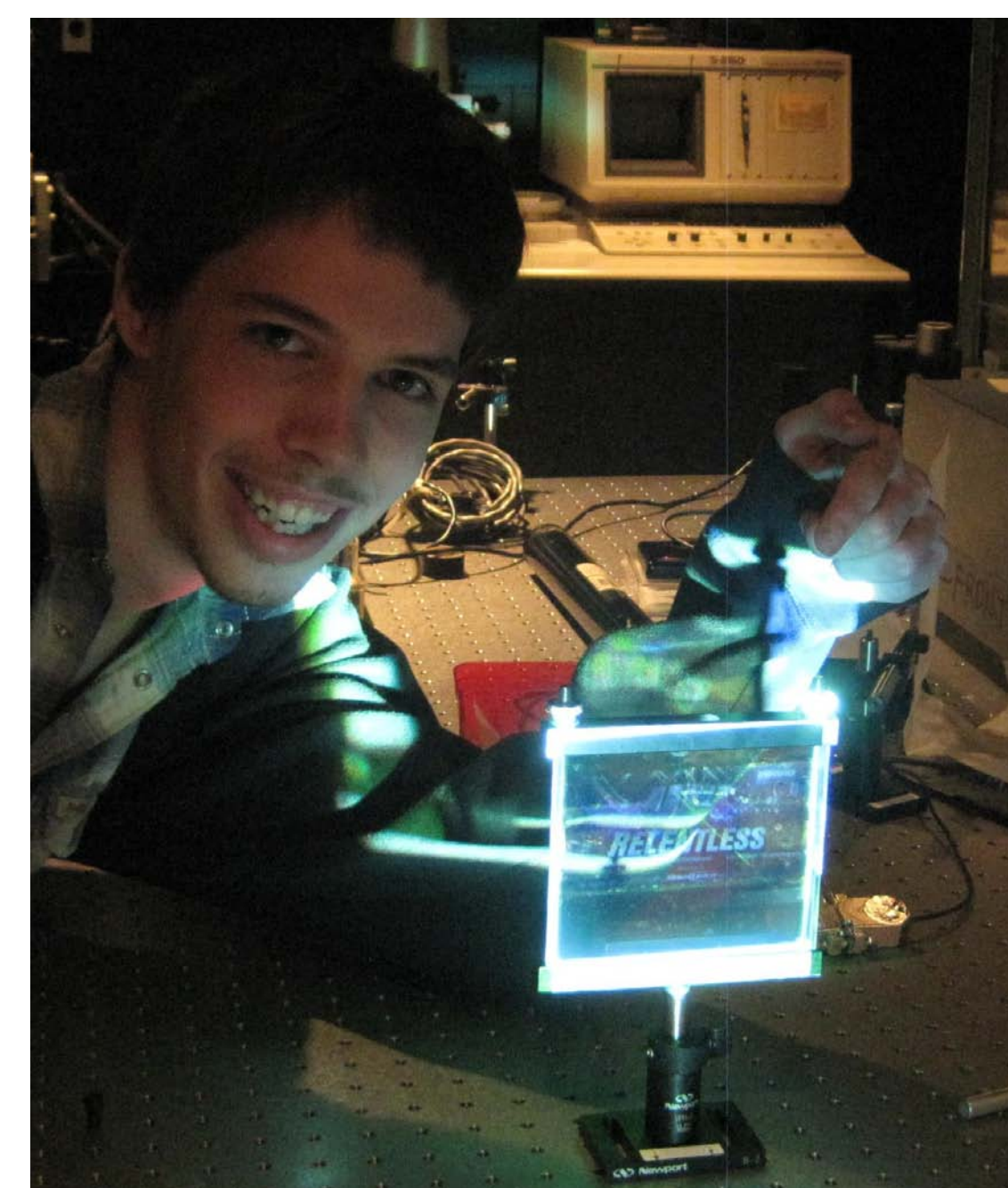
We did some experiments for me to learn; what a diffraction grating is, what a spatial filter does. Geoff even got me to align a couple of mirrors and a beam splitter to make an interferometers. I had to take apart an LSD screen we had laying around in order to obtain its diffuser layer for my holoscreen's development.

Making the Holoscreen

- The setup includes a laser divided by a beam splitter.
- The first beam is reflected by a mirror at 90° to the spatial filter where it diverges onto the holographic film's target area.
- The beam splitter's reflected beam is at an angle of 22.5°. Reflected at 90° on a mirror into a cylindrical lens, causing a diverging line on the diffuser.
- The two beams have to intersect on the holographic film at a 45° angle.



This was when we tested projecting without the diffraction grating. The result was a much clearer image.
 ~Relentless.



Projecting video

A computer is connected to a projector that projects video through a diffraction grating. We magnified the colours by two 6" lenses onto the Holoscreen. Looking from just the right angle, we observed the video in different colour schemes.



Top left is viewed from the left, bottom left is viewed near the centre, and the other two were viewed from the right. The bottom two are the same scene paused to show the difference from angle change.



A look at the projection set-up. Projecting video feed from the computer onto the Holoscreen.



