ALTERNATIVE RESOURCES FOR THEATRE: 3D PRINTING, WOOLEN FELT AND GELATIN ADAPTED TO PRODUCE THE KISS OF BLOOD: DEVELOPING ALTERNATE TECHNIQUES TO IMPLEMENT RENEWABLE, BIODEGRADABLE, AND LOCAL RESOURCES TO DECREASE THE CARBON FOOTPRINT

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DEDICATION

Sherlene Harper and Elsie Lipscomb

A California girl began tailoring garments for clients and reached near-couture level expertise. Sewing from *Vogue* patterns and making mock-ups, aided by tips learned from New York City designers taught to her by her wealthy client, she produced high-quality, high-fashion garments. At seventeen, she relocated to Missouri with her family, with one year of high school remaining. She was, sadly, forced to enroll in a freshman-level Home Ec. Course, one she could have taught. She had to submit to the teacher's credentialed superiority. Her dishcloth stitched to a gross grain ribbon received poor grades citing improper handling of a needle. Humiliation ensued throughout the semester though her skill was superior to her teacher. This is the story of my nightmares, to work so hard and not be appreciated. Survive and become stronger, never give up and never surrender.

A busy Mother trying to teach a stubborn young girl how to sew, seeing the potential but frustrated with the girl's impatience. The mother silently remembered a time when the girl was five. In desperation for her own Barbie doll, the child cut images from a colouring book, added dimension with fabric and stuffing, and then pieced together clothing for her dolls from bits of cloth. Having faith that her daughter would find her own path when the time was right, the Mother lovingly encouraged her child. Letting her daughter experiment on her own prized Bernina sewing machine, through many broken needles, lost and unhappily found pins, even sewing through plastic and cutting paper with fabric scissors. Support, guidance, encouragement, a listening ear and a shoulder to cry on. This Mother knew that success is gained through sacrifice.

ABSTRACT

An Evening at the Grand Guignol 2022 was presented at the University of Lethbridge in the spring of 2022. Three short plays were presented to fulfill the vision of Mia Van Leeuwen. Van Leeuwen directed the production as a whole and the final play, *The Masque of the Red Death*. Jay Whitehead directed the opening show, *The Lighthouse Keepers.* The second show, *The Kiss of Blood,* was directed initially by van Leeuwen and subsequently completed under the direction of Justin A. Blum. Blum was familiar with the work. The costumes and special effects for *The Kiss of Blood* were my assignments. Designs for *The Kiss of Blood* were facilitated by my research which focused on manufacturing procedures, including digital manufacturing, gelatin moulds, and woollen felt. A priority for this research was the utilization of local and sustainable resources to minimize our carbon footprint.

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Above all, I thank my Maker, who led me on this path and was my most considerable support through the challenges of the past few years. This road has led me to knowledge and creation, a joy for my heart and mind. I hope that my Father in Heaven will be proud.

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one another. My wonderful kids, Harper, Ethan, Adelle and Emery, for picking up the slack between dishes and laundry piles.

This project would have been impossible without you.

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DEFINITIONS AND ABBREVIATIONS

3D	Three Dimensional
CAD	Computer-Aided Design: A computer program for dimensional work.
Creality support.	Popular Chinese 3D printer company with successful printers and crowd.
Creality CR-30	3DPrintMill- Infinite-Z - Belt 3DPrinter. A modified FDM printer, a belt replaced the stationary platform, and a printing head is mounted at 45°. The belt moves the Z axis; the printer can print unlimited lengths. This printer was used for prints in this research.
DLP	Type of 3D Printing. Digital Light Process: Layers are formed by projecting images into a pool of photosensitive material. One layer is formed simultaneously.
DMLS	Type of 3D Printing. Direct Metal Laser Sintering: Laser fuses layers of powdered metal to form model.
DPI	Dents per inch. Weaving measurement equal to threads per inch.
FDM	Type of 3D Printing. Fused Deposition Modeling: Melted plastic deposited in layers forming a model.
Felt	A non-woven wool fabric produced with wool, fibre is wetted, heated, and agitated into a matted form.
Fibre	Wool from sheep and other animals.
Filament	Plastic material fed into the hot end of an FDM printer, deposited in layers to create a model
G-code	Cartesian directions coded for a 3D printer.
Infill	Filament material printed inside a 3D model for support and durability.
Navajo Plying	Method of plying with one strand, the strand is pulled into a long chain stitch and spun into a three-ply yarn.
MJF	Type of 3D Printing. Multi Jet Fusion: A fast commercial process like an ink jet printer creates a robust Nylon prototype.
MSDS	Material Safety Data Sheet
PETG	Polyester-based thermoplastic commonly used for pop-bottles.
PLA	PolyLactic Acid: Bioplastic and most common filament for FDM 3D printers.
Print Mill	A small business that manufactures 3D models, 3-20 printers being used non-stop, often home-based.

Prusa	A trusted brand of a 3D printer designed and manufactured by Josef Prusa in Prague, Czech.
Prusa MK3S+	Standard FDM filament printer used for prints in this research.
Resist	A prepared form that repels fibres felting together.
SLA	Type of 3D Printing. Stereolithography: A laser traces layers into a pool of photosensitive material.
Slicer	A program that slices an STL in layers and creates a map code for a 3D printer to follow.
SLS:	Type of 3D Printing. Selective Laser Sintering: Laser fuses layers of powdered plastic to form a model (Hoskins).
STL:	Standard Triangle or Tessellation Language: The file type used for 3D printing must be imported into a slicer.
Support Material:	Filament material printed outside a model for support is removed as waste.
RHINO:	CAD program used to build a digital 3D object.
ULFA:	University of Lethbridge Faculty Association: Voted for a job action suspending the University of Lethbridge education for 50 days, winter semester 2022.
VM:	Vegetable Matter. Organic pieces found in wool, grass, bugs, and dung.

CHAPTER 1: INTRODUCTION

> [Design is] not just what it looks like and feels like. Design is how it works.
> -Steve Jobs, The NY Times Magazine (Rob Walker)

As artists, we can only improve as we practice and expand our knowledge. We continually add colours to our palette. The work is most productive when we know how to use each colour and continue to paint and blend combinations. Effective design is knowing the possibilities. As collaborating artists, we can borrow and learn from each other's palettes.

Our head director Mia van Leeuwen thrived on the macabre. Her work paired the dark and the beautiful, juxtaposing joy with terror or delicate with gore. The mysteriously dark style developed in Le Théâtre du Grand-Guignol was fit for her study. During the turn of the 20th century, the Parisian Theatre, which hereafter I will refer to as The Theatre of the Grand Guignol or Grand Guignol, titillated audiences drawn to the morbid, a precursor to the modern horror film. Van Leeuwen spearheaded this production and brought a bit of old Paris to Lethbridge.

The University of Lethbridge presented *An Evening at the Grand Guignol* as a live theatrical performance in the Spring of 2022. Van Leeuwen directed the production as a whole and the final play, *The Masque of the Red Death*. Jay Whitehead directed the opening show, *The Lighthouse Keepers.* Van Leeuwen initially directed the second show, *The Kiss of Blood,* but it was subsequently completed under the direction of Justin A. Blum. Blum was familiar with the work because he had translated *The Kiss of Blood* from French. The audience was a combination of students and members of the general public. It was scheduled to run for one week in March 2022. Due to the UFLA strike, the production was delayed and ran on the 22nd and 23rd of April 2022. It was deemed a work-in-progress performance.

My assignments included designing the costumes and special effects for *The Kiss of Blood.* My objective was to creatively explore options to achieve the desired effects; for both the costumes and effects. I also endeavoured to become consciously creative. I looked for mediums better for the environment than conventional norms. Specifically, I wanted to avoid importing goods from overseas and using more degradable materials.

As carbon pollution rises, we become increasingly aware of our eco-footprint. To address personal impact, I aimed to become more carbon conscious. Throughout my research, I looked for positive solutions that helped balance the need to create a theatrical atmosphere without harming our own. Locally sourced materials help local economies and cut shipping emissions and costs. I focused on two specific products: wool and renewable bioplastics. Wool sourced from local sheep helps sustain farmers. Also, renewable bioplastics made from corn and gelatin are preferable to petroleum-based plastics.

3D (three-dimensional) printing, gelatin prosthetics and felt as research topics may seem incongruous. However, they fulfilled my desire to explore alternative materials for theatre production, and they aligned with my goals to utilize local and sustainable resources in hopes of softening our theatre's carbon footprint. Research of the topics individually was beneficial. However, combining my chosen production materials and methods expanded the possibilities and facilitated creation.

CHAPTER 2: THE THEATRE OF THE GRAND GUIGNOL

> I think most of us are fascinated by the macabre and by the weird and even the nastiness that comes along- Stephen King (King)

The Grand Guignol was a French Theatre popular at the end of the 1800s and maintained a following into the 1960s, though its popularity began to decline around World War II (Hand and Wilson 23-24). It was the precursor to modern horror flicks. It was famed for displaying carnal, macabre, and satanic themes. A hot shower of bloody and graphic scenes were acted out; stabbings, amputations, beheadings, and dismemberments. Then a cold shower of comedy was presented to loosen up the crowd. As advertised, audiences were then splashed with pornographic scenes that sparked sexual excitement, a theme familiar in the Pigalle, the red-light district of the time and home of The Grand Guignol (Merriam-Webster "Pornography").The sudective nude posters for *Les Crucifiés*, *Le Jardin De Supplices*, *La Femme Qui Aimait Les Têtes and Les Coupers de Têtes* enticed with a taste of what they may expect from the production (Pierron). *Madomiselle Fifi* performed many times in the theatre depicted sexworkers attending an orgy, one of many plays involving sex workers (DeGiglio-Bellemare). Paula Maxa performed in explicit rape scenes over 3000 times. (Hand and Wilson 102). This "hot and cold shower" effect was repeated in different orders for different nights (M. Gordon 16).

This effect was reiterated throughout the design process and implemented to different degrees. The most prominent example comes from the difference between the three chosen plays. *The Lighthouse Keepers* was a bloodless psychological thriller that roused questions of self-preservation coupled with heartbreak. *The Kiss of Blood* was a melodramatic ghost story that mocked male superiority and delighted with over-the-top effects. *The Masque of the Red*

Death was a movement-based devised adaptation of a classic gothic tale by Edgar Allan Poe. The audience could not help feeling various emotions as they viewed the production.

Like any script, *The Kiss of Blood* was open to a director's interpretation (Aragny and Neilson). To magnify the "hot and cold shower" effect for the overall production, van Leeuwen developed the theme in a melodramatic style. As the middle production, it broke up the intellectual thriller and the severe plague deaths. It was the splash of fun tangled with horror; the fun came in the over-the-top hyper-realism. For Halloween I watched a cult classic horror B-movie, *Army of Darkness* (Rami). The main character Ash was stuck in a haunted house trying to kill him. There were chainsaws and shotguns and lots of blood. When the house started bleeding, I laughed out loud. At that moment, I realized why people love the movie and why being melodramatic in horror is funny; it is ridiculous.

Benign portrayals of over-the-top violence tend to induce laughter. Another example is Punch and Judy's English puppets, who love to beat each other for children's entertainment. Similarly, Guignol was the name of a satirical French puppet. While designing the costumes and gory special effects for *The Kiss of Blood*, I related to the creation of violent puppets. To entice a mature audience, a human actor becomes the puppet. The theatrical realism was titillating because it was a visceral visual experience. Meanwhile, the subconscious knew it was as harmless as a toy made to deliver entertainment.

The special effects created in theatre must be believable to an audience. Removing an arm would convey the visual impact of cutting the arm off. For the actor to keep his appendages, we must create a prosthetic arm. This arm is fake and controlled by the actor, essentially a puppet. We can then harm the puppets to convince the audience that gore is happening right before them. The damage is not done to a human, creating an element of humour and release.

2.1 SPECULATION

At first, I was skeptical of this horror genre. However, I was more intrigued after contextualizing the genre within its historical time frame. I speculated that the Grand Guignol was an important form of entertainment, the horrors that attracted people were not literal. This was a critical change from the past.

During design meetings, the Grand Guignol was often identified as the precursor to horror films by van Leeuwen (M. Gordon 40). I found the entertainment of The Grand Guignol was a safe fiction; with the audience protected by the stage. Blum explained, in its time, The Grand Guignol was considered low-brow entertainment, though some opening nights wealthy theatre goers would dress in style for the gathering. Nevertheless, it might be an evolutionary stepping stone toward more civilized humanity.

Horror films or violent video games might be considered the modern equivalent of the Grand Guignol. In North America, most people have only seen this kind of violence on screens. We live in a time and place hardly touched by war (Zelikow). Therefore, live-action scenes of explicit gore performed in the Grand Guignol may seem disturbing to some modern audiences, which are used to watching through a screen. The screen has become a protective veil of fiction, distancing the audience one step further from literal trauma.

A hundred years before the opening of the Grand Guignol, public execution was a frequent form of entertainment during the French Revolution. La Guillotine was a generous execution; death came relatively quick and painless. Loius XVI and Marie Antoinette's executions filled the square between Champs-Élysées and Tuileries and boasted audiences of over 100,000 (Carlin). Luckily for the French aristocracy, older forms of public executions, such

as breaking on the wheel, being drawn and quartered or boiling alive, had gone out of style. Nonetheless, these types of executions drew in crowds as well (M. Gordon 18).

Around 80AD, the Colosseum was built to house the growing popularity of live carnage; it held 80,000 spectators. Romans flocked to the Colosseum to watch gladiators and animals fight to the death. They also viewed dramatic executions staged as plays; convicts were murdered in the dramatized performance. Before Rome's apex, the Mesopotamian conquerors held live tortures and executions to strike fear into subjects as a deterrent to treason, and crowds gathered. For millennia lascivious crowds gathered to watch suffering and death (Carlin).

Some historians have drawn the conclusion that after Christ taught the importance of brotherly kindness, western culture gradually embraced what we call human rights(Holland). There is historical evidence this change slowly spread thoughought Europe after the apostles began their ministry in Roman territories. As the faith spread over the next 1500 years, methods of excruciating execution slowly began to decline and become less torturous. The Reformation began with the printing press: Martin Luther, John Calvin and others were quickly able to present information to wider audiences. The population gradually began to become more literate. Christian teachings of brotherly kindness gained momentum, and the overall cruelty of executions continued to decline. During the Enlightenment, a general tolerance of religious differences was developed. Slowly, people were no longer imprisoned or killed because of differences, and societies began to learn to co-exist. This brisk summary of European history helps visualize the Christian influence on human rights. General society's moral beliefs had evolved (Carlin) (Holland).

This evidence helps contextualize the moral shift of the 1800s. The trend of society seems to reach for a higher morality, in the relevant western world. In 1846 Charles Dickens

wrote a letter to the editor of *The Daily News* elaborating on the social question of capital punishment as commentary on United States discussions. New York state began to question the death penalty in 1841; capital punishment was a common punishment in many civilizations. Dickens objected to capital punishment as a sentence. He condemns the papers for printing every gruesome detail from an execution because the human fascination with the macabre is irresistible. He explains that even highly moral people are naturally drawn to the curiosity of a condemned person.

> [Newspapers] are published because they are read and sought for. They are read and sought for: not because society has causelessly entered into a monstrous and unnatural league on this theme (which it would be absurd to suppose), but because it is in the secret nature of those of whom society is made up, to have a dark and dreadful interest in the punishment at issue.
>
> The attraction of repulsion being as much a low of our moral nature as gravitation is in the structure of the visible world operates in no case (I believe) so powerfully as in this case of punishment of death (Dickens).

