

Everyday growing up, my Nana would come get me ready for school. She'd always drive me in her grey Toyota Camry, a car she got the day I was born. We would often listen to "*Under the Boardwalk*," by The Drifters, singing along together at obnoxious tones. As I got older, I got busier. I never had time for "sick days" and I didn't get to see Nana as often. In middle school, I remember thinking that I was too cool for Nana's radio and always changed the station to trashy pop music. Despite my rude adolescent behaviors, Nana was always there for me, reminding me that I was worthy of love.

When I got my license, the first place I drove was Nana's house. I ran up the steps, Nana beamed as she noticed that I was alone. Driving with Nana consumed 50% of my childhood, and now, I could drive her. Nana is my home, she is always there with her Camry and always elated to see me grow.

This story exhibits my relationship with my Nana who had a large role in my growth and development. The letter represents the theme of comfort and that no matter where I am, she is my home. I wanted to create a piece that encouraged gratitude; one that pays homage to the relationships that shape us.

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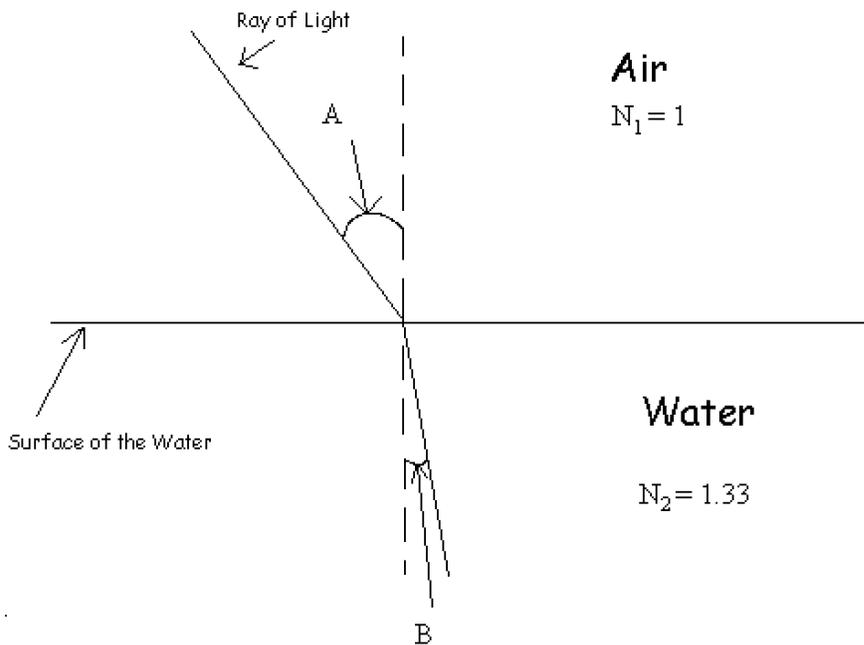
# A Look Into Light In Animation

Julia M.



Light waves impact everything we see on a day to day basis; if one can understand how light responds to different mediums, this understanding can then be used to enhance art in all facets. I wanted to discern how light patterns explain something without the use of words, as art often does. How many times a ray of light bends or refracts must be considered by all who partake in the animation process. This pushed me to ask my essential question: in what way can light refraction/ reflection inform my artistic perspective? The focus of this paper is to educate readers, showing how light's properties advance a visual story.

Light is everything and nothing all at once. It is an energy that can only be seen; not tasted, nor heard. Light can be defined as a form of electromagnetic radiation of a wavelength which is one of few that can be detected by the human eye. It has properties of waves and particles which exist in small energy packets called photons (Khan). These photons interact with many different mediums, depending on the medium's refractive index, changing how fast the light propagates (Khan). When light itself is moving through any one medium, it must respond in at least one of these three ways: reflected, absorbed, or transmitted (Bozeman). Refraction occurs when there is light hitting a new medium at an angle. When this occurs, if the new medium is slowing the light waves, the light bends its movement towards the normal (Bozeman). Through studying light, Willebrord Snellius, a Dutch astronomer, composed an equation serving a *refractive index*. Through the use of Snell's law, both the speed and angle of the light can be calculated. The equation is  $n_1 \sin \theta_1 = n_2 \sin \theta_2$  where  $n$  represents the index of refraction for each medium ("Refractive...").  $\sin \theta_1$  is the angle of incidence and  $\sin \theta_2$  is the angle of refraction; as displayed in the visual below:



