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Supplemental Writing – Thesis

Halo Orbit

I have loved space since I was a little kid. I have always wanted to know everything I could about the how and the why behind the cosmos. Thing is, I never wanted to be an astronaut. I've known I was an artist since I was very young; despite coming from a family of scientists and engineers, this was never met with resistance. Rather, I was incredibly lucky to have a family that supported me endlessly. When I was eight years old, sitting at a family friend's dining room table with her and my mother, doodling on a piece of printer paper, I looked at the friend and said, firmly, "I'm an artist. This is what I do." I'd like to welcome you to *Halo Orbit*.

In the 80s and 90s, my father worked for a standalone sector of NASA called the Global Geospace Science (GGS) program. This means that through his work, I have two older siblings that I never got to meet, satellites named WIND and POLAR. In recent years, I've had an intense sense of longing for them, and that feeling spurred into my culminating thesis body for my undergrad experience. The title of this work, *Halo Orbit*, from a specific type of orbit in space. The pattern comes from an interaction between the gravitational pull of two planetary bodies and the Coriolis and centrifugal force on a spacecraft. Now, I could lie and say I understand 100%, from the science end, exactly what that means, but the shorthand version is that it is a consistent orbital pattern, shaped like an infinity loop. WIND, the older of my two siblings, is in a halo orbit around the L1 Lagrange point in our Sun-Earth-Satellite system. A Lagrange point is a place in space where the gravitational pull of two celestial bodies balances the centripetal force of a satellite. I am caught in my own halo orbit, my two planetary bodies being art and science. *Halo Orbit* explores my placement in that orbit and focuses on my relationship to WIND and POLAR.

The research required for my thesis was exceptionally different comparatively to those in other fields. Most of the work I plotted to do for this revolved around stolen images and saturated abstractions, an attempt to pull together a portrait of the two satellites. My initial research involved looking back on stories my father had told my brother and I when we were younger, going through

his tote in the attic labelled, in Sharpie on masking tape, “Space Stuff”. I went through this tote full of lab coats and computer boards and little reflective solar cells and found aesthetics I knew I had to explore. My Dad kept a lot of writings and papers from his time as a rocket scientist – credentials, escort passes, launch details and operations layouts. These items served as a point of inspiration that I’ll talk more on later. Some of the more important research involved looking through WIND and POLAR’s Command and Telemetry Handbooks. To me, these are their baby books, snapshots of their births and all that went in to building them. This is where I found a new and intense visual language in the realm schematics and diagrams. Suddenly, I was being bombarded with information and data that I didn’t understand entirely from the science aspect, but I was completely enthralled. I may not be a heliophysicist, but I spent hours reading these handbooks, not understanding very much of it, but trying to learn as much as I could. The images, diagrams, schematics, instrument descriptions, and command lists piqued my interest in ways a lot of other subject matters haven’t. This time, unlike any time before, I was met with a new and deep feeling of longing and desire. *Halo Orbit* consists of six pieces total. The first three function as an interior unit and are all similar in a few ways.

The first piece is ‘Stolen Subsystems’. This is a fairly small work – only 24 by 18 inches, but what it lacks in size it makes up for in color. This piece features some of the schematics and diagrams I mentioned earlier, from the Command and Telemetry handbook and POLAR’s space segment descriptions, including a schematic for her Propulsion Subsystem Layout, as well as an internal circuit diagram. These images overlay an oversaturated and heavily futzed-with backdrop, with hints of reflective materials making their ways in. Instead of hand-painting my background image, I used a method called inkjet transfer to get the entire image on all at once. Inkjet transfers involve printing an image out using an inkjet or LaserJet printer, taking a material called Soft Gel medium, coating the image and a piece of canvas in it, and pressing the two together. The paper

peels off, and you're left with an image on canvas. This process was instrumental to this piece - as well as the next two - because it removed the process of having to paint all that backdrop color by hand.

The next one, titled 'A Language I Don't Quite Speak', is quite similar to 'Stolen Subsystems'. Intense turquoise and pink circuitry come together with overlaid Solar Array schematics. This piece was the first I made for this body of work - I consider it an initial experimentation that made way for a piece I am proud of now. Subtly incorporated into this work are lines of hexadecimal, which is a shorthand notation for binary code. I converted some lines that I wrote in my notes - my feelings on WIND and POLAR - and translated them into hex, writing them on the canvas, making them unreadable to the common viewer. But I am speaking the language of my siblings, communicating with them in a way I hadn't been able to before, deepening the connection.