He criticized the gossip inflicted upon the accused, the commercialization and sightseeing of prisoners' homes or crime scenes and abhorred the audience's levity when attending an execution. He objected to these horrific scenes fearing that the images would reduce people's morals.

Viewing the Grand Guignol Theatre's importance within the context of recorded history, we see an evolutionary way to satiate blood lust. It seems humans are inherently attracted to visualizing traumatic death. The craving is more robust in some than others, and perhaps the desire grows as it is fed. Knowing whether this longing stems from our hunter-gatherer ancestors and their survival of the fittest may be hard to prove; however, it has been part of much-recorded history (Carlin).

In his book about the Grand Guignol, Mel Gordon compares Nazi zealots who banned the Theatre during the World War II occupation with the peaceful Parisian bohemians. He states, “The connection between what people see and what they do is not manifest (M. Gordon 49) .” I felt Gordon warned the reader of the danger of ignoring the innate desire to visualize the macabre. He was defending the Grand Guignol as a simple alternative to human slaughter.

In 2022 we are living through a transition period, from a mechanical world into a virtual one. Time will tell if this social experiment can virtually quench humanity’s thirst for blood. 2000-2020 has been one of the least violent score of years in the world's recorded history (Zelikow). Perhaps that correlates to the introduction of video games to the youth of the 1970s. In the future, perhaps the data will show that mock-fighting tempers slaughter. In that case, The Theatre of the Grand Guignol could be considered a massive turning point for humanity, from murderous foe to faux murderers.

2.2 ANTIQUATED SPECIAL EFFECTS

During the reign of the Grand Guignol, the Theatre used different special effect techniques that would not be acceptable by today’s standards. The company often used body parts from dead animals. Standard cosmetic products used in the first half of the 1900s are now known to be carcinogens or highly flammable. However, the blood recipe using Carmine, a red colouring, and glycerin resembles the blood recipe created for *The Kiss of Blood*; the two main ingredients were food colouring and glycerin (Morton 14) (M. Gordon 44).

Many of the effects used in the Grand Guignol were kept secret; the audience discovering the secret could spoil the magic. The horror of the audience’s reaction to the gory effects is well documented in books about the Theatre, but I did not find much literature describing how the

effects were achieved (Gordon) (Hand and Wilson) (DeGiglio-Bellemare). The English Bystander's article *The Joys of the Gory Grand Guignol* in 1932, explains how the titillating form of entertainment was too much for the censors in England (Bystander 1932).

One enlightening excerpt of a violent scene from *The Garden of Terror* was the best example found. It described how a plaster bandage was painted red on one side attached to the actress's skin and painted flesh tone to mask the effect. The audience would watch the villain drag a stunt knife along the actress's back; meanwhile, the actor would pull off the plaster exposing a bloody wound (M. Gordon 47). This rare description is far from comprehensive; I had to find other research methods.

By looking at this time period, we can infer some techniques and materials. The British actor Cavendish Morton published his makeup effects in *The Art of Theatrical Make-up* in 1909. His preferred medium for face altering was toupee paste and second nose paste (Morton 19). The book was relevant because actors of this time did their own makeup; Morton created a makeup design based on his interpretation of his role. He completed the look with body movement and complete characterization. We can assume that actors doing their makeup would add action to the special effects to enhance the effect. The actor developed a relationship with the character and applied special effects to advance the story. In modern times a makeup artist would apply pre-designed makeup onto the actor.

In the 1920s, American actor Lon Chaney, called the "Man of a Thousand Faces," became the master of monsters. He used nose wax and collodion to create his famous disfigured looks in *The Phantom of the Opera* and *The Hunchback of Notre Dame*. Collodion, in simple terms, is a highly flammable plastic dissolved in ether. I cannot draw any conclusions but present

two interesting facts; ether inhalation can cause lung cancer, and Chaney died of lung cancer (Registry). Essentially, we are grateful to have healthier options for special effects makeup.

Jack Pierce created Boris Karloff's legendary makeup for *Frankenstein*. He, too, used collodion and cotton balls to build up the famous square-headed monster (Debreceni 372). From these accounts, we learn the importance of building layers onto the body to create a dimension that was not there before. Grotesque forms were created as well as blood pockets hidden beneath. These non-living attachments endured slicing and torture without damaging the human beneath.

My goal was to create a Grand Guignol performance using safe techniques and materials. I also wanted to remain conscientious of where materials were coming from, what type of ecological impact might be affected and supporting local economies.

I learned that gelatin began to be used for theatrical prosthetics as early as the 1920s (Debreceni 233). My original theory was that Grand Guignol actors could have used gelatin for special effects in their productions. The possibility motivated me to explore the medium. I practiced moulding gelatin prosthetics during my research phase. I was unable to corroborate this theory with any documentation. I corresponded with Todd Debreceni about the book quote and its possible relation to the Grand Guignol. His essential response was that he did not believe the Grand Guignol would have used gelatin because of its low melting point, and the stage would be too hot under the lights (T. Debreceni).

CHAPTER 3: KISS OF BLOOD

I was assigned to design the costumes and special effects for *The Kiss of Blood* production. Collaborating with other team members allowed me to apply my investigation in practice and meld our visions into one.

The Kiss of Blood was to be a spectacular blood-spilling event, the graphic theme based on imaginary and experimental medical procedures of the 1920s. It also included haunting and madness, furthering the need for special effects and costumes that enhanced the story. This story was about blood and inspired much experimentation with stage blood.

Watching *Evil Dead* was not interesting to me in the past. As I developed *The Kiss of Blood*, I was in on the joke; Ash's impossible amount of blood and seriousness in his unbelievable situation was ridiculous. It was fun to watch and inspired me to think of special effects for *The Kiss of Blood.*

3.1 SYNOPSIS

In the early phases of my design work for *The Kiss of Blood,* I was challenged by my supervisor to sketch the scenes in comic book style. Comic sketches were an appealing way to create a storyboard, as the essential visuals were quickly defined in simplified pictures. The storyboard helped me order and visualize the play while highlighting the most critical moments that needed specific attention. Referring to this comic strip throughout the design and production process helped me stay focused on telling the story. Please see the storyboard in Appendix 2; figures 1-13.

ACT I: In a medical theatre, Professor Leduc performs an experimental brain surgery assisted by Doctor Volguine, it is unsuccessful, and the patient dies. Joubert enters and demands

to have his healthy finger amputated. The doctors attempts to trick him into a simulated surgery, hoping to ease his mental state. After Joubert wakes and realizes the surgery was ingenuine, he slices off most of his finger with a scalpel, and the Doctor completes the amputation.

ACT II: The doctors make an uninvited home check-up. The maid explains that Joubert's wife drowned and that he is going insane. Joubert stomps in and throws everyone out. His wife, Hélène, appears; we learn he killed her in a jealous rage. Hélène haunts Joubert and casts a spell on his arm, causing him insufferable pain. The doctors return in time to see Hélène and watch as Joubert chops off his arm with an axe and dies. Hélène's ghost veil is lifted, and we find she was not dead but insane too.

3.2 RESEARCH

Please see the posters in Appendix 3: figures 14-22 for this chapter.

There are descriptions of the Grand Guignol found in books and articles, explaining how some special effects were achieved at the time. There are also a few black-and-white pictures that helped demonstrate the way the action took place. However, the advertised posters produced for the shows were the most helpful material I researched. The visual spectacle they conveyed merited more than the best textual description. Though implausible, the graphic illustrations displayed the horror the theatre and spectators wanted. They were a snapshot of the gore as the poster artist chose to reveal to entice an audience.

The iconic posters were a regular part of the Grand Guignol's history. I knew the images before I learned about the Grand Guignol Theatre; specifically, a post-impressionist can-can dancer in front of a theatre with an audience resembling clowns by Jules-Alexandre Grün.

The publicity posters expressed the story independently, and they became part of my visual inspiration for designing *The Kiss of Blood's* special effects and costume design. The script does not accurately portray the visual spectacle envisioned for a performance on the stage of the Grand Guignol. However, the poster , like *Le Baiser de Sang* and *L'homme Qui A Tué La Mort,* do. The graphics of these two artworks visualize the strangeness expected for the stage. My mind was only opened to the creative possibilities after exploring the artwork.

I needed to produce inspired colour swatches for *The Kiss of Blood* and pre-production discussions. Returning to the posters for inspiration was a simple choice. A printer's pallet limited the poster's colours, but black and white are a given. The posters consistently included red and grey blue and two different shades of greens on opposing sides of the colour wheel; lime and teal. I incorporated these colours throughout the production, hoping to transport the audience back to a time when posters were printed in a few selected colours.

One colour was reserved for specific moments. The title *The Kiss of Blood* implied that there would be blood. Blood red was found on many of the posters. Red was reserved for the moments when blood appeared; nothing else on set or actor would incorporate that colour.

3.3 PERFORMANCE

Van Leeuwen began the night's performance with a medical team for the front of the house; they donned teal green scrubs. They were a sneak peek of *The Kiss of Blood*. Before the show began, actors in scrubs interacted with the audience and asked Covid-screen-styled questions. The questions were too familiar, and the audience member's stomachs turned. The mood quickly turned humorous when follow-up questions about irrelevant, scary movies were asked. In order to have enough people serve in the Front of House crew, the actor who was to

play the body for the brain surgery was made a set of scrubs as the hospital gown worn on the medical table was not appropriate for the position. See figure 36.

The first act was masculine, with harsh straight lines. The males were distinctly superior, at least to themselves. The female nurses were around for eye candy to juxtapose Volguine, who fought her way through the demoralizing ranks to become a doctor. She was obviously more intelligent than the Professor but second in command because she was a woman. This theme provided humour as the Professor pretended to know what he was doing; meanwhile, Volguine rolled her eyes at his idiocy. I did not find a specific section of text that demonstrates this concept; it seemed to develop because our current climate is highly focused on equality for women. I can visualize the dialogue in the script played sincerely, which seems plausible. However, this production played strongly on the idea that the Professor was a joke.

The Professor's incompetence was demonstrated throughout the brain surgery. Elaborating on the brain surgery was an opportunity to produce a gory effect in The Grand Guignol style. The abrupt exposure of a whole brain that oozed brain matter elicited audible sounds from the audience.

When Joubert entered, he exuded eccentricity and wealth with a hint of madness. He arrived after a long day of pacing in pain. The subsequent special effect began as a mental disturbance that evolved into finger amputation. This moment was the first time the audience saw blood on stage, and I planned it to be overly dramatic.

Cleaning complications were discussed early in the design process; an intermission was planned to give the crew enough time to clean blood and brain fluid off the stage. During several

rehearsals, the show was trialled without intermission. In order for the crew to effectively clean the spills and return the floor to a safe and usable condition, the intermission was restored.

Joubert's home was also masculine but more comfortable. It was mainly coloured in green but on the opposite side of the spectrum of the medical team; a dark yellowish, sickly green. Reference poster *Harakiri*. The finishes were gold and black and white granite to enhance the feeling of wealth while portraying a hard and cold atmosphere.

A reason for an axe to appear on stage was required; the script called for a fireplace (Aragnay and Neilson).A picture of a mysterious woman was intended to be displayed on Joubert's wall, achieved by a projection. The picture would fade in and out at appropriate times to add a ghostly presence to the home. Ultimately, this effect was not successful. The production timeline prevented ongoing exploration and it was eliminated. Reference portrait of Hélène, figure 20.

Maria, the maid, was dressed in a green shade that felt like it belonged to the house. Professor and Volguine were in dress coats and hats. Their colours changed to a faded grey-blue taken from the posters.

I wanted an overabundance of blood to be sprayed through this production, similar to *Evil Dead*. However, cleaning extravagant amounts of fluid was not feasible within the time allotted to present this production. Nonetheless, we were able to have enough blood to represent the effect. The spray was achieved by mounting a pressure pump under a table. When Joubert chopped off his arm, he pressed a button with his knee, and blood spewed out of the table.

Finally Hélène. The text suggested that she was alive. However, van Leeuwen wanted to explore the concept of the audience not knowing if she was dead or alive. She entered as a ghost, up through a trap in the floor. Her ghost veil was removed at the end of the act. Hélène was beautiful and out of this world, out of the time period, surreal and unique. She became part of a ghost dance with two other ghosts, and they transitioned into *The Masque of the Red Death*. The dance provided time for the crew to clean the blood backstage.

CHAPTER 4: COSTUME DESIGN

Please refer to Appendix 4; figures 23-42.

The Theatre of the Grand Guignol became most popular between World War I and II. Audiences declined for a few years after the first war, but the popularity increased, and the theatre reached its golden age by 1925 (Hand and Wilson 16). I wanted the characters to look like they were from the past but not tied to a specific year. I pulled design elements from the fashions of 1905 through 1935. I amalgamated these elements to create a fusion of fashion and time and presented a non-specific period of the first third of the 1900s.

For *The Kiss of Blood,* a medical team made up most of the costume requirements. Additionally, ~~p~~period pieces were designed for the second act. Hélène, the final character, required a costume that would transition from *The Kiss of Blood* into *The Masque of the Red Death.*

I applied the concept of heightened realism to magnify the melodramatic effect. To me this idea meant that the costumes would be realistic, in a way that was too perfect to be true: sharp, crisp, and never washed or used. As the play unfolds, this perfection is juxtaposed with the outrageous events, ideas and amount of body fluid.

I paid close attention to colours and tried to use them appropriately. When I found the perfect colour, I used it everywhere, for every detail. This concept looked real but was too perfect to be authentic.

Applying my research and experimentation on Hélène's costume helped develop an ethereal undead character reflective of Edward Gorey's illustrations (Wilkin). Hélène was unearthly and reflective of death, a common thread throughout *A Night at the Grand Guignol*

2022. She wore an exoskeleton created virtually and produced on a 3D printer. I will discuss Hélène's costume separately from the rest of the costumes because of its extreme differences in design and build.

Hélène and two ghostly companions danced through a transition from the end of *The Kiss of Blood* to *The Masque of the Red Death*. The final design for each was developed through collaboration between the *Masque* designer and myself. The characters evolved seamlessly from one world to the next

4.1 ACT I

I designed medical scrubs uniforms. Off the same bolt of fabric, I added hats, bandanas, shoe covers, belts, hospital gowns and sheets to create heightened realism. The sharp lines of the stark, clean uniforms completed the over-dramatic style.

The set was presented as a stark, cold, white world. Deferring to van Leeuwen's request, white scrubs were initially chosen for the medical scenes. The object was to create a great contrast when the blood began to spray. The colour scheme for the final show, *The Masque of the Red Death*, was pronounced black and white during the design process. Van Leeuwen wanted to distinguish the productions; they differed in style and concept. Hélène and her ghosts were the only characters that visually transitioned into the night's final play. To separate the productions, I was allowed to choose an alternate colour for the scrubs in *The Kiss of Blood*.

Before committing to the poster colours, various pastel-coloured fabrics were colour tested by pouring theatrical blood over them. It was important for the stage blood to pop when sprayed on the medical team. The least preferable choice was green, the opposite of red; the red

blood was neutralized as it absorbed into the fabric, and the red blood looked like black tar. The better choices were white, yellow, and peach. Those colours did not depict a medical scrub vibe.

Van Leeuwen suggested watching *Ratched* because she loved the show's aesthetic (Romansky). It was a modern version of horror, set in the past, and the costumes were divine. We settled on a teal green colour as a homage to *Ratched,* and the exact shade was lifted from the posters of the Grand Guignol. See poster *Le Baiser dans la Nuit,* figure 18.