This "n" variable can be calculated through the equation  $n = c/v$  where  $c$  = speed of light and  $v$  = velocity ("Refractive..."). If  $\sin \theta_1$  reaches a degree referred to as the critical angle,  $\sin \theta_2$  becomes  $0^\circ$  or, if  $\sin \theta_1$  is above the critical angle, reflected back into the first medium ("Refractive..."). Reflection is another behavior of light energy that, rather than focusing on how light moves through

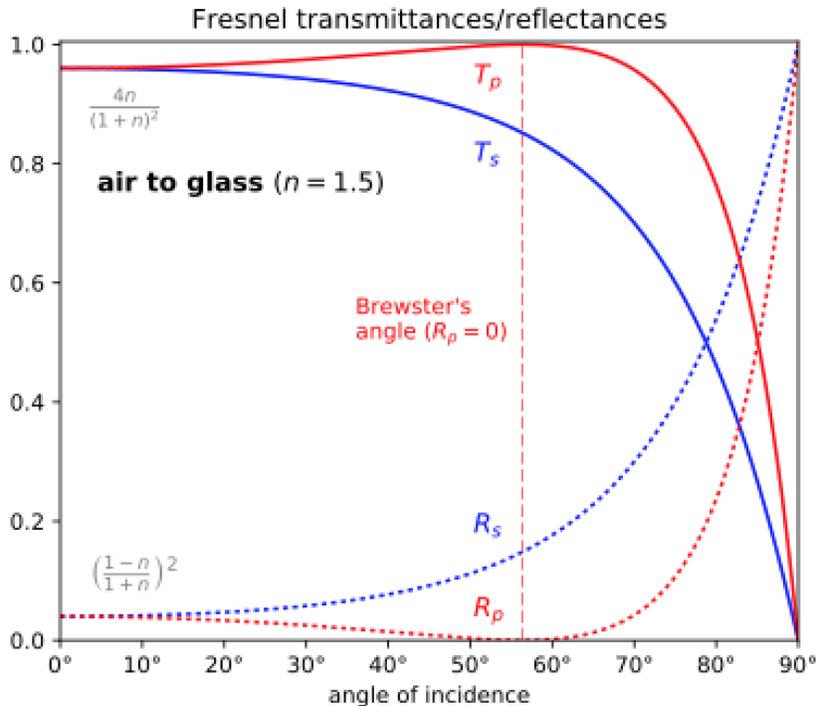
something, focuses on how light changes direction. Augustine-Jean Fresnel explored concepts in the early 1800s discovering *The Fresnel Equations* which are used to quantify polarization. The two basic Fresnel coefficients are  $s$  and  $p$  which are used to distinguish between an incident waves direction. The  $s$  coefficient refers to polarization of a wave's electric field *normal* to the plane of

incidence whereas the  $p$  coefficient refers to polarization of the electric field *in* the plane of incidence (“Fresnel...”). The graph for these equations is as shown below for air to glass:

There are two main kinds of reflections when speaking in terms of light: specular reflections and diffuse reflections (Abramowitz). The difference between the two lies in the texture of the surface. If the surface is uneven the light will reflect in many different directions in a less concentrated way; this pattern is called a *diffuse reflection*. If the surface is smooth, the reflected light will be specular because it reflects all components of light equally (Abramowitz). The most commonly known light patterns are shadows and highlights.

Shadows are created when a surface blocks light from its reach creating a dimmed outline of the surface blocking the light. Conversely, highlights are areas on an uneven surface that are closest to the light making them more illuminated than the surrounding areas.