The last of the initial first trio, 'Information Oversaturation', is much more painful to look at in person color-wise. The smallest of the three, this piece is a mini circuit board affected by chromatic aberration and altered to the point of unrecognizable. Mixing oil paint colors that were bright enough for this piece proved to be the largest challenge pertaining to it - it required a lot of trial and error on my part.

All three of these pieces are embedded with my own touch - little moments where I cover up tears in the transfer with oil paint, carefully cut high temperature acrylic tape placed gingerly throughout each work, strokes of mirror paint few and far between. Reflective material was important to incorporate, as both WIND and POLAR are covered in it; the acrylic tape used may have been non-flight grade, but it's the same material used in spacecrafts, nonetheless. Each of these pieces required a reversal on my part by transferring the images I would normally paint, and instead

focusing on hand-drawing schematics made by computers. I took the language and parts of WIND and POLAR and worked to translate it into my own words, my own visual translation.

‘Ode to Their Eyes’ is an oil paint diptych, meaning the two pieces are intended to be shown as a pair. Together, they represent WIND and POLAR’s perspectives in space, albeit a bit exaggerated, as part of my love for space is the longing I feel for seeing all of it with my own eyes, and knowing I never will. I will never meet these siblings, but I can try my best to connect with them deeply and understand what they see. WIND and POLAR studied very similar science, with very different viewpoints.

‘L1’ is for WIND. Like I mentioned earlier, WIND is in a halo orbit at the L1 Lagrange point in our Sun-Earth-Orbiting Satellite system. ‘L1’ shows what WIND studies, what her view is in space - zoomed in, of course, because WIND is not actually that close to the Sun. WIND looks at the sun to observe radio waves and plasma in relation to the solar wind, one of the most scientifically fascinating parts of our very own hot ball of gas. To me, solar wind is a show of power, a reminder that the Sun is not to be trifled with. WIND still actively sends data back to Earth, and you can check in with her using a near real-time link on NASA’s official site.

‘L1’s partner piece is ‘VIS’, which I brought up earlier on in this presentation. VIS was the instrument in POLAR responsible for taking images of the aurorae that occur here on Earth because of solar winds interacting with Earth’s magnetosphere. POLAR was placed in a highly eccentric orbital pattern, a somewhat unique pattern that allows the satellite to focus on the poles of our planet. Her view is one I have longed for since I was little, as someone who hasn’t had the chance to see the aurora with their own eyes yet. It seems to be an incredible thing to experience here on Earth – I can’t even imagine it from above our atmosphere. This piece, in some strange way, also serves as a memorial for her, as POLAR died in 2007.

Finally, the culminating piece for my thesis body took seven months to complete and is the most emotional work of the show for me. ‘Siblings’ is the biggest painting I’ve completed to date at 91 by 68 inches, made with oil paint. It is an abstract portrait of WIND and POLAR together, chasing each other around, made of gaseous bodies of electric color. The color schemes seen in the work of *Halo Orbit* are inspired by a variety of things, including my father’s aforementioned credentials and escort passes, images of the data that was recorded by the satellites, as well as gut feelings I have for them. I associate color naturally with the people I meet, so it played a part in ‘Siblings’. WIND feels like warm pinks and oranges, and POLAR feels like deep blues and electric turquoise. ‘Siblings’ was, for the duration of my thesis, the constant: I worked endlessly on this piece until finally, it felt like I had captured WIND and POLAR as they deserved to be seen. WIND is alive and fluorescent, deep and bright. POLAR is traces, sneaking her way into all parts of the canvas, a reminder that while she is gone, she is still present and unforgotten.