Concerned about historical accuracy, I studied the implementation of coloured scrubs. The evidence shows that it was plausible for a medical team to have coloured scrubs after World War I. Stark-white walls and linens were hard on the eyes; Dr. Harry Sherman introduced green scrubs during the war to camouflage the blood (Belkin). The same colour theory I used to disregard green was the same reason it was chosen in the end as a popular contrast colour to blood.

The general design of the scrubs was an old-fashioned uniform, clean and professional. All the scrubs were made of the same teal fabric. The ladies' hats, skirts and aprons brought the timeline into the past. The men had shoulder buttons that held the shirt closed, signifying a time before elastic was commonplace when items were generally tailored. The patient's robe was also constructed out of the same material. The medical team had teal shoe coverings and gloves; this specific choice heightened the reality. Costumes and accessories designed in all the same colour and placed on a white backdrop appeared nearly surreal.

As the costumes were all made of the same fabric, the specific characters' designs required varied components to set them apart.

The first act portrayed Professor Leduc as an average doctor who was not afraid to experiment. His female assistant Volguine was more brilliant but second in command, likely because she was female. This atmosphere was evident in the first readings and later in Volguine's eye rolls during the production; it added humour to the situation. I played off this concept; the costumes were designed to highlight the atmosphere of toxic masculinity.

Professor Leduc and Dr.Volguine were designed to appear more important than the rest of the medical team. They were given longer clothing to insinuate height above others and maturity; the additional length suggested higher cost and implied higher pay. They were heads of the establishment and worked on the surgery together, but Volguine could not be on the same level as the Professor; in this great-man's-world, we accentuated her gender with a skirt and apron.

The scrubs designed for the male medical staff were similar to the Professor. However, they donned short sleeves and a higher hip-length top; the Professor's shirt hem was mid-thigh.

The female nurses wore shorter skirts than Volguine and folded nurse caps. A Peter-pan collar was added to represent youth and inexperience. The nurses were intended to be the medical men's eye candy; I designed their skirts fuller to accentuate their hourglass figures.

In the original design, Volguine had a snug stand collar to contrast the nurses. After the play had been cast, I re-evaluated my designs based on the cast's body types. The actress for Volguine had a shallow neck; to accommodate this, we removed her collar. The maid was also reconsidered and will be discussed in the next section.

The last person to enter this scene was Joubert, a wealthy gentleman; the story begins at nearly ten o'clock at night (Aragny and Neilson 4). I wanted him to appear in his after-dinner

clothes as if he had been pacing his house for hours. He had finally gathered the courage to be there, or his sanity finally snapped. I dressed him in a striped brocade smoking jacket with a velvet rolled collar; the mid-thigh length gave it the appearance of a housecoat. His pants were dark grey-green, and his shoes were green snake-skinned loafers. A loose unbuttoned dark red shirt was chosen as it would camouflage any blood spills from previous nights. The fake arm was sewn into the shirt and could not be washed. The actor had naturally curly hair, and I found the perfect haircut for an eccentric wealthy man. My actor grew his hair out for this purpose. However, he was sent to get a haircut from an inexperienced barber without my knowledge, and it was too short to achieve the look I had planned. We fluffed it up as much as possible and settled for what we had.

4.2 ACT II

The Professor and Volguine wore long wool coats to suit the time frame. The coats and hats remained on because the pair were not invited to stay and were not welcome. Joubert remained in the same costume for the second act, though he changed his shirt to dark green. This design helped keep the budget down for the play and portrayed his insanity and lack of consideration for guests. I chose the green shirt because Joubert was in his home, and green was his primary colour. The costume shop was able to pull his outfit out of stock. They spent some time altering the fit and adding a velvet collar, but the work on his ensemble was minimal.

We are first introduced to the maid dressed in a crisp, sage-green uniform to signify that she was part of Joubert's world. The original design was a long, plain silhouette to achieve a pathetic, downcast girl afraid of her situation. This design was modified after the show was cast. The actress selected was curvy and played the part flirtatiously. The skirt was shortened, and

fullness was added; the sleeves were redesigned to be short and poofy. I added a triangular-shaped, art deco-styled apron with a lacy hair piece. These elements filled out the character and better suited the actress's interpretation of the maid.

All the actors in *The Kiss of Blood* had to merge into the final show; *Masque*. Therefore, everyone in Act II had to be considered a quick change. To benefit the collaboration, I simplified their changes. I had the actors wear the same black tights and socks they would in the final show. They also wore parts of their *Masque* costume under their *Kiss* costumes. This consideration worked nicely for both designer's needs. When the Professor and Volguine entered Act II, I wanted them to appear uncomfortable. They were not welcomed into the house and, therefore, not asked to remove their coats or hats. The two coats easily covered costumes in place for the final show. A skirt for Volguine and pants for the Professor was added, and a hat for each. When the actors finished their part, they could exit the stage and easily make the costume change.

When Joubert was left alone, he began to feel Hélène's presence. Two ghosts were designed to appear in random places around the mansion to give the illusion of Hélène apparating in various locations. The ghosts wore long circular ghost veils made of lace with large black eyes. I wanted fancy spirits that would compliment Hélène. The design is meant to imply they lived in Joubert's household and grabbed the delicate table-cloth instead of the bedroom sheets. Lace-layered ghosts suited the time period and shifted smoothly into *Masque*. Lacy skirts added fullness to the ghostly silhouette and texture for the final show. I added fabric spirals to the skirt lining; the spirals emerged from the bottom of the skirt and provided movement; I hoped the movement would symbolize floating.

The transition scene required further collaboration between the *Masque* designer and myself. I needed the ghost bodices to be completely white, but the style was irrelevant under the

ghost sheet. This understanding allowed the *Masque* designer to choose bodices that worked best for her show, as long as they were white. She found two white corsets that the ghosts wore throughout the production.

The *Masque* designer required two things for these characters to enter her world. They needed to be dressed in black and white and have a throat encumbrance or snug collar. This result was achieved by removing the ghost veil behind the scenes, and black accessories were quickly added, for example, a choker necklace. They quickly transitioned into *Masque.*

Hélène's transition was more straightforward than the ghosts. Her attire was already black and white. I added a 3D-printed, moulded collar that fit snuggly around her neck, and she stepped effortlessly from *The Kiss of Blood* into the dance number, then right into *Masque.* We removed her peplum to accommodate a large amount of floor movement. This collaboration was a simple and successful effort.

Volguine and the maid both had understudy cast members; due to the Covid risk among production members. The maid actress could take Volguine's place, and happily, she fit in the primary actress's costumes. However, an actress with a different body shape was cast to replace the maid. The costume shop worked a miracle with fabric remnants of the original costume and came up with a replica of the original design.

4.3 DISCUSSION

A majority of the costume shop budget for this show was spent on the medical team. I was able to source a polyester and cotton blend from a local shop. The store stocked several hundred yards of the fabric, but the colour selection was limited. I decided on a bright pigmented teal over a medium grey-green or light blue. I knew the stage lights would wash out and dull the

other two colours. Though it was not the exact colour of the swatch I provided, the bright teal was the correct amount of colour for the scene and did not wash out in the stage lights.

The medical costumes were easy to manufacture because scrubs are naturally generic and did not require much fitting. They were completed and fit by the middle of February. When the show was rebooted in April, the male assistant and dead body actors were unavailable for their roles. The body actor was easy to replace in the scene. The male assistant did appear in the Front-of-House but ultimately did not appear on stage with the Professor. The nurse's roles became more hands-on than initially planned. They performed the special effects as the Professor and Volguine were reading lines at the front of the stage. Though the stage was not a busy medical unit, I think the costume design still effectively portrayed an atmosphere of toxic masculinity. The Professor was the only man in the room, and the females worked in skirts.

The mess of brain fluid and blood was minimized. The scrubs were never sprayed, and the white floor emphasized the colours of brain fluid and blood. The hospital gown on the dead body did get brain fluid on it nightly, but it washed out nicely every time.

Joubert came across as a wealthy eccentric. I am unsure how the audience felt about his jacket. I felt it read as an upscale house coat, not quite a smoking jacket, and it worked for the scene. I had designed it to be a formal after-dinner jacket; taking up the hem might have achieved that. However, we experimented with the coat length in fittings and found the longer hem suited the actor's figure and the persona he portrayed as Joubert.

I missed Joubert's eccentric hairstyle. Alternatively, the audience did not know differently. However, I think the role would have been better supported by hair long enough to ruffle up, as mad people are often portrayed. The costume shop suggested a wig, but I turned it

down, considering the complication it would have caused the actor and the lack of time to coordinate and practice these changes with him. Ultimately the character still came across as crazy, with nice hair, and was balanced with a less stressed actor.

In Act II, I was thrilled with the maid's costume. This costume had been scheduled to be pulled from stock. Nevertheless, it was not possible to find an option after the show was cast. It was created by the costume shop based on the alternate sketch I made. I chose a fabric from stock so it would not negatively affect the budget. There were several green fabrics to choose from; I picked the best colour over the fabric type. I needed Joubert's clothing, home, and staff to be shades of green, unique from the scrubs in Act I. The fabric was a light taffeta, and the crispness encouraged the maid's formality. The apron was interpreted with folded pleats, and the finished product was formal on stage and flattered the actress's body better than my original design would have. It also looked great on the understudy, though she only wore her costume in fittings. See figure 37.

We were lucky to have two grey-blue-toned coats, pulled from stock, that fit both of our doctors. The Professor's coat was a darker blue, and the silhouette was straight. Volguine's was lighter in colour and had a feminine flair. Though the colours were nearly perfect compared to my swatches, they both appeared dreary and dull grey under the lights. I do not know if changing the lights would have helped; I was uncomfortable asking the lighting designer to experiment based on our timetable. I tried to add life to Volguine's coat by adding three rows of small golden buttons down the front; the coat perked up enough that I could move on. Her hat was brighter than the coat. The colour brought attention to the actress's face and helped the character pop out of the dull coat. I expanded on the details of felting Volguine's hat. See 8.4 Workshop.

After watching the first rehearsal, I thought about adding completed outfits underneath the doctor's coats. The scene felt longer on stage than I had forecasted. It seemed awkward for them to walk around the house and talk with the maid without at least unbuttoning their coats. I did not explore this option further because the actors were unavailable during the strike. After everyone returned, this no longer felt necessary for a stage reading.

The ghost sheets never received their big black eyes for a similar reason. After speaking to the new director Blum, we decided the eyes were not essential to explain that they were ghosts. I loved the light effect that the lace had on the costumes. The sheerness enabled the audience to see the human under the sheet. Two parts of the soul were visualized, body and spirit, represented in the actress and the ghost sheet. Death comes when the spirit leaves the body. The two ghosts had spirits which hovered over the body, no longer united. Death had lingered over Hélène but did not divide her, her veil was lifted, and she remained living.

4.4 HÉLÈNE: INSPIRATION AND RESEARCH

Iris van Herpen heavily inspired me during my graduate research. The influential Haute Couture designer from the Netherlands, van Herpen has created some of the most cutting-edge fashion designs in the last five years. A fan of bio-mimicry, she designed clothing based on the movement of the living world and piloted successful collaborations to replicate a supernatural style (Hemmings et al.).

I began researching how her clothing lines were produced and discovered that computer engineering was a significant factor. To better understand the world van Herpen worked in, I enrolled in a digital manufacturing art class; I learned the basics of three-dimensional digital design and production. It was evident that connecting the CAD programs to the fashion industry

would have required help from other experts. The architectural field heavily influenced the development of CAD programming; including architects in these collaborations was essential to bridge the gap. I began to notice reoccurring names used in her collaborative projects. See figure 39.

This exploration led me to her contemporaries; Daphne Guinness, an influencer; Neri Oxman, a researcher from MIT; and Julia Koerner, an architect (Herpen). The work done by these four brilliant women inspired me to explore beyond the textile work I knew.

Daphne Guinness is a British socialite and has been the muse of several famous fashion designers, including van Herpen, Alexander McQueen and Hogan McLaughlin. How McLaughlin influenced this design will be explained later (Collins). For van Herpen, Guinness posed as a model. She was repeatedly doused with water in the nude to achieve the perfect inspiration for a fashion line inspired by water; the picture was named *Splash*! I fell in love with Guinness's hair, known for her jet black and platinum blond coiffure, which was always styled perfectly. It was the marvellous inspiration used to create the wig used for Hélène. Her sense of dark style displayed how I pictured Hélène.

Neri Oxman is a scientist and a designer who has worked with van Herpen on several collaborations. Her initiative has been to learn through science and art combined, similar to the style of Leonardo da Vinci, who was unbound by modern educational boundaries. At MIT, Oxman led the Mediated Matter Group in an experiment that studied silkworms. The group used CAD to design and build a scaffold system created with a CNC machine. The frame created an exoskeleton of a pavilion laced with silk threads. After the structure was in place, 6,500 silk worms were introduced to the environment. The worms were studied as they spun miles of silk and reinforced the structure. The worms continued their life cycle; eventually, they laid their

eggs. In the silk industry, most worms are killed to prevent holes from being made in the silk cocoon when they emerge (Oxman et al.).

Oxman's humane use of silkworms correlated directly to my environmentally friendly manufacturing research; silk threads are a biodegradable resource created from the earth by living creatures. Oxman's continued research seeks to heal the earth from the harm human beings have inflicted so that humans may live with nature instead of against it in the future (Neri).

Oxman was involved with another favourite project, *The Molten Glass Sewing Machine*; the title drew all my attention. In another highly scientific project developed at MIT, researchers invented a way to heat and print liquid glass. The system could print the glass in coils that resembled a knitting pattern; without the interlocking but still strong because of the welding qualities of molten glass. As the glass cooled, it could be layered to create structurally sound fabrication (Brun et al.). Watching the development of a machine that heats and prints glass in strong coils was intriguing. Exploring Oxman's work inspired me to research outside theatrical confines and collaborate with other designers.

Julia Koerner loved fashion design but was accepted into an architecture program and a fashion school. Through her CAD collaboration with van Herpen, she has moved into the highest fashion markets. Koerner also teamed with Ruth Carter. Koerner designed the 3D-printed costumes produced for the film Black Panther, which won an Oscar for best costumes in 2018 (Tess). Koerner's vision for the future of fashion parallels my aspirations to use technology to develop a better environmental footprint, customize fit, localize construction, and produce eco-friendly clothing.

> Additive manufacturing allows for localised on-site production of garments, eliminating overseas sweatshops, shipping costs and associated carbon footprints. Several materials used in 3D printing are biodegradable and others can be melted, fused and reused. The accuracy and ability to digitally adapt form allows for highly customised garments that can be printed on demand, leading to mass-customisation. -Julia Koerner (Koerner)

The designers I researched came out of the fashion industry. I only found one scholarly article about 3D printing in the costume world. A project based out of China used 3D printing to make customized battle armour for movies (Zhou, Liao and Zhou). This article was a great starting point, but more about this work needs to be published. I turned to the fashion world because they have been experimenting with 3D printing concepts longer and have advanced past hard armoured shells. Interestingly, the fashion world had turned to the architectural field to accomplish its goals.

The most relevant fashion article discussed why 3D scanning and printing technology would not quickly adapt to the masses. Production models are based on producing for the masses in the most generic one-size-fits-lots sizes. Even expensive clothing, or ready-to-wear styles, have become increasingly generic but can be altered to create a better fit. The article suggests that there is no need for an expensive 3D body scan when you are sized according to what the store carries (Paganelli).