Light and visual arts are constantly interwoven to educate and inspire both as subject and a material. Strong contrasts between light and dark are used to emphasize both mood and depth within a piece. *Chiaroscuro* is one of many examples of technical terms for shading in art and art history, it is often used as a way to show solidity, originating in Renaissance art (Britannica). More literally, light is used in art through *luminism*, this is when a sculpture gives off light or when light is manipulated in order to create a sculpture. Light has been used symbolically as well, one shadow or reflection can hold meaning. Particularly in paintings relating to religion because many religious texts are closely associated with light. Light was used to characterize a figure as divine in religious paintings; similarly, impressionist painters used the way light refracted as the subject itself (“Symbolism...”). In terms of creativity, if we look to the Impressionists and their process of painting, we too could relate the central force of their paintings to the sources of light they experienced. For Example, Monet’s “Autumn Effect at Argenteuil” shows the significance of light, and furthermore its prominent force over the whole work (Gibson). Photographers and animators have been able to relight virtual objects accurately with the captured lighting so that scenes can be rendered using real light. Animators must consider highlights, shadows, reflections, and refractions when creating each frame. They must understand the surface appearance, or how every material interacts with the light (Setalvad). Advances in technology have made this process easier allowing a computer to virtually light objects with the captured lighting.



The complexity of doing a drawing of realistic depth and reaction to light in and of itself is an arduous task. Animators do this, but thousands of times, constantly reacting to light and how it impacts a scene (Setalvad). This pressed me towards how this process was executed given that light impacts an entire image completely. Artists will struggle to create an image of cloth, hair, or detailed appendages because of the varying textures, shapes, and movements.

Keeping in mind all of the variables that have a large impact on the behaviors of light, I became interested in how animators were able to create thousands of drawings. The steps of animation, even with the help of technology, are very tedious. First, the story and storyboards are made, and if accepted, dialogue is recorded. This helps the animators when considering the lips and facial expressions of the characters. Next, in a colorless process, rough sketches of the characters are made (Little). The most experienced animators will only sketch a few frames, creating the outline or main positions within a frame. A large group of artists will then fill in these gaps, creating a fluid image of the character (Little). Then cells are created by putting acetate over each drawing and outlines with ink are made. Painters then color in the images on the other side of the acetate leaving crisp, completed characters to be placed on the backgrounds of the image. Everything is then photographed and meshed together with dialogue (Little). Finally, the tedious process of creating an animation is finished and put into the world for viewing.

Now that I have a stronger understanding of what goes into the animating process, I wanted to explore the creation of a story that piques the interest of both artists. I quickly found the concept of “The Hero’s Journey” when searching for what components create a good story (“Joseph...”). Joseph Campbell is the “father of folklore” who focused on telling stories relating to human experience. His theory was that all stories have the common structural elements that follow:

1. Ordinary world- This is the protagonist’s life before the story begins. By anchoring the character’s life, the reader can then feel more connected to the story.
2. Call to adventure- This is when the issue is first presented to the reader, manifesting in a goal or quest.
3. Refusal to the call- This is when the character’s inner doubts or fears are considered, thus causing hesitation.
4. Meeting the mentor- This takes place during a time of internal struggle for the protagonist. Typically some act of faith provides the confidence needed to dispel the hesitations.
5. Crossing the threshold- The journey of the character begins here, they take a step away from previous realities and commit to what’s ahead.
6. Tests, allies, enemies- This is when the series of smaller obstacles meet the main character.
7. Approach to the climax- This is the point in the story when the protagonist must confront himself and grow before confronting his quest.
8. Climax - This is when the protagonist faces the source of the journey. It either leaves them with success or failure.
9. Reward- This is the recognition, growth, compensation, etc. that comes from the journey fought for.
10. Aftermath - This concludes the story as well as the journey for the character (Bronzite).

These ideas were interesting to me because many books, movies, shows, etc. follow these patterns in unique ways. It is how these steps are interpreted and executed that makes storytelling both a unique and intriguing experience. I wanted to use this as guidance rather than a parameter in order to push myself creatively. Storytelling is a huge part of what makes animations exciting and I think it is another strong source of foundational knowledge like light patterns. Using Joseph Campbell’s

10 steps as my foundation, I combined my own personal storytelling with an animation process to create a visual narrative that is at once singularly and universally resonating, much like the nature of light.