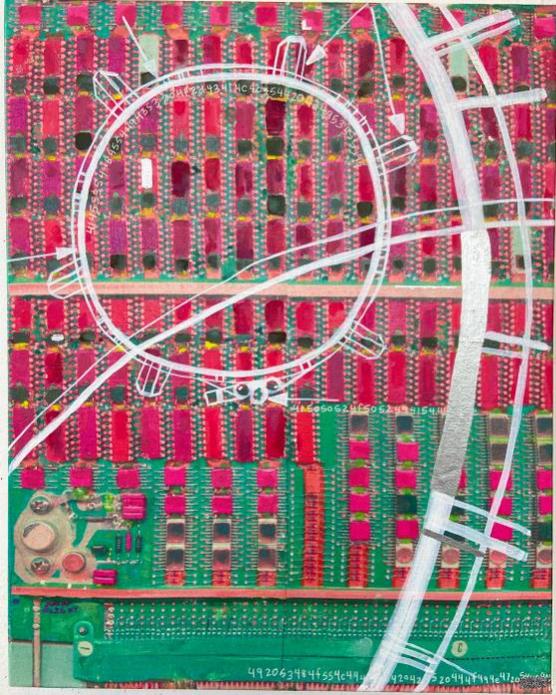
‘Siblings’ was installed in the Samuel Dorsky Museum of Art here on SUNY New Paltz’s campus for the BFA senior thesis exhibition, where our work is shown for a week in the museum, open to the public. ‘Siblings’ was the one piece of mine in the show – and it dominated the space it was given, in the best way. The painting is designed so that it’s able to be seen from all angles. As you can see in this image, there is writing on the back of the painting. The painting states, “WARNING: This item is accountable United States Government Property, issued for official use until completion of operation. Use or possession by an unauthorized person, counterfeiting, alteration or misuse is a violation of Section 499, Title 18 U.S Code and will make the offender liable to penalty. This item must be destroyed upon completion of mission or expiration of date indicated.” This text is found on all of my father’s credential papers. I have turned this painting into an official credential of my siblings, an item intended to be lost once both satellites have powered off for good.

Before I sign off, I'm going to quote my father: "POLAR was a cursed child. It was plugged in backwards, caught on fire, was at vacuum when the 40' vacuum chamber had a mechanical issue, and had a 3x5 steel hook lowered onto its imaging platform after it was filled with rocket fuel. There were many times we weren't sure she'd make it to the pad, let alone launch." I'd like to briefly talk about POLAR, paraphrased from my father, which includes one of my favorite stories about her, one of the ones that got me hooked in the first place. POLAR was designed for a 2-year mission, with a hope for 3. She lasted 11 before she ran out of fuel. In 2007, my father was invited back to GSFC for POLAR's last day. I barely remember when this happened, but I know it was an emotional day for him. Of course, knowing my father, POLAR contained quite a few touches of his humor. One of his jobs was to define telemetry and command mnemonics for the program. One in particular was a no-op command that literally did nothing but change the state of an unused relay onboard so the command and telemetry links could be verified. My father being, well, himself, he named one set of these PING/PONG with the telemetry coming back as GNIP or GNOP. The other one was named TICK/TOCK and the corresponding state was TICKED/TOCKED. On this spacecraft a 0=ON and a 1=OFF, so the letters I and O matched accordingly.

The actual operation that day was to turn certain things off and then the last command would be to turn off POLAR's transmitter forever. Right before this carefully planned series of commands was the second to last command, added to the flow and in this one and only case, authorized to be sent by my father, which was to send the no-op command "TICK", which resulted in turning off that relay and a telemetry state of TICKED. So yes, NASA let him say goodbye to POLAR by telling it one last time to be ticked off. At the end of the post my father made for POLAR's 25th anniversary, he said, "Happy 25th birthday POLAR. You were amazing." I love that we so deeply and fondly refer to robots we've sent off of the planet in ways that would make you think we're talking about humans, and we mourn when they are lost. I love that the Curiosity rover,