An example from my youth illustrates this concept. I went with my roommate to a bra store in the mall; she was measured to fit a 28F and then handed a 32D labelled bra to wear. I realized the company only measured to find their size, not her size. A detailed body scan with precise measurements is unnecessary in that field.

As a professional seamstress, I have learned how to accommodate and fit over 100 bra sizes. Each bra can also be made for a specific person, and the discrepancy in each breast can be

customized. I have been researching 3D imagining to find better ways to make bras for women who do not fit the mould of ready-made commercial bras. Wearing the incorrect bra size is uncomfortable; it is hard on shoulders, armpits and backs (McGhee and Steele). A custom-fitted bra is comfortable, supportive and helps posture.

A 3D scanner would only be helpful in a fitting environment that made a specific outfit for a specific person. This clothing category is often left for Haute Couture or custom bespoke pieces. However, as costume designers, custom bespoke pieces are precisely what we do. Therefore I wanted to combine 3D scanning and printing technology with my garment construction experience and apply it to customized theatrical costumes. Though I am new to the world of CAD and my experiments were amateur, I found the results promising. I am excited to become proficient in the design and application of CAD techniques in the future.

4.5 DESIGN

Van Leeuwen spoke about her love for the work of illustrator Edward Gorey. His pen and ink illustrations often describe the moment right before death. I connected immediately to the textures he created with black lines on white paper. Immediately I knew that I wanted Hélène to look like she had stepped off the page of a Gorey book. The theme was tied to van Leeuwen's ongoing discussion: was Hélène dead and a ghost? Was she alive and crazy? It was like designing a costume for Schrödinger's cat, both dead and alive simultaneously.

Internet searches helped me visualize this concept in the best way. Skeletal references were standard; I then explored the placement of bones over the body. I wanted to place them in areas that would accentuate the actress's female form. I used my knowledge as a bra maker to add the skeletal bones in a supportive manner. Corsetry support is referred to as boning. I had a

breakthrough after searching Edward Gorey and corsetry together, a dark inky illustration of a Victorian-styled corset. Months after pulling the image for inspiration, I researched the sketch and found that Hogan McLaughlin drew it. He drew a series of illustrations and captured Daphne Guinness's eye; with her influence, he was thrown to stardom (Battista). I was able to effectively incorporate skeletal bones into the supportive boning. See figure 39.

I drew several iterations of the costume for Hélène's corset, inspired by McLaughlin and Gorey's harsh, beautiful lines. Printing in PLA meant the 3D parts would be ridged, and I theorized that they might work as boning. I simplified the design to accommodate the actress's movement, as well as my limited experience with CAD and 3D printing. The general visual from the front of the bodice resembled a skull, and the back included bone-like shapes that appeared to be a protruding spinal column.

The dress was sheer, and I planned to attach the prints directly to the dress. I wanted the actress's body to reflect skin and life; the sheer fabric was her spirit not yet separated from her body. The black bones on her skin signified the inevitability of death.

Hélène was designed in a skirt, which fit the time period; more importantly, skirts can also provide spectacular movement. I acquired silk organza for the project; to create a look that flowed beautifully through the air but maintained some crisp structure. The movement I tried to recreate was inspired by Iris van Herpen's clothing and its movement down the runway. I wanted a mystical flow that resembled a ghost-like quality. The silhouette was also essential, and I wanted to keep a feminine trumpet shape like the other ghost designs. The skirt needed to maintain fullness on its own, to keep the design sheer, and without the help of layered tulle or wire. The organza weave held the fabric firmly in place and provided a sheer, stiff look.

The skirt needed to look hand-painted, but I would need to minimize the work time to accommodate our budget. I tested several types of fabric paint and dyes to get the desired result. The liquid dye was too runny; the acrylic paint was too thick; I chose a liquid acrylic ink that was exactly right. I created thin solid lines reflecting Edward Gory's style. Then in some places, I bled the ink with splashed water. I was able to detail the process and provide a schematic so the costume shop could create the look I wanted.

The hard lines in the corset illustration became an opportunity for me to learn and apply 3D printing techniques. My design sketch was approved through the preliminary processes, and the costume shop seamstresses agreed to collaborate on this process. They called in the actress for a fitting, and I was allowed to scan her body with a 3D scanner. The scanner pictured and measured her; the result was a digital image of her body. I imported the scan into Rhino, which remained in scale, meaning I designed and printed the correct proportions.

In Rhino, I was able to design the details and form them around the shape of her body. Designing the bodice décor was tedious and involved much trial and error. I realized that some details were easier to print flat; this was faster and achieved better detail. Then I warmed the print with a heat gun and bent the print into the desired shape to curve around her body. More dimensional pieces had to be printed slowly with the proper supports. The supports were removed, and the pieces were sanded smooth.

I theorized that melting the 3D prints into the bodice fabric was the best way to attach them to the silk. However, ironing the inside of a concave piece was very difficult. Instead, we used Shoe Goo® to adhere the pieces in the correct places. A row of black 3D-printed vertebrae ran down her back and encased the zipper; it appeared to be a protruding spine. It was apparent that adding ridged pieces restricted the actress's movement. I eliminated some side pieces to

accommodate dancing that would happen in *Masque* after her transition. I worried about the back zipper design for movement, but the actress reassured me that she would adapt to the dress, as she also believed in the importance of the skeletal spine aesthetic.

Hélène was raised from the floor in a ghost sheet, which was stunning. I did not get a feel of what the audience thought. Then Hélène and two ghostly companions danced through a transition from the end of *The Kiss of Blood* to *The Masque of the Red Death*. They fit into that production; stylized black and white pieces were collected from various periods.

Hélène's physical persona was the culminated of my CAD research for the past year. Applying my research and experimentation on Hélène's costume helped develop an ethereal undead character reflective of Edward Gorey's illustrations. Hélène was unearthly and reflective of death, a common thread throughout *A Night at the Grand Guignol 2022*. She wore an exoskeleton designed virtually and manufactured on a 3D printer.

CHAPTER 5: SPECIAL EFFECTS

Mapping out the special effects for *The Kiss of Blood* began by mining the script for any references to visual elements (Aragny and Neilson).The storyboard helped me visualize the play while highlighting the most critical moments. I gleaned essential details for the special effects I wanted to create. See Appendix 2; figures 1-13.

The beginning of Act I described a brain surgery performed by Professor Leduc. At the end of the act, Joubert amputated his finger in front of the audience, with blood flowing freely. In Act II, Hélène appeared as a ghost causing Joubert to chop off his arm with an axe and subsequently bleed to death.

Through discussions with van Leeuwen, it was decided that the gore would be over the top during the blood scenes. I suggested that the surgery could also be a spectacle; though it deviated slightly from the script, it honoured the extreme side of the Grand Guignol (Aragny and Neilson). I explained that instead of a drill being pressed into the skull, which could evoke horror, we could create a brain removal surgery or transplant. This effect would align with our efforts to take the scene above and beyond terror, creating a humourous effect.

Initially, I had oriented the patient's body so that the feet faced the audience. The surgery on the brain was performed, and the doctors were positioned upstage and away from the audience. It was determined that a better reaction from the audience could be achieved if they witnessed the surgery. Flipping the patient around was crucial and focused the viewers on the brain surgery, creating the perception that the audience members were part of the surgery. Knowing the orientation of the body and brain was the key to designing the prop appropriately.

I brainstormed different approaches for the finger effect, they were presented and discussed with van Leeuwen. The first was a stationary pumping apparatus; the second, the actor would wear a blood pump. Comparing these options helps illustrate the choices made. Examining the outcome was assisted by elaborating on each method. Both options were visualized in the storyboard and helped troubleshoot this interesting special effect.

The sketches informed the timing of Hélène's appearance and the final reveal concerning the back story and Joubert's death. It became clear that Hélène had very little time on stage; she was central to the storyline and larger than life. Her entrance needed to align with the story and portray Hélène as mystical, possibly even ethereal. In a brainstorming session, the stage designer suggested that Hélène rise through a trap on the stage. This effect supported Hélène's mysticism and ghostly manner when she appeared from the floor.

Joubert's final act of dismemberment was the last effect to consider. Splitting with an axe required a chopping block or support surface. In Joubert's home, a firm table was needed for the action to take place. An end-table provided an opportunity to hide blood inconspicuously within the table.

5.1 DISCUSSIONS

See Appendix 6; figures 45-46.

Before planning a full-spectrum brain-transplant surgery, I pitched the idea to van Leeuwen. The script did not call for skull removal, only a drill was needed, but she believed it would work within the scene. I discussed the possibility of transplanting the brain into a machine based on an original Grand Guignol poster *L'homme Qui A Tue La Mort.* Including a robot was too much science fiction; van Leeuwen preferred gore for the mood she desired to create.

A layering concept for the brain effect was developed; an outer skull, a thin brain layer, a black layer providing the illusion of an empty head, and a halo that held all the pieces together. For testing and visualization, a 3D model printed in half-scale was developed. Computer design ensured that the layers fit snugly together, like stacking dolls. In slideshow format, I demonstrated the brain surgery concept on a doll. This prototype was simple and effective, and van Leeuwen okayed the effect.

Two possible solutions for finger amputation could have achieved the desired outcome. The first envisioned the actor on stage with fully functioning hands, and the actor would mimic Joubert's infirmity. During the doctor's deceptive surgery, Volguine would attach the prosthetic hand to Joubert under the guise of a simple bandaging procedure. This hand would be heavily bandaged with the faux finger exposed for amputation. The finger would be connected by tubing to a stationary IV blood bag. The bag would be suspended in full audience view and use gravity to feed the special effect. Volguine re-enters as Joubert begins to tear at his bandages. She would discreetly pump the blood as he cut off the fake finger; this would effectively create a significant flowing effect. The prosthetic hand could be covered in gauze and, therefore, would not need to replicate the actor's hand perfectly; this would easily hide his actual finger. This method leaves two pages of dialogue where the actor must remain attached to an IV line limiting his movement. Nevertheless, the line could stretch to accommodate standing and gestured movements.

The other option was to create a prosthetic based on the actor's arm. The actor would wear the entire system. He would control the blood spray and simultaneously amputate the faux finger. The faux finger would double as a plug; when amputated, the tubing would be opened. The tubing connected the finger to an electric pump feeding from the blood bag. The blood bag

would be positioned on his back, hidden by a night coat. The performer would engage the motor, and blood would spew aggressively.

For van Leeuwen, who specialized in movement, tying actors to a table felt too limiting to her visualization. We decided to go with the prosthetic hand option. This choice would allow the actor to move freely on the stage while blood spattered in various directions. Blood could be sprayed on the set and other actors.

The arm amputation was simple to imagine; a fake arm in two pieces was temporarily held together until the axe removed the forearm. Blood storage placement was complex; a large quantity of blood was envisioned, and hiding an adequate amount on the actor was impossible. In preliminary discussions concealing blood in the basement was a viable option. A tube could be fed through a small hole in the deck and placed near the table where the amputation would occur. A crew member operating a pump would expel a large quantity of blood.

I also asked permission to remove the sling from Act I and use it in Act II, contrary to what the script describes. It made sense visually with the story; the sling would conceal the actor's arm, and he could puppet the prosthetic. Van Leeuwen and Blum approved the change. I neglected to ask if we could switch right and left hands in the script, as I should have. Assuming the actor would be right-handed, I felt these effects would be safer if the actor's dominant hand had control of exacting movements. Regrettably, I had to ask for forgiveness later in the process because the left arm had already been cast for the prosthetic.

5.2 PRELIMS

The Kiss of Blood's special effects budget was approved. Most of the funding would cover costs for casting material, mould materials, blood ingredients and 3D printer filament.

One challenge that arose was the lack of special-effect building resources. The staff member hired for this position was out on what would prove to be an extended long-term sick leave due to Covid complications. To compound matters, it was uncertain if a replacement hire would be available or if the replacement would possess the skill set necessary to create the special effects envisioned. Aware of the situation, I felt up to the challenge of building these effects by collaborating with the scenic shop manager and tech students; I could share my experience and have valuable help troubleshooting the process.

5.3 PRACTICAL STUDY: PRODUCTION

In January, several elements contributed to a slow start in manufacturing the production of *The Kiss of Blood*. After a successful fall semester of 2021 of in-person instruction, the University returned to online learning for January 2022. The campus was open, and some classes remained on campus. Nevertheless, it was difficult for students to attend their requisite online classes and arrive on campus to participate in in-person tech labs, fittings, or service hours. Constrictive timing limited my interactions with lab students. The scene shop focused on their first productions, and the costume shop worked through *The Masque of the Red Death*. *The Masque* was a devised piece, and van Leeuwen needed costumes immediately to inform the actors' choices and movements. I focused on working from home, creating 3D-printed elements for the production. I scheduled weekly check-ins to use my time most efficiently.

I led a body casting workshop early in the semester. The class included the shop manager and several undergraduates who volunteered their time to participate and learn. The assigned tech students participated via video conference during the process, unable to attend because of their online timetable. Instructions were presented, and the students produced a successful arm cast; our model was the actor for Joubert.

We used Silicone Body Double products from Smooth-On. The first layer was Body Double SILK; this layer is more flexible and releases easily from the skin. The remaining layers were Body Double Standard Set; this product cures after 5 minutes. Several thin layers were applied; the product is highly subject to gravity; it is safer to use small workable amounts spread thinly over the casting surface. These products were expensive but explicitly chosen to produce a quality negative that would hold up to repeated use. One good negative can produce hundreds of positives; at this time, we were unsure how many arms would be required during the production run.

Andy Wright, a mould maker referred to in Debreceni's book, adds zippers to his moulds to perfectly re-align a seam (Debreceni 184). I hoped we would not have to cut our mould down the side, but I had the students attach a prepared zipper just in case. I had prepped the zipper by sewing strips of wax paper covering the center; this protected the teeth from the silicone. Mesh was stitched on each side of the zipper to create a larger area for the silicone layers to adhere. I instructed the students to place the zipper in fresh silicone; it ran from the wrist to the elbow and up the underarm. After each layer was cured, another was applied, holding the zipper in place.

Finally, we created a hard plaster support cast in two pieces with plaster and gauze strips. We removed the hard and soft casts from the grateful and patient actor once the silicone and

plaster were sufficiently firm. Due to the expensive nature of the silicone material, our budget only allowed one attempt. Happily, it was a successful cast.

Foamed gelatin was poured into the negative cast. I did not expect the actor's wrist to be very small; the replicated hands were impossible to remove in one piece. In my summer research, my model was a man with thicker arms. It had not been challenging to pull the hand mould through a wrist with more girth.

Unfortunately, it proved necessary to slice the new mould down the side. I was able to test the zipper attachment. The zipper aligned the seam correctly, but the silicone was not stiff enough to stabilize the seam, and the zipper could not hold the seam tightly together. The edges would collapse over one another during a vigorous moulding process. The edges skewed away from one another, creating a cliff-like, uneven seam. Hand stitching the seam, similar to medical sutures, was the most effective way to eliminate the uneven seam. Hand sewing the seam was laborious, but the best arm prosthetics were moulded in this way.