## You are my Home

*My Nana has always been there for me. From the day that I was born to the moment I flew to California, she was there.*

*Both of my parents are doctors, so growing up, they weren't home often. In the summer, when I didn't have camp, I would be taken to my Nana's house for the day. Nana's house was always better than camp anyway. I was over the moon with excitement every car ride we took. When anyone ever left Nana's, we would wave out the window goodbye as they drove away. I don't know why we did that... but Nana always did it, so I did it too.*

*Nana always had the best snacks: Cocoa Puffs, Muffins, Doritos, Strawberries, Cranberry Juice, and, my favorite, Scooby Doo Fruit-Snacks. I was always brought to her house when I got "sick" too. She would have the really fuzzy blanket all ready to wrap me up in as soon as I arrived. On days like those, Nana would offer to go drive and get me something so, naturally, I asked for the high quality cuisine that my parents deprived me of: Dunkin Donuts and McDonalds.*

*Grey Toyota Camry. That was Nana's car. She got it the same day I was born and we went everywhere in it. She'd take me to school in it and we would listen to the radio. "Under the Boardwalk," by The Drifters, was always on and she would always sing a harmony that was many octaves away from being on pitch. I would scream, "NO SINGING!" and she would put her hands over her mouth laughing.*

*As I got older, I got busier. I never had time for "sick days" and I didn't get to see Nana as often. Donuts and muffins became coffee and oatmeal; school consumed me so much that my grades were my worth. In middle school, I remember thinking that I was too cool for Nana's radio and always changed the station to trashy pop music. Despite my rude adolescent behaviors, Nana was always there for me, reminding me that I was worthy of love.*

*When I got my license, the first place I drove was Nana's house. I pulled into her driveway, flashing my keys and waving my slip of success. I ran up the steps and swung the door open, Nana beamed as she noticed that I was alone. Driving with Nana consumed 50% of my childhood, and now, I could drive her! As I pulled out of her driveway she watched me go and she waved out the window.*

*Nana is my home, she is always there with her Camry but always elated to see me grow.*

Storyboard for animation:

The scene begins with the young girl and her parents driving and the young girl is bouncing up and down with excitement. The car stops and the girl struggles to untangle herself from her seatbelt and leaps out of the car running to the door. Banging on the doorbell, the door swings open and Nana is waving her arms dancing. The little girl jumps into the Nana's arms and then waves goodbye to her parents through the window. They watch the parents drive away.

The scene begins with, "Under the Boardwalk," by The Drifters, playing while the little girl, this time a little older, in a car seat with her hair braided and her backpack on her lap. Nana starts singing and Little girl shakes her head and whines, "NO SINGING!!" And the two laugh. Nana and Little Girl arrive at school and walk in. The girl quickly gets overwhelmed by all of the other kids. She huddles, crying, behind her Nana's leg from the approaching teacher. Nana hugs her goodbye and shakes little girl off of her leg. Little girl watches Nana drive away.

The scene begins with snow outside and the young girl is wrapped up in a blanket on the couch of her Nana's house. The little girl is home sick from school, Nana brings her some Cocoa Puffs and watches "Let's make a deal" with her. The day goes by and the two fade into different

positions on the couch as Fruit Snacks, McDonalds, and Dunkin' Donuts accumulate on the table and the light darkens as the sun sets. The parents come to pick up the girl and Nana waves goodbye to the three as they drive away.

The girl is in middle school now. She runs out of school and hops into her Nana's car. She is crying because of a test grade. Nana tries to comfort the girl but she turns away. "Under the Boardwalk" by The Drifters comes on and the girl slams the radio to "In My Feelings," By Drake. Nana starts dancing to it and as the girl looks over, she can't help but laugh. Nana drops the girl off at her house and she waves goodbye as the car drives away.

The scene begins with the girl, now a teen, getting her license photo taken. She is handed the slip of paper and hops into the driver's seat all by herself. She drives to her Nana's house with motivation and hops out of the car. Skipping up the steps, she swings open the door and flashes the license to her Nana. The two hug and the Nana waves goodbye as the girl drives away.

The final scene is the girl on her dorm bed writing, "You are my home," and it ends.