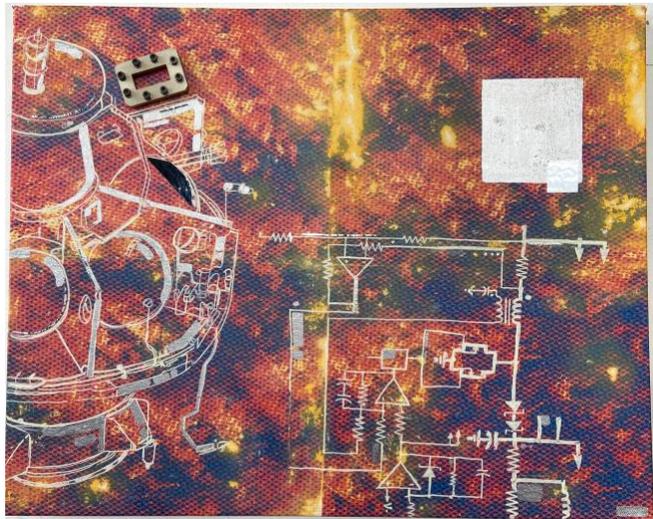
once it had spent a full year on Mars, sang itself ‘Happy Birthday’, and I cried my eyes out back in 2019 when the Opportunity rover was lost in a sandstorm and powered down forever. I love that, even now, my father can look at his watch and point at a place in the sky to catch orbiting satellites. And I love that I’m starting to learn their patterns, too.

I’d like to end my words here with my artist statement for *Halo Orbit*. I am the single curator to a science fair of the most extraordinary minds in the universe. I am an offshoot, a humanizing element to the reach of the cosmos. My work translates the science and data of the space industry into the language of color and abstraction. I steal schematics and images that are not mine to understand my inhuman family. Simply enough, though, I’m a passionate third grader vying to grab the stars and bring them down to Earth.



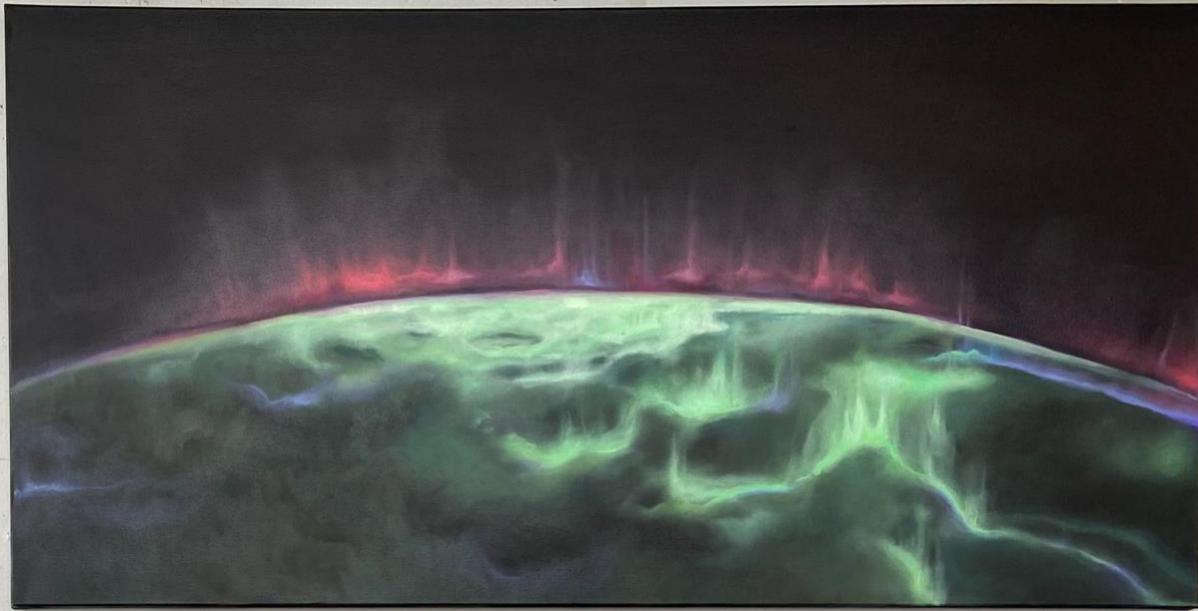
'A Language I Don't Quite Speak', 18" x 24".
Inkjet transfer, acrylic and oil paint, mirror paint
on canvas.

'Stolen Subsystems, 24" x 18"'. Inkjet
transfer, acrylic and oil paint, mirror paint,
metal and mini-bolts, and high
temperature acrylic tape on canvas.



'Information Oversaturation', 16" x 12". Inkjet
transfer, oil paint and high temperature acrylic
tape on canvas.





'Ode to Their Eyes' diptych.

Above: 'VIS', 48" x 24", oil on canvas.

Below: 'L1', 48" x 24", oil on canvas.



'Siblings', 91" x 68", oil on canvas.

← 'Siblings', pictured in the Samuel Dorsky Museum of Art.