I scheduled a special effect workshop every week for three hours and invited several students to attend. We concocted many blood samples to test under the bright stage lights during our stage blood workshop. The colours varied from purple to orange. The opacity became an essential part of the tests as the varied ingredients impacted the opaqueness of the blood samples. Each recipe was applied to the white and teal-coloured fabric. With help from the lighting designer, we trialled the various prepared samples of blood under gelled stage lights that would be used for this show. We wanted the blood to look red, not black, and several concoctions popped on the white fabric. However, the crucial test was on the teal-coloured scrubs because we planned to get blood on the medical staff. We hoped the opacity would be strong enough for the blood to remain visually red over the teal uniforms and not fade to black. "Bloody Mary,"

created by a student, was the clear visual winner; refer to “Bloody Mary” Stage Blood, appendix: 4.

By design, the chosen material for the medical team had a high polyester content; 60/40 Poly/cotton. Polyester is stain resistant, an ideal fibre for withstanding a performance bathed in blood: rinse, wash and repeat. Non-staining products were chosen for blood ingredients as well. The red pigment was realized from children’s washable paint instead of food colouring. Glycerin, a typical soap component, added slickness, creating a beautiful texture that helped prevent stain absorption.

Regarding staining potential, I hesitated to use chocolate syrup. However, stage light testing confirmed that chocolate syrup was a vital ingredient. The depth of colour was thickened with the rich brown. Several blood samples were tested for washability. Fabric scraps from the teal medical costumes were soaked in each type of blood sample. All samples were washed in a regular cycle with soap. Most of the fabrics were clean; these included samples containing chocolate syrup. The sample fabrics stained in the test were from recipes with a high food colouring content. The “Bloody Mary” recipe passed the washing test, and only one test remained.

After calculating the cost of the “Bloody Mary” recipe, I made minor modifications to the ingredients to fit the budget. By quadrupling the water, the consistency thinned, but the colour and opacity remained reasonably constant. The thinned mixture worked excellently in both of the blood delivery systems. Our recipe was finalized by adding a few tablespoons of shimmery mica powder. With its reflective properties, I hoped to catch some stage light to heighten the melodramatic effect of the play. However, I did not notice an effective shimmer during the productions.

5.4 THE WAY THE COOKIE CRUMBLES

In the first week of February, I attended the second rehearsal for *The Kiss of Blood* after the blocking was roughed in. I started to sense how this story should evolve and developed ideas and questions for van Leeuwen. I found the solutions needed and prepared for the next rehearsal the following week. This rehearsal was rescheduled and finally cancelled. On February 10th, the ULFA went on strike. During this time, I was able to continue my development and research. However, I could not communicate with van Leeuwen. I sent pictures to her, but she was prohibited from responding. I filled in many blanks the best I could, but troubleshooting and answers had to wait indefinitely.

Graduate students were encouraged to keep developing their research. However, undergraduate students were encouraged by the ULFA to avoid crossing the picket line or refrain from attending the campus. My tech support team chose to follow that advise. The head of the costume shop found it impractical to schedule non-mandatory fittings; no other work could be achieved while waiting for students who might or might not arrive. Several days after the strike began, our scene shop manager went on personal leave and could not return. I depended on her abilities, support, and knowledge of my projects. Losing her expertise following the earlier setbacks was disheartening; at this point, the loss of support was devastating.

Gratefully the remainder of the theatre staff were still working on campus; this modified team included costume seamstresses, a lighting technician, carpenters, and the stage coordinator. Working through designs and troubleshooting problems with this team was gratifying to troubleshoot and gave me hope. Ideas bounced around, and complications were simplified or reimagined. Brainstorming with makers is what I love to do.

5.5 3D PRINTING AND SPECIAL EFFECTS

I focused on computer design and 3D printing the brain surgery effect. Fortunately, I had 3D scanned several actors' bodies and faces in December; I had a complete head scan of the actor playing the dead body. Collaborating with the costume shop, we decided that the actor could wear a tight black toque for the first layer, the final reveal. The second layer began with a medically scanned brain STL file from Thingiverse (MiloMi). I modified the full brain scan using Rhino, a CAD program, hollowing the interior as it needed to fit over the actor's head. The wrinkled brain layer was slightly larger than the scanned head image. Using the head scan, I subtracted the shape and size of the actor's head, slightly enlarged for comfort. The computer-modelled brain should have fit snuggly over the black toque. I created a slightly larger skull to cover the brain layer for the final layer.

My design incorporated a halo to hold all these layers, fitting snugly on the actor's head. Each layer could be removed by loosening several large thumbscrews. Inside the halo above the crown of the head was a hollowed, piped line or a subtracted space created to enclose silicone tubing. This tubing delivered the brain fluid to the crown of the head. After removing the skull layer, holes in the halo would be opened, and tubing allowed fluid to leak over the top of the brain. See figure 46.

The brain pieces were machine fabricated in roughly 120 hours. I used a CR-30 3DPrintMill belt printer from Creality (Creality). The CR-30 is a specialized 3D printer that prints at 45° and has infinite z-axis, achieved by the building plate moving along a conveyor belt. For particular projects, the extreme angle minimizes the support material required, printing smoother and more economically. Much less support material is required for hollow curved

objects than the support demanded on a standard bed 3D printer. In order to accommodate the large size of the brain pieces, as they could not fit directly on the printing surface, the brain layer was sliced into two sections. The skull was also sliced, requiring three sections to fit within the print area. After printing, the appropriate sections were affixed with glue and painted to appear seamless.

The surface needed to be sealed with gloss to protect it from staining and give it a nice sheen. Out of Rosco Crystal Gel™, I opted for silicone caulk instead. The look was perfect with a thick slimy shine, but it added too much dimension to the brain. The thickness was problematic when attaching the snug skull and inserting both pieces into the halo. Adding a few millimetres of buffer space to account for paint and glue will be remembered for future projects.

A handheld rubber siphon pump was attached to the halo by threading the pipeline with silicone tubing. A three-millimetre drill bit was used to puncture holes in the halo and the tubing. The aligned punctures along the line of the crown of the head let fluid ooze over the brain when the dead body actor squeezed the rubber pump.

The finger amputation prosthetic required a pump and vessel to hold enough blood to create the desired illusion. I sourced an aquarium 12v diaphragm pump; the pump was small enough to fit inconspicuously up a sleeve. Also purchased was a hydration bladder, typically used for hiking; the bladder would be used to hold the blood on the actor's back. Silicone tubing connected the bag to the pump inflow, and another length of tubing was attached to the outflow on the pump. The system piped blood from the bag to a pump, forcing the blood through the fake hand and depositing it on the floor. The contraption was small enough to be covered with clothing and concealed in the costume sleeve.

The power to operate the pump remained the most complicated component throughout the run. My first trial involved connecting a 16v rechargeable tool battery to the 12v pump. Using a buck transformer, I regulated the voltage from 16v to 12v. The battery was bulky and required a large pocket or harness built into the costume. Long wires were needed to connect the battery to the pump; they could quickly become tangled and broken. Fortuitously while digging through my junk drawer, I stumbled upon a LiCB 23A battery, a 12v power cell roughly the size of an AA battery. It powered the pump and was a fraction of the size. The pump required the maximum voltage; the battery would be strong enough for approximately one hour. An inexpensive purchase of ten batteries meant we could use a fresh battery daily for each dress rehearsal and performance.

I modelled a handheld case in Rhino to enclose the pump, wiring, battery, and button switch. My first version had several flaws: large size, no battery opening or place for a button. Understanding the flawed print clarified the changes I needed to make. I modified the computer design by decreasing the size and adding a battery cap, a wire path, and a buttonhole. This design was intended to double as a handle inside the prosthetic. After the second print, the most prominent flaw was the cap, in which the threads were reversed. The familiar rhyme also changed; lefty tighty, righty loosey is easier to say than do. However, this model worked, and a perfected model was not required at this phase of production or the undefined production pause.

The foam gelatin hands had dried and cured for nearly three months. On one faux hand, I removed the foam inside the palm, creating ample space to include the pump apparatus. The index finger was also removed. The pipe from the pump's outflow was inserted through an orifice in the knuckle. The pipe was trimmed flush, ready to attach the false finger.

I modelled a pipe plug to serve several purposes; the first was to prevent premature blood flow from the hand tube. The second was to provide a stable attachment for the separate finger. The support section referenced a phalanx; the reverse side a plug. The model was printed in a white filament. Simultaneously printing nine plugs on the Prusa printer was possible with a simple copy-and-paste command; the printing took longer but was more convenient.

Foam gelatin scraps were melted in the microwave, and enough foam for one finger was poured into the index finger of the hand mould. While the foam was still warm and pliable, the bone end of the plug was pushed into the foam, leaving only the plug visible. After cooling and removal, the boney end of the plug fulfilled its purpose and held fast to the newly moulded finger. The exposed plug fit into the pipe at the end of the knuckle, and the finger held its place. The excess foam was trimmed to blend into the hand; admittedly, the blend was not as convincing as I would have liked.

This design was developed to hold the gelatin firmly onto the finger plug. However, if the finger detached without taking the plug, the actor could pretend to break off the protruding finger bone. The plug worked as envisioned. It would have been beneficial if the actor and director had been involved in the design process because they would have been aware of the insight. I neglected to mention this aspect when re-familiarising the team. The actor was unaware of the backup plan, and the finger failed during the tech rehearsal. It looked great, but his reaction was unprepared.

Ideally, I imagined the actor being able to slice through each prosthetic visually. That is why I had initially planned at least twenty arms. However, an authentic sharpened axe and knife, harkening back to The Grand Guignol, were needed for this to happen. I quickly realized that this

idea would be quashed over safety issues. In the end, I only needed two finished arms. However, many versions were poured into achieving the quality I wanted.

The best hand reproduction was utilized for the arm amputation prosthetic. The foam was sliced at the forearm, and magnets were inserted into each side to hold the arm together. The costume shop created a prototype for the arm sling. The sling was designed to hold the prop arm and camouflage the actor's actual arm. The sling design included a black sleeve in the back to hide the actor's actual arm. I hoped the actor would be able to puppet the prop arm to distract from its inauthenticity. The testing remained incomplete; the special effect was set aside to wait for the return of cast and crew.

5.6 PRODUCTION ANALYSIS

The UFLA strike ended on March eighteenth, and it took some time for the dust to settle. Ultimately *The Kiss of Blood* was reorganized into a staged reading and was given director, Blum. The special effects and costumes remained in the show for my benefit, and I could ultimately fulfil my graduate project requirements. Thankful that I would be able to present the creations to a live audience, I eagerly anticipated human reactions. The props were in theorized working order but had been frozen in the prototype phase.

5.6.1 FINGER AMPUTATION

I chose to do our first test with water in lieu of blood. I wanted to have the actors get a feel for the special effects without a bloody mess during their rehearsal. The finger amputation hand got wet and began to dissolve, it did not show much damage, but its structure became limp, and details faded. Joubert looked like Quasimodo with the giant water bag on his back. The mechanism sprayed well, but I wanted more pressure than we were getting. The hunchback and

wet hand were priorities; both required a solution. With little time remaining, I chose to ignore the limited pump.

Fortunately, I had enough urethane foam remaining from my summer research to make one hand; it turned out perfect. It was prepared using the same mould as the gelatin hand. The urethane held up well in water but did develop small tears with use. The rips were sutured together and were not noticeable; the hand held throughout the production run. A smaller blood bag was found and attached under the actor's armpit, effectively removing the hump. Because of its toxicity, using urethane was a bit out of the realm of my thesis. It was necessary because I did not have time to invest in an alternative and had to fall back on a material I had on hand and would hold up to the water I hope that makers will adapt and develop better methods and that the theatre will continue evolving and building more effective and less toxic materials.

During rehearsals, there was a persistent electrical problem with the blood pump. The wired connection would not remain in place, prohibiting the pump from receiving power. Troubleshooting this issue occurred nightly with little improvement. I upgraded the battery terminal to solid metal, taken from one-half of a 9v battery attachment. It worked during my tests but was displaced when used by the actor.

Ultimately the best solution was pre-testing the device, postponing dressing the actor until the last minute, and testing the apparatus again before he went on stage. We also requested the actor to limit his movements, remaining stationary to diminish the opportunity for the wire to slip. It worked for all three shows. The evidence points to excess movement between dress and performance, causing the connection to pull away. I regret not having enough time to redesign the pump apparatus to eliminate the slippage directly. Constant modification of the inadequate model changed the orientation of the handle repeatedly, and the inconsistency was disorienting to

the actor. Having little confidence in the viability of the effect did not help his performance either.

The audience was affected during the shows; gasps and moans were audible as the finger was amputated. I would have preferred more melodrama, more blood and a more potent spray. The inanimate hand bent awkwardly at times; I take responsibility for not providing a consistent prop for the actor to use in developing his performance. The stiff hand stood out like a sore thumb, and the finger seam was visible. The effect was disappointing for me to watch. However, the blood pump did work every night, and the audience responded appropriately.

Had I known that the show would be performed as reading, I might have picked the stationary amputation method. The actor would not have had to control the blood or wear the unconvincing prosthetic throughout the scene. It would have been simpler for him to learn and perform in the limited time frame. Moreover, perhaps a more vigorous amount of blood would have been applied to the stage.

5.6.2 BRAIN SURGERY

The brain prop needed minor adjustments. Our original dead body actor was not available for the part, but the technical student I had been working with was allowed to step in and control the effect. I added a foam cushion inside the apparatus to improve fit and comfort; the original build was enormous for her head, and we eliminated the final black layer reveal. There was some struggle to keep the layers in place. I do not know if this difficulty resulted from the different sized heads; perhaps it would have been less problematic working with the original actor. I glued the brain layer directly to the halo; this lessened the problem. However, the skull layer was

inconsistent, it stuck too tight, but after a minor adjustment it popped off when lightly bumped. Magnets might have helped the skull stay in the proper location and pull away more smoothly.

We tested the slimy green fluid on stage, and the flow worked great, but the colour was not visible until it hit the white floor. With only one dress rehearsal left, I decided I would rather it was too much than not enough. The green was ramped up until it resembled pureed cartoon turtles. Another key to a visible brain fluid recipe was adding talcum powder to make it less transparent. I am learning how vital opacity is when liquid is hit with stage lights. The colour was severely over the top, and the effect was discernible.

The discrete delivery system I developed proved unreliable. The fluid bag did not remain attached. The tubing was not tight enough; when the actress moved on the table, the tubing would slide off its attachments. I had a weekend for troubleshooting and plenty of time to 3D print a solution. Mad-science was a theme throughout the play, and I expounded on it to fix this problem. I found an exciting vase model on the Prusa Printables site (StephanieS). I modified it to fit our needs and added a base that would hold the silicone tubing properly without kinks. Holes in the base were fitted for magnets, so the mysterious brain fluid container would hold solid on the steel gurney. The top portion was printed in clear filament resembling glass pipe. The transparency revealed the brain fluid, which appeared to be a strange green chemical attached to the dead body. This solution worked overly well. The brain and pump had always worked with a slightly elevated hip height bag and never leaked prematurely. However, I had unintentionally created a water tower. The brain fluid was suspended higher than the exit height, and there was no stopping mechanism.

It prematurely leaked on the floor for all three performances. At that point, I did not know what was wrong and did not have time to fix it. The solution was to put a white towel on the

ground in the scene; it looked natural. However, we missed the fantastic sound of goo hitting the floor. The audience made audible gasps and gagging noises. A melodramatic and successful special effect was accomplished.

5.6.3 ARM AMPUTATION

Blum decided on a short table for the amputation and suggested a half-kneeling position, leaving the upper knee to push in the trigger. It was the great inspiration I hoped would develop during rehearsal or a workshop. Concept mechanisms are challenging to plan but can become apparent when visually demonstrated. It looked awkward for the actor, but it became smooth and natural after practice. We marked his knee and arms placements, and I finally had a job for the shop to do.