UFC video projection looks better, and isn't as blinding from certain uncomfortable angles.

The larger screen &

We began this project with 6 plates. The first holoscreen was a success. The second HS had some sort of development defect. I had the idea of making a large screen combining four of the holoscreens in a 2x2 pattern, making the screen size 8"x10" instead of 4"x5".

We wanted the last four plates to be identical and also tried to save time by developing them all at once. A bad idea, for the first plate contaminated the bleach and decreased its ability to clean the other plates. In fact the plates got invisibly worse as the development proceeded. The effects were only visible once they had completely dried. The development should not have been rushed...

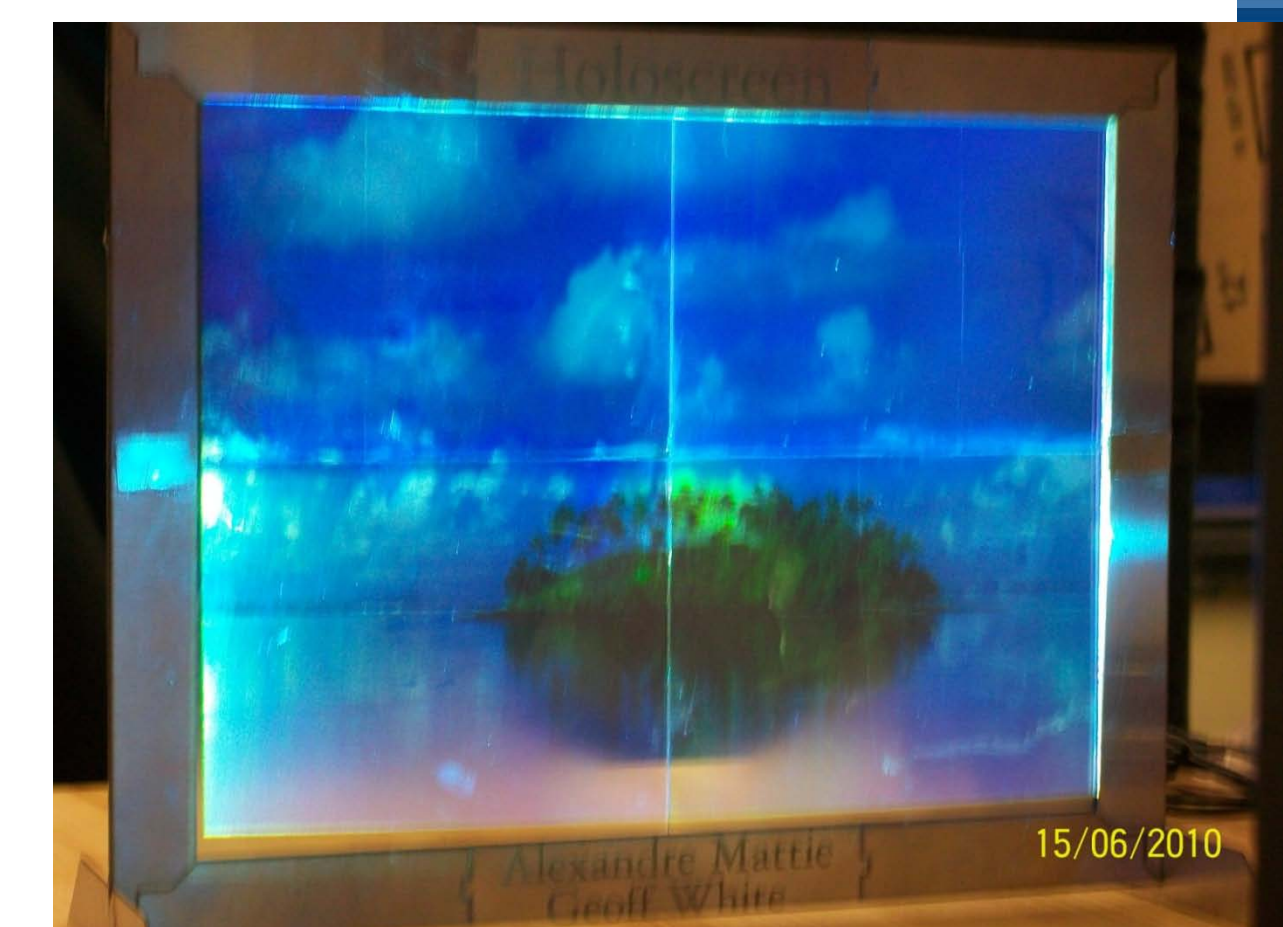


Conclusion

I, a french highschool co-op student, have learned about various optical components and how to make holograms. I did my research, went through the development process and created my very own Holoscreen. Like true scientists, after obtaining results, we modified the projection setup to acquire different results. Then we wanted bigger and better, so we made a 2x2 screen, and stuck our names on its frame, I had the idea for frame design.

Acknowledgements

The whole project has been a great and memorable learning experience for Geoff and I, especially because we were the first to do this here at Niagara College Research.



Our Holoscreen, with our names etched in the bottom. I chose a nice island scene to be display, from this angle the blue really stand out.