The scene shop prepared the blood spraying table. They removed the tabletop and added hinges to reattach it. A platform was built between the table sides for the blood pump to sit on. Straps were added to hold the pump in place. The hose was carefully aligned and fixed at a precise angle. I designed a 3D model resembling a flagpole wall-mount, proportioned to hold the hose snuggly. It was printed and attached under the pre-drilled hole in the hinged tabletop. The tube was inserted and trimmed flush. The hose remained positioned to spray precisely where intended during every rehearsal and performance.

Stage blood was added to the new weed-spray tank. The tank was hand-pumped to become pressurized. It was hidden in the table, waiting to release its potential energy. Following the first successful blood test on the table, a suggestion was made to paint the table white. This was brilliant because white made the blood pop instantly. I marbled the tabletop, subtly

incorporating a marbled arrow to indicate the direction the blood should spray. The arrow helped the stage crew when they set the table in place.

My favourite rehearsal was the night the trigger on the table stuck and kept spraying even after Joubert died. I wish a melodramatic amount of blood had been used every night. Our stage manager suggested I place a screen over the hose to make the blood spray instead of a stream. It would not work for the finger mechanism because of the plug, and I put it out of my mind. It would have improved this blood effect had I incorporated the suggestion.

The arm gag could have been better with a stronger magnetic connection or another connecting device. There was a night the arm fell out prematurely. I also think the sling could have been improved. The straps were tricky to get into during a quick change. As an audience member I did not notice the prosthetic arm, which I spent considerable time manufacturing to look realistic. The chopping might have been more convincing if the arm had been visible. The finger cap and bone worked remarkably well; if I were to build the chopped arm again, I might develop a mechanical snapping device rather than magnets.

CHAPTER 6: GELATIN

In researching special effects makeup, I came across a thought-provoking line; “Gelatin has been used to create makeup special effects since the 1920s (Debreceni 233).” I assumed this statement was true and theorized that gelatin might have been used in the Grand Guignol Theatre. As stated in the introduction, I have been unsuccessful in finding a literary link between gelatin prosthetics and the gruesome Grand Guignol. Nor have I found resources backing up Debreceni’s statement. However, the possibility is conceivable, safe, and practical for my research.

During my first academic summer of 2021, I began experimenting with gelatin and had positive results. I conducted a practice test by casting a volunteer's arm with Smooth-On’s Skin Tite™, a silicone material formulated for the skin; it is even used to produce full body casts. The practice arm shell was successful, and the arm was reproduced in foamed gelatin. The mould produced was a lightweight prosthetic that looked and acted like human flesh. By the end of the summer, I had several arms and hands to experiment further. It was temperature resistant and would not melt under hot stage lights. The prosthetic also produced positive water resistance but only after several months and loss some skin-like flexibility.

The results were compelling, and I decided to use gelatin to produce *The Kiss of Blood's* special effects. The successful summer prepared me to teach student assistants the application and removal of direct body casting and coach them in foam gelatin replication from the silicone cast. I found that six weeks of curing was not enough time for effective water resistance; close contact with synthetic blood did begin to decompose the material. One gelatin prosthetic did make it into the final show and was effective.

6.1 SUSTAINABILITY

Gelatin is a by-product of the meat industry. After an animal is butchered and the meat harvested, the bones are processed to remove collagen. The liquified collagen protein that emerges is called gelatin. Alberta Beef! A common Alberta slogan. Similar to a famous commercial I watched as a young Idahoan, it began with Aaron Copeland's *Hoe-Down* and Sam Elliot narrating, "Beef! It's what's for dinner (Company)." Most of us eat meat; approximately 88% of Canadians and 92% of Americans (Reinhart). Gelatin is a usable by-product of the industry. Conserving every part of an animal is the best way to honour its sacrifice for our maintenance.

Organic and renewable, gelatin quickly decomposes, making it a responsible environmental choice. Gelatin as a prosthetic moulding medium was appropriate for my thesis goals of promoting sustainability and ecological conservation. During the summer of 2021, I developed a foamed gelatin recipe that was effective on stage. Foamed gelatin provided a less expensive and reusable alternative to common moulding materials, and the ingredients were found locally. Standard moulding products like silicone and urethane-based materials are expensive. Initially, we estimated up to 40 hands for this production run. Traditional products were not practical for the show's budget. Also, these specialty products were more difficult to source because they were not readily available in a hardware or grocery store. Most pertinently, urethane would eventually bio-degrade; however, silicon does not. Gelatin is a bioplastic that quickly decomposes.

Silicone and urethane moulding products are only available through a handful of North American distributors; these specialty items must be shipped to Lethbridge, Alberta. Shipping

increases the product's final cost because it is expensive to ship materials, these materials are toxic and considered hazardous they require special shipping precautions raising the cost. Everything that is shipped collects a carbon footprint, because the vehicles used to transport the items most often use fossil fuels as power. Acquiring new materials can be stressful if a mould or cast turns out poorly. The lack of access can also cause production timeline issues.

Gelatin was found at a local grocery store, and glycerin from the pharmacy. Please refer to Foam Gelatin recipe Appendix: 5. The honey was donated from a local farm because it was several years old and heavily crystallized. It was safe for consumption but less desirable—another aspect of repurposing instead of wasting. Finding local ingredients also reassured the creation timeline; if supplies had run short, they would have been easy to access.

Jell-O™ from the grocery store does not have a high enough concentration for casting prosthetic moulds. Pure gelatin powdered is required. Vegan gelatin substitutes are available but were not tested in this research. Actors were advised of this beforehand, and none involved were opposed.

During my investigation, a basic prosthetic recipe noted that gelatin is re-heatable, a beneficial discovery. If a mould turns out to be inadequate, the mould can be heated in a microwave and re-poured. Gelatin was an excellent source for my finished product, in this case, several replications of the same arm. When the moulding process failed to produce a usable replica, often missed fingers were the culprit. I cut up the faulty model, re-heated the foamy pieces in a bowl and repoured the mould. Silicone and urethane moulds can be used repeatedly but can not be broken down and reused in the same way gelatin can.

For this reason, I used Smooth-On's Skin Tite™ on the actor for Joubert. This silicon product produces a lasting arm cast. Because I was familiar with the product, I knew the actor would be most comfortable using this material. This one silicone mould was used repeatedly. Being familiar with the pros and cons of each material is beneficial when casting moulds. This cast was used over twenty times and is still in working shape. The benefit of repeatedly reusing the mould balanced the larger expense and less environmentally friendly footprint.

6.2 PRACTICAL RESEARCH

The original recipe I experimented with was solid and heavy. A foamed product is less dense, so I worked with different combinations to add air bubbles into the mixture. Yeast or a combination of vinegar and baking soda were suggested in Debreceni's book; both worked once. The one-hit wonders could not withstand repeated heat and negated the reusable element. (Debreceni 233).

I found a video of Adam Savage at the Weta Workshop that I recommended to the shop manager and student assistants in preparation for body casting. In the second part of the program, Weta explained how they foamed urethane. They used a large mixer to whip the liquid urethane until it formed bubbles. I applied that technique to the gelatin recipe, but the mixture would not hold the air bubbles. However, after adding dish soap, the mixture held the bubbles in suspension and remained after cooling. The cooled product was reused by cutting it into roughly one-inch squares and re-heating. When the mixture became too dense, it was warmed and whipped again.

Evaporation occurred during each heating process, changing the consistency of the gelatin compound. The foam became lighter and more firm when the water level decreased. After more than eight re-heatings, the mixture would become sticky and difficult to stir and pour.

This problem was rectified by adding a few teaspoons of water when melting. My summer arm cast would not dissolve easily in water.

I did not appropriately factor in six months of gelatin dehydration. The newer gelatin hand melted like a wicked witch. I hoped that letting the arms cure for a month would be enough time to build water resistance. I had the assistance of several students; they were interested in the process and earned some hours working in the lab and being part of the crew for the show. By the first of February, we had prepared several victorious arms, hoping that would be enough time to cure before the play in March. The curing time helped but was not long enough to keep a prosthetic strong when wet. After rehearsals resumed in April, the prosthetics were not sustainable in a wet environment.

CHAPTER 7: 3D PRINTING

Imagine a hot glue gun attached to a plotter. The plotter moves in circles, creating a coil pot out of glue. This basic description provides an excellent visual of how FDM or Fused Deposition Modeling works. SLA-Stereolithography, SLS-Selective Laser Sintering, DLP-Digital Light Process, and MJF-Multi Jet Fusion are other types of 3D printing outlined in the definitions. I focused on FDM for my research. The description also helps explain that dating the first 3D printer is a difficult task. 3D printing is the culmination of many different manufacturing technologies built upon each other.

The coil pot was an ancient technique used to manufacture substantial clay pots. Layer by layer, the shape was created with cylindrical rolls of clay. Similarly, an FDM printer extrudes heated plastic onto a bed in tiny, flattened coils approximately .2mm in size; size can vary depending on the operator's needs. Layers build to create a 3D shape ultimately.

In the early 1600s, Rene Descartes invented Cartesian coordinates; this system directly influenced the creators of the plotter. Remington-Rand developed the plotter in 1953. A plotter uses a computer to create drawings mapped with X and Y coordinates or horizontal and vertical dimensions. With a 3D printer, the Z-axis is added, creating the third dimension. An FDM printer moves the heated nozzle up .2mm after completing one plane of coordinates. The printer follows an information map called G-code, or Cartesian directions coded for a 3D printer

A computer program called a slicer is required to create G-code for 3D printing. The slicer application cuts the digital STL file into tiny layers. It then translates 3D models into code that moves the printer's X, Y and Z coordinates. The G-code consists of X and Y path coordinates, nozzle and bed temperatures and Z-axis instructions.

Finally, Carl Weller is credited for creating the most important tool known to all crafters, or at least me, the almighty hot melt glue gun (C. Weller). Similarly, the FDM printer melts plastic through a heated nozzle.

In 1980 the first 3D printers began to appear. These $250,000 printers were used primarily in the medical field. Through the 1980-1990s, Paul Traughber was a radiologist in Boise, Idaho; this is a summary of his explanation to me. CT scans were administered and processed to create a digital 3D model. The models were scaled down and printed. Doctors could discuss and practice complex procedures, for example, separating conjoined twins or the best way to remove a tumour. It was a slow, expensive process only used for critical surgical planning (Traughber).

3D printing is generally considered a new and innovative technology. Nonetheless, 40 years in the past hardly seem recent. In the mid-90s, my sister brought home an intricate sphere that can only be described as a three-dimensional snowflake. She explained that on a field trip to the University of Idaho, the class watched a demonstration of their 3D printer. It extruded wet cornstarch to build a model, and she won a draw and brought the model home. I dreamed of the day this technology would trickle down to the average person.

That day came closer into view when RepRap was envisioned in 2004. A forum was created for independent researchers to collaborate on a replicating rapid prototype or RepRap. All of the designs and software for the project were open-sourced and released for free to the general public. Open sourcing helped the innovations grow in a way no starter company could. Any maker could and was encouraged to hack the machine and publish the results. Enlarging the think tank multiplied RepRaps progress.

By 2009 the Makerbot company could produce home-use machines based on the Rep Rap innovations. These machines were becoming affordable to consumers. Alternatively, you could follow the supply list and instructions, download the free files and build one for around $200 (Jones). These coders were ambitious and had strong computing skills.

Ten years ago, a popular theory surfaced; 3D printing would be the next industrial revolution (Broadcast and Films Media). The 3D printer was supposed to become as relevant as a microwave, but it did not. Many factors could have contributed to the general lack of interest, but I believe it came down to printers being more complicated than plug-and-play. Push-button microwaves do not require creative problem-solving. An artist or a creative maker must develop a 3D print effectively. A 3D print model requires specific decisions, which will change depending on the printer, model and end-use.

To illustrate, here are some complex situations that regularly arise. The printer's build plate restricts the size possibilities of a potential project. If the maker needs a larger size than the build plate, the maker must creatively cut and join to complete the project.

Additionally, a 3D printer can not print in mid-air. The slicing program can reduce this problem. Infill and support material can be added to print models with overhangs of more than 45°. Printed inside, the infill creates connections within the model, supporting the top, and preventing collapse. The infill can also be manipulated to change the density of an object. A low 5% infill creates a lightweight, filament-frugal, delicate and fragile model. 90% infill uses a large amount of filament and adds weight and strength to a model.

Finally, like a beam bridge that suspends a road, the support material prints outside the model and grows until the actual print can begin. Generally, the same filament is used to

generate both the support material and model; the support material is lightweight and printed to break away quickly after a print; this is waste material.

7.1 SUSTAINABILITY

PLA, or polylactic acid, is the most popular filament material for FDM printers. In the first RepRap experiments, PLA performed better than other plastics like ABS, PCL, acrylonitrile butadiene styrene, and polycaprolactone, respectively (Jones 185). PLA is a bioplastic; its hottest tagline is "biodegradable." There is debate concerning the biodegrading properties of PLA. Compostable and degradable are more accurate terms, meaning that in proper conditions with enough heat, PLA breaks down, but simple soil and bacteria are not enough (Muniyasamy et al.). However, I think the most underrated benefit of PLA is that it is made of corn. Petroleum-based plastics are non-renewable and have a harmful carbon footprint. Corn renews every year, and its natural growing process reduces carbon.

PLA was used in most prints during my research; however, I also used PETG. PETG has a higher melting temperature and is generally more rigid. It is polyester, a safe, clear plastic, and is better known for making pop bottles.

Plastic bottles can be chopped, melted and extruded into filament for an FDM printer. Failed prints or discarded support material can be reclaimed as well. Filabot sells a filament recycling kit for $18,990. That is not cheap for an individual but could be a lucrative recycling business or added to a print mill studio to eliminate waste (Filabot).

When we create a part or model locally, we become less dependent on other countries to make everything for us, saving time and money. It may take a day or two to print a part, but that is still faster than having the manufactured part shipped across the ocean. Alternatively, the piece

becomes far more expensive for prompt shipping. A part sent around the world also has a larger carbon footprint because it has to be transported. Decreasing the amount of travel by cargo ships, trains and automobiles can benefit the environment because their emissions decrease when the vehicles are used less frequently.

The best thing about 3D printing is that I can make exactly what I need. Sometimes this required me to build a model in Rhino using callipers, carefully measuring details. I love the ability to imagine a tool in my head and sculpt it digitally. Then the print started, and when I returned in a few hours, my vision had materialized. Designing in Rhino is a skill I am grateful to have had the opportunity to learn during this research process. However, I do not design everything I print.

RepRap defined the 3D printing world we now live in by promoting open-sourced research. A worldwide 3D printing community has developed and generally embraced the open-source concept. Thingiverse is a website archive of over 2.3 million “things” (MakerBot). “Things” are open-sourced STLs. STL is short for Standard Triangle or Tessellation Language; it is the name of a file format used for dimensional computerized models. 3D STL models are created by community users and freely shared with everyone. Like the idea behind RepRap, users are encouraged to download and modify models and urged to track their evolution (MakerBot). That is only one website; there are many more 3D archives, and not all are free. I know a model of my favourite video game sword is next to a fancy toilet paper dispenser.

7.2 PRACTICAL STUDY

I had never used a 3D printer before May 2021, and my only knowledge came from watching others' suggestions and reviews on YouTube. Angus Deveson, a University of

Technology Sydney graduate, was the best teacher for learning 3D printing basics (Deverson). Because technology has changed so quickly, YouTube was the best resource for hands-on learning. Some peer review articles cover 3D printing, but they only cover the past.

I knew that I wanted to be able to design the items I needed to print. I signed up for a 3D manufacturing class in the Art department. We learned to use Rhino. It was slow and frustrating, but the class helped keep me on track. Due to Covid, the class was through Zoom. We designed a lot but did not get to see anything practically produced. To progress, I needed a finished tangible product to apply the theory I had learned. I watched the most current YouTube reviews on 3D printers, applied for grants, and was able to purchase my first 3D printer. Unfortunately, I would not consider myself a computer expert, so I chose a higher-rated, more expensive printer. As suggested by Angus, I bought the Prusa MK3S+ in hopes that it would eliminate many of the technical struggles I had learned about through videos.

To further understand, I ordered my printer as a kit instead of an entirely constructed machine. This option was beneficial because I felt confident to do it independently when I needed to fix issues. Prusa also has good customer service, and they have helped me walk through troubleshooting through photos. Learning through mistakes and experience was the most valuable way to grasp 3D printing.

In order to develop my basic skills in Rhino, I started a personal project. I wanted to 3D print a spinning wheel; it was a challenge. I learned so much that I would not have understood without practice. The project was large; I could design the parts according to the size of my print bed. The parts would then push together to create the entire wheel. The wheel was printed and beautiful. More importantly, I developed many modelling skills in the process.

The other project I wanted to experiment with was based on my felting research. I did not know how to build a wooden hat block and could not purchase the design I wanted. I wanted to recreate Philip Treacy's Beauxbaton hats from the Harry Potter Series (World). By using photographs, I was able to sculpt the shape in Rhino and print it. It was the most practical way to create this form. An added benefit is that the plastic is waterproof and will not deform when wet. However, I did learn the hard way that because PLA has a low melting temperature, it can melt in the sun. I plan to use PETG for hat blocks in the future.

With wool, I could felt four matching hats and get photographs of girls wearing them. This fulfilling project combined two of my research projects, helping prove the usefulness of both materials. See figure 43.

Another significant proof of the benefits of 3D printing began when I volunteered to help another designer. She required face casts of all the actors to make masks for her production, *The Masque of the Red Death.* I believed we could 3D scan a person's face and 3D print a face form more efficiently than taking face casts. I had successfully done one for myself. I volunteered for the job. However, the production team did not understand the process and decided to proceed in a different direction.

The costume shop team used alginate and plaster bandages for the face casts as recommended by the University. Half of the castings failed to produce a working plaster positive. The plasters were not deep enough or not enough forehead or chin was captured; many noses were squished badly. I did not help with this process. However, it was incredibly messy and time-consuming; each actor's cast took an hour of work for two people. There was also a lot of waste material after the process; the alginate and plaster backing created a large amount of waste. The actors spread Vaseline over their faces and covered their entire faces in alginate until

it was set up; it was a claustrophobic process. The process was threatened to be repeated on the actors whose mould did not turn out.

I had previously taken a body scan of the actress playing Hélène for the dress, I was working on. I had done her face as well, so I printed her face to prove it could work and calculate the cost. The twelve-hour print failed halfway up her face, and I was heartbroken, thinking that I would not be able to help. Nevertheless, there was a simple solution: I could slice the STL where the print stopped and glue it onto the unfinished piece. A failed print cost about five dollars and looked better than the good alginate prints. I gave the print to the other designer, and we soon had permission to 3D scan the actors who needed improved face moulds.

The most extensive scan took fifteen minutes. The actors were thrilled to be done quickly and without a mess. I used several programs that converted the scan into an STL, cut up the form in Rhino, and sliced it on the Prusa slicer. This process also took about 15 minutes. Depending on the size, they take 8-13 hours to print, but the technology has improved enough that if I watch the first layer go down successfully, I can print them overnight. I had one other print fail due to a plugged nozzle, but it was quickly remedied, and seven facial prints were done in a weekend. That one failed print was the only waste, 3D printing was more economical than I had anticipated, and the waste was minuscule compared to the casting process.

7.3 3D PRINTS

I will analyze most of the 3D printed pieces used in the show in other places of this document. Here is a comprehensive list of the items with a short description.

- Face positives for seven people. See figure 44.
- Brain special effects include the halo, bolts, brain and skull. See figure 46.
- The Victorian hand saw was designed for the medical team based on images of a hand-powered drill and a treadle sewing machine. See figure 47.
- Hélène's embellishments for her dress. See figure 47.
- The lava lamp disguise is printed to help the lava lamp appear as part of the machine. See figure 47.
- Brain fluid container held liquid set at a distance to appear as part of a mad science experiment. See figure 27.
- Angled hose mount used to direct blood spray.
- Case for the finger amputation device contained the pump, battery, and switch.
- Clear buttons, printed for a transparent lighting effect on the mad science machine.
- Chloroform mask design based on original masks from 1920.
- Hat block used to create Volguine's hat.
- ½" scale model of the set for *Kiss of Blood*.

CHAPTER 8: WOOL FELTING

Initially, my graduate research focused on wool felting as my anticipated role was to support puppet creation in Jim Henson's *Muppets* style. I spent time and resources researching a variety of sheep breeds and the characteristics of their wool. However, due to Covid restrictions, my responsibilities were reassigned to *The Kiss of Blood,* where the script did not exude felt-inspired design. However, I managed to weave in my nearly completed felt research by constructing a woollen felt hat that Dr. Volguine wore in the second act.

This breed study revealed the most productive sheep fleece for felting projects. Adhering to my efforts to embrace conscious design, I specifically identified Alberta-raised sheep breeds for my needs. However, the research can benefit many felt makers worldwide.

8.1 RESEARCH

Felting is a process in which wool is agitated while wet; this technique creates a naturally compacted fabric web. This method was used anciently by European and Asian people. Felt can have many uses due to its ability to create and hold shapes seamlessly. Wool is biodegradable and sustainable, as it comes from sheep that naturally reproduce. Though it is known for its warming ability, it is more breathable than synthetic fibres.

Wool fibres are the hair of animals; the most common wool is shorn from sheep, goats, and camelids. Less common fibres are obtained from bison, dogs, mink, and rabbits (Robson and Ekarius 1). An electron microscope can observe five layers within an individual wool strand. However, the most significant layer to study for felting was the epicuticle. The epicuticle is the outer shell of the fibre made up of Keratin. The epicuticle forms triangular layers, similar to fish scales (Castelli 3:25).

When wool is rubbed together, the scales on the epicuticle grab like Velcro hooks and cling to one another. In comparison, artificial fibres are mechanically extruded; therefore, they are sleek and do not have multiple layers like wool. When hot and cold water treatments are combined with agitation, a lofty batt of wool can be felted into a naturally bound web of sturdy fabric without weaving or knitting. There was an irony in this method. The "hot and cold shower" effect from the Grand Guignol has been expounded throughout this work (M. Gordon 16). Wool reacts in hot water; hair scales open up and relax; conversely, the scales clamp tight in cold water.

The oldest pieces of felt found were estimated from 1500-1000 BC (B. Gordon 20). Most anthropologists believe that felt was likely discovered by accident when sheep were first domesticated near 8000-11000 BC. The lack of older specimens is evidence of wool's biodegradable properties. Ancient people wore the cured skins of animals, and it is only logical to assume that humans wearing a full sheepskin in cooler climates would notice that felting, with wear, would occur (Eiland 4). One reason, it was assumed, is that historically felting is unknown in Africa (Laufer 1). The warmer climates produced animals without fleece. Oddly though, American anthropological research has yet to find evidence of felt being used anciently on either the North or South American continent. It seems strange because South America has a rich history of domesticating wild vicuna and guanaco; the modern-day alpaca and llama, respectively, are their descendants (Robson and Ekarius 364). Eiland suggests that a reason felt has not been found in the Americas would be similar to the ancient Chinese. Nomadic tribes of Asia commonly wore wool. These migrants periodically attacked the settled Chinese farms and cities. Therefore, felted wool was negatively associated with Nomads, who were perceived as unsophisticated and disruptive (Laufer 4).

Moreover, renowned anthropologist Berthold Laufer, known for his studies of the Asian continent, published *The Early History of Felt* in the American Anthropologist in 1930. Laufer believed that felt began in the plains of present-day Iran and Turkey. Another name for this location was "The Fertile Crescent," where most historians agree that modern civilization was born. In his research, Laufer explains the earliest text discovered discussing felt dates in AD 399, written by Fa Hien, a Chinese pilgrim. Laufer surmised that Mesopotamian expertise in the manipulation of felt was far more advanced than in other world areas; this was evidence of the antiquity of felt in that region (Laufer 9).

The art of felting was most likely spread by the nomadic tribes throughout the Asian continent. Murray Eiland III illustrated this conclusion by sharing archeological evidence of the same patterns moving across the continent. The specific "spirals and waves" pattern was found on felt in Scythian burial sites in Pazyryk, the far western corner of Mongolia, and Noin-Ula in mid-northern Mongolia (B. Gordon 21). Duplicate patterns are concurrently found in Chinese ceramics and Turkish coins. Makers in Hungary and Kashmir continue traditions of beautiful felted rugs to the present day, with similar "spirals and waves" designs (Eiland 1).

Early Asian Nomads began using felt commonly before 300 BC; it became quite a commonly used item through dispersion. Felt is quite versatile and was used for sleeping mats, tents, doors, hats, boots, blankets, ponchos, and mittens, and it was also used for robes to protect from extremes in both summer and winter (Laufer 7).

Laufer described a less functional use of felt idols. Felted sculptures were used as religious symbols. By symbolically feeding their felted god sculpture, they gave thanks for their meal, similar to how many today would pray to God for the bounty they receive. He quotes

Captain John Smith in an excerpt from; *The True Travels, Adventures, and Observations of Captain John Smith into Europe, Asia, Africa, and America From Ann. Dom. 1593 to 1629.* Smith explained the migration camping habits of the Scythians:

> [T]hey place the Master always towards the North; over whose head is always an Image like a Puppet, made of Felt, which they call his Brother; the Women on his left hand, and over the chief Mistriss her Head, such another Brother, and between them a little one, which is the keeper of the House; at the good Wives Beds-feet is a Kids Skin, stuffed with Wooll, and near it a Puppet looking towards the Maids; (Laufer 16)

This discovery was particularly fascinating because it can be similarly used today. Though Iron age tribes may have used the felted dolls for idol worship, one can parallel the representations of the self in the present day on stage in the form of puppetry. In the Grand Guignol, the actor becomes the puppet, maimed and mutilated for amusement. Alternatively, on Sesame Street, puppets represent children; this brings the adult down to the child's level. The puppet is not seen as an adult by the child; therefore, mature discussions are more manageable for the child to assimilate (Wein et al.). As the Scythians made representations of their Gods, perhaps to understand and feel closer to them.

8.2 SUSTAINABILITY

Wool is a renewable resource grown from sheep and is biodegradable; ask the sweater moths. Luckily, those moths die in the cold; we do not have many in Alberta. With a small quantity of heat and water, wool composts well and is added to gardens to nourish and retain water. Wool is also not a petroleum-based fibre like polyester, nor does it use harsh chemicals to manufacture, like the production of rayon. Unlike most other materials, it is naturally fire-resistant without chemicals. Moreover, it is breathable compared to synthetic textiles.

Every inhabitable continent harbours sheep; North America has fewer sheep than all others. Wool can be found locally in Alberta. Therefore if we can find local wool, the chance is high that anybody can acquire local wool globally. This fact benefits us and the world in several ways.

Buying wool from local farmers keeps money within our communities and strengthens our local economy. Neighbourhood wool minimizes the carbon footprint of the materials we use. Textiles are transported by land and sea often and significantly contribute to carbon accumulation. Here is an example of hypothetical travelling textiles. Beginning with cotton grown in the USA, it could be shipped to Argentina to be cleaned and spun. The yarn then might be sent to China for weaving or knitting into cloth. The cloth could then be transferred to Korea for fabrication. And then back to the USA, where it could be custom silk-screened and sold to European shops. The shirts we wear have probably travelled more than most of us will in a lifetime.

Wool is often a bi-product of farm animals used for milking or meat. It is similar to the story of leather; using the cow's hide efficiently uses as much of the animal as possible. It can be disrespectful to waste a usable part of an animal after giving us its life to sustain our own.

However, sheep can provide many beautiful wool coats without harming animals in milk and wool production situations. Contrary to popular belief, wool production is not a slaughter industry. There is no reason to kill a sheep which would produce another beautiful fleece the following year, repeating for approximately ten years. Most sheep need to be shorn. The animals have been bred to produce excess wool. Therefore in the warmer months, they get a trim.

Wool is not initially clean; it has vegetable matter, or VM, including everything from small hay or sticks to droppings. The wool is skirted to remove chunks not worth cleaning; these pieces are composted. Then the lanolin needs to be removed. Lanolin is a naturally produced sheep's oil to keep water from absorbing into their coat. Wool is carefully soaked with hot water and dish soap so that it does not felt. In hot soapy water, the lanolin melts and washes away. It takes some time to wash wool but is very inexpensive to accomplish.

Another option is to purchase prepared wool from local mills. There are two local mills in Alberta as of 2022; *Custom Woolen Mills Ltd*. near Carstairs and *Rosebud River Fibre Mill* in Rosebud (Martin) (Fen Roessingh). The mills clean and comb wool using industrial machines without requiring long distances or repeated shipping. This step can save time and remains inexpensive.

The wool used for the Volguines hat was purchased from a local source in person and cost less than $6. This project limited the carbon footprint and supported local farmers. The hat was made with human hands, and it could biodegrade back to the earth in a short time if left to mother nature.

Time equals money in felt manufacturing. Dave and Connie Carlson, the local sheep shearers, sell meter square sheets of manufactured felt for $70; they weigh 21oz (Carlson). To make the same by hand, using wool from *Custom Woolen Mills* would cost $31.50 and one and a half hours of hand felting time. Wool from a local farm would cost $5 and take three hours to clean, and felt a similar sheet of felt. The project design would also affect these scenarios. For example, the hat created for Volguine could not have been made from manufactured felt because

sculpting a detailed hat shape requires wool in a pre-felted form. However, some projects may not require as much flexibility, and a manufactured sheet of felted wool could be purchased.

8.3 PRACTICAL APPLICATION: FELT STUDY

The first question I asked was: what kind of wool will felt the best? There are over 1,000 different breeds of sheep and even more mixed breeds: different varieties of sheep wool have various felting capabilities. The second question was: what other animal fibres can be used for felting? Third question: what kind of wool is most accessible to me? Many local farmers have wool available, and there are many resources online. The objective here was to find the best fleece for the job.

This artistic research is based on *The Fleece and Fiber Sourcebook.* Deb Robson, the co-author of the book, explained that she is often asked if certain types of wool will felt; her usual answer is, "test it and find out." (D. Robson) The book overviews over 100 sheep and more than 25 other animals. The Sourcebook's goal was to inform an English-speaking audience based on wool availability for that audience.

The *Fleece and Fiber Sourcebook* classifies only a handful of wools by felting characteristics:

Good felting wools:

> Cheviot Family, Border Leicester, Gulf Coast Native, Rambouillet, Finnsheep, Ronaldsay, Cormo, Ile-de-France, Karakul, Targhee, Whitefaced, Woodland, Gute, Pellsau, Racka, Bison and Yak

Non-felting wools:

> Suffolk, Mohair-goat, Cashmere, Bactrian Camel, Possum, and Qiviut-Musk Ox

I designed an experiment to find the best felting wools. I hand-tested as many different fleece breeds as I could find from the list provided in the book. If the fleece breed proved too tricky for me to obtain, then the fleece does not meet the criteria of accessibility.

I took approximately 200g of fibre from every breed of animal I could acquire from the list in the *Sourcebook*. This fibre was used to create samples for cataloguing. The fibre was hand spun into a sports-weight yarn or approximately 2.75mm in diameter. The yarn was then Navajo plied; an elongated chain stitch was used to create a three-ply yarn. The completed yarn was used to create catalogue samples for testing. Each catalogued fibre included a Fibre Sample, a Yarn Sample and a 4"x4" Woven Sample.

The remaining yarn yardage was woven into a testing strip. The strip was prepared on a table loom using 40 warp strands of Pendleton woollen yarn. The set was 5" at DPI (Dents per inch). Each wool breed was woven into the prepared warp and spaced with coloured waste yarn. The preferred sample length was six to seven inches; however, some samples were limited by supply and were as small as four inches.

Some samples were not tested for felting because the cost made them impractical. For example, James Meservy, a muskox farmer in Mountain View, Alberta, sells Qiviut for $200oz. Qiviut is not supposed to felt; therefore, I only acquired enough sample fibre to catalogue a small woven square.

Currently, fifty different sheep and fourteen other animal fibres have been collected. Because each sample varied, measurements were taken individually before and after the felting process. The woven samples were washed twice in a standard washing machine with soap and hot water, dried on high heat, washed once more, and then dried again. Enough felting occurred during the process to be able to analyze the results. The measurements were recorded in a table along with the amount of shrinkage. Please refer to Appendix: 1. The square inches of the

washed fibre, divided by the square inches of pre-washed fibre, times 100, calculates the percentage of shrinkage; the lower the number, the better the felt ability.

$$[\ (WL \times WW) \div (PL \times PW)]\ 100 = \text{Shrinkage Rate}$$

Even though each breed has specific characteristics, they can also vary from sheep to sheep and year to year. This test is not definitive; however, it is a guideline to help pick the best wool for felting according to budget and availability.

When purchasing wool online, it is easy to find Charolais, Cheviot, Corriedale, and Merino. Trusted sites like Paradise Fibers, Kansas Yarn Barn and Woolery provide these wools at premium quality. However, buying this way can be expensive due to the cost of processing and shipping, particularly when a large quantity is needed. Imported, highly processed wool does not fit the criteria set for my thesis goals. I obtained several of my fibre samples from these websites; nonetheless, they served as a comparison guide for locally sourced fibres. Developing a broad range of statistics aided the fibre assessments.

Looking for local sources aligned with my directive was more beneficial. Many hobby farmers will have breeds with usable fleeces; the wool can be purchased reasonably. Before it can be felted, some care must be taken to remove VM from the fleece. Also, if the fleece is very "greasy" or full of lanolin, it may need to be washed with hot water and soap. However, the felting process also uses hot water and soap, so this step is not always necessary.

Finding other local fleeces became part of my mission. Without much trouble, Alpaca, Baby Doll, Columbia, Polypay, NC Cheviot and Rambouillet were located on small farms within 80km of Lethbridge, Alberta. There are also a couple of woollen mills in Alberta that sell

cleaned batts, which can be purchased reasonably. Custom Woolen Mills in Carstairs had East Friesian, Este Laine, Hampshire, Ile de France, Merino and Rambouillet readily available (Fen Roessingh). Rosebud River Fibre Mill said they often get Alpaca, BFL, Gotland, Icelandic, and Longwool crosses (Martin).

Through spinning, weaving and felting different breeds, I have found that the best felting wools are typically fine and very crimped. These wools include Merino, Targhee, Camel, Este Lane, Hampshire, Ile de France, Navajo Churro, Polwarth, and Rambouillet. Most wools do felt the biggest surprises were Icelandic and Karakul. These wools were thick and hair-like, but they still had the remarkable ability to felt, though usually, such characteristics resist felting. A few fibres that felt very little, such as Suffolk, can be used as naturally washable wool. Washable wool would be valuable for knitted socks but not for felting.

8.4 WORKSHOP

Wool can be felted into many different shapes. It can be moulded from a two-dimensional shape into simple 3D forms. Like fondant folded over a cake, wool can be moulded over a form. The wool will hold its new shape quite well but can be strengthened with lacquer. Felt is commonly moulded into hats.

Our actress's larger head made it difficult to pull an existing cap; our stock hats were vintage and ran in smaller sizes. An opportunity was provided to incorporate traditional felting skills and newer 3D technology. I took the 3D file of the actress's head and developed a felting form in her size and desired shape. Traditionally these blocks are carved out of wood; with the help of my 3D printer, I was able to print the form while working on other projects. The structure took approximately 48 hours to print.

I had been encouraged to design projects but not make them all myself. Many people do not know how to felt. During the ULFA strike, I offered a workshop on campus, inviting people to learn the skill. Students from theatre tech, my fellow grad students, and the costume shop staff, none of whom had hand felted before, were invited to participate in the workshop. Those who attended the workshop produced simple samples and helped create the final hat piece.

Considering accessibility, felt-ability and affordability, I chose Hampshire wool which met all the requirements. It was processed in Alberta at Custom Woolen Mills; it tested at 61% shrinkage, a good score, and $24 per lb. The hat was not more than 4oz and cost about $6.

The wool was pre-dyed and hung to dry in preparation for the felting workshop. Water is a crucial part of the process. I prepared for a watery mess with several towels and tubs for containment. The students laid out a sheet of no-slide shelf liner, four times as large as the project, placing the resist in the bottom corner. The resist was a flat pattern cut from 1/8" craft foam in a dome shape. The resist was a simple shape to create the pre-felt on. Pre-felt is when wool fibres are sticking together, but it has not yet become one. We began by pulling small squarish tufts from our pre-dyed wool to open up the fibres. Then layered them like shingles over the resist, once vertically, then horizontally. Folding half the shelf liner, we carefully flipped the resist to cover the other side. We folded the fibrous edges over the empty side of the resist and repeated the shingling process. This layering process was repeated on each side three to five times.

The shelf liner was folded around the wool and resist and placed in a waterproof tub. Hot soapy water was applied and agitated. The modern process is done the same way it was thousands of years ago; however, we replaced bamboo mats with shelf liners. Once the fibre was

soaked, it was placed flat on a towel. We massaged the project, moving over the liner in circular motions. The small bumps on the shelf liner mimic hundreds of fingers agitating the wool. Felting takes time; after five minutes, the wool was secure enough to flip, and agitation began on the other side. After a few turns of this process, the felt began holding its shape well.

We then rinsed the felt piece in hot and cold water. This process opened the scales on the wool and created more cling. The final body needed to be moulded onto a form. We removed the resist and spread open the pocket it left behind. The wool was in an appropriate pre-felted phase, and we placed it over the hat mould to finish the felting process. The process was similar, rubbing and moulding with our hands and working with the shelf liner. We repeated these motions until the felt became stable and held the desired shape. It took about an hour to complete the felting. When the felt had achieved the required hat shape and the brim was laid flat, it was left to dry in place over the weekend or 4-5 days. Excess felt was trimmed to create a sharp-edged brim, and the edge was bound with bias tape. The costume staff was eager to learn a new skill with their hands; they were fascinated to make fabric from fluff grown from a sheep. They were excited to get more wool and continue the practice.

8.5 ANALYSIS

Felting for the first time is tricky to grasp and takes practice. There were a few thin spots on the hat produced by the students. I needle-felted the spots to make them sturdier. The hat was then finished with a bias trim along the brim. A few felted flowers were hand sewn on the hat for the final embellishment.

I was pleased with the results; it fit the actress for Volguine, with a few minor adjustments to pull up the brim. The colour was brighter than expected, but it drew attention to

her face. One of the biggest problems I see as a designer is the general lack of felting knowledge. Though I am happy to teach felting, finding crew members with experience in this area may be difficult.

For a moderately experienced felter, this hat could be created in three manual labour hours and cost less than $6 in materials. Another benefit of this method is the ability to form mould and shape the hat before it is completely felted. The maximum control is available when the wool is in its raw form

There are a plethora of variables when it comes to felting, making it difficult to quantify. However, wool can be found locally, we can help support our farmers and eliminate some shipping emissions, and ultimately the wool is biodegradable. Felt may be a bit niche but valuable because it is a sustainable and environmentally friendly resource.

It may seem that there is an overabundance of felt research concerning the amount of felt that made it into the production of *The Kiss of Blood*. I was initially assigned to work on a show for children. I expected to focus on making puppets from wool for my thesis project and spent a year studying wool. Covid restrictions caused difficulties, and the faculty had to pivot the show production schedule, and my project was reassigned to *The Kiss of Blood*. These challenging years have provided great learning opportunities. I wanted to incorporate all of my research; the felted hat proved to be a good link that tied the sustainability of wool to my project on *The Kiss of Blood.*

CHAPTER 9: CONCLUSION

Working on this degree was a harrowing experience. I love to work and give my all. Being stuck through Covid and constantly waiting for the unexpected was taxing. Balancing my research and life with the threat of constant upheaval and varied pivots was mentally exhausting. I did not mentally cope well and adding the ULFA strike felt devastating. I believe my outcomes would have been better in an alternate reality. As the strike dragged on, the costume shop became more confident that a show would not be possible, we all lost ambition, and the work became mediocre. However, I am proud of my research and am striving to focus on the positive opportunities I had.

This project helped me focus on the environment and economy around me; locally sourcing supplies was challenging but also opened doors for knowledge. Shipping from Asia was not dependable during the Covid crisis, so being able to pivot was crucial. This crisis provided extra opportunities to be inventive and flexible. Local fabric choices were limited, making colour selection slightly frustrating but also a simple choice.

Shipping wool from Australia was costly. Making relationships with local sheep, goat and alpaca farmers and learning from their hands-on knowledge was priceless. It was a highlight to teach the seamstresses how to felt wool, which they had never done before. We had so much fun learning together and created a unique hat for the show.

The study of 3D printing was also based on local sourcing to become less dependent upon foreign resources. PLA filament is made from plant base material, with carbon dioxide reduction at its core. Most of my PLA filaments were made in Canada or the USA. PTEG from

pop bottles is recyclable from home, with a few 3D-printed models readily available online.

RepRap building the first home-based 3D printers was a phenomenal collaboration project. A giant pool of community knowledge has been collected and refined. Most importantly, it is open to the public, unlike much research in the scholastic community. I am grateful for open-sourced knowledge based on scientific evidence and genuine experience.

Interestingly, during Covid, when biochemists hurried to develop effective vaccines, the scientific world broke down publishing barriers by openly sharing their data to improve as quickly as possible. This collaboration of open community knowledge speed up the development of life-saving vaccines. There were no egos as big as saving the world. Perhaps some of the blinding paywalls will remain toppled (Isaacson).

I am satisfied that I was able to fulfill my requirements. I loved the research and learning. *The Theatre of the Grand Guignol* was a fascinating subject to study. I, like most of humanity, am fascinated by the macabre. I enjoyed being able to design in a melodramatic style. The posters of unbelievable gore were inspirational. It would be fascinating to design more for this theatre genre. I did not get enough blood to satisfy my imagination. However, I did gain experience in the design and production of staged liquid.

Working with the costume shop to realize my renderings were equally satisfying. The costume shop was a refuge of normalcy through the inconsistency of this process. The shop remained more reliable than any other place on campus. I loved being in the creative atmosphere and working with my hands. I enjoyed talking with the ladies who spoke the language of a maker. I have enjoyed this research. I will continue to develop and share what I have learned,

and most of all, I will keep creating.

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APPENDIX 1:

Table 1: Breed Specific Felt Study

Breed	Prewashed			Washed x3			
	Width	Length		Width	Length		
Column1	**Column2**	**Column3**	**Column4**	**Column5**	**Column6**	**Column7**	**#VALUE!**
							#DIV/0!
Arcott	4.625	5.625	26.015625	4	5.25	21	80.7207207
Baby Doll	4.5	6.5	29.25	4	6.25	25	85.4700855
Badger Faced	4.9	6	29.4	3.5	5.4	18.9	64.2857143
BFL	4.75	4	19	3.2	3.25	10.4	54.7368421
Border Leister	4.625	5.5	25.4375	4.5	5	22.5	88.4520885
British Milk	5	7	35	6.1	3.3	20.13	57.5142857
Camel	5	6.75	33.25	3.5	6	21	63.1578947
Camel Low	4.75	7	33.25	4.75	6	28.5	85.7142857
Cashmere	4.75	7	33.25	3.2	5.75	18.4	55.3383459
Castlemilk Moorit	4	5	20	3.625	4.625	16.765625	83.828125
Charollais	5.25	6.1	32.025	3.9	5.75	22.425	70.0234192
Cheviot	4.9	6	29.4	3.75	5.75	21.5625	73.3418367
Columbia	4.25	2.75	11.6875	3.5	2.125	7.4375	63.6363636
Coopworth	4.375	6	26.25	3.75	5.5	20.625	78.5714286
Cormo	4.25	10	42.5	3.25	9.5	30.875	72.6470588
CVM	4.8	7.75	37.2	3	6.9	20.7	55.6451613
Derbishire Gritstone	4.5	3.5	15.75	4.25	3.25	13.8125	87.6984127

Devon	5.75	5	28.75	5.5	4.75	26.125	90.8695652
Dorset Horn	5.25	6	31.5	3.6	5.6	20.16	64
East Fiesen	4.75	7	33.25	4	6.3	25.2	75.7894737
Eider	4.8	5.6	26.88	3.75	5.25	19.6875	73.2421875
Este Laine	4.5	7	31.5	3.5	6.4	22.4	71.1111111
Finnish	5	5.75	28.75	3.75	5.6	21	73.0434783
Gotland	5	5.5	27.5	3.75	5.25	19.6875	71.5909091
Grey Suffolk	5	5.75	28.75	3.75	5.4	20.25	70.4347826
Gulf Coast Native	4.6	8	36.8	3.2	6.75	21.6	58.6956522
Gute	4.5	6.125	27.5625	5.5	4.125	22.6875	82.3129252
Hampshire	4.6	7	32.2	3.25	6.25	20.3125	63.0822981
Hill Radnor	4.5	9	40.5	4	8.75	35	86.4197531
Herdwick	5	5.2	26	4	4.8	19.2	73.8461538
Icelandic	5	4.75	23.75	4.25	4.25	18.0625	76.0526316
Ile de France	4.25	7	29.75	2.3	6	13.8	46.3865546
Jacob	5	6	30	3.75	5.75	21.5625	71.875
Karakul	4.9	6.5	31.85	4	5.5	22	69.0737834
Kent Romney	4.9	6	29.4	3.9	5.5	21.45	72.9591837
Llama baby	4.375	4.5	19.6875	4.25	4	17	86.3492063
Lleyn	4	4.25	17	4	3.75	15	88.2352941
Leister Longwool	4.9	7	34.3	4	6	24	69.9708455
Lincoln	5	5.8	29	4.4	5	22	75.862069
Manx	5	6	30	3.9	5.5	21.45	71.5
Masham	5.1	3.5	17.85	4.5	3	13.5	75.6302521

Merino	4.1	5.9	24.19	2.9	5.4	15.66	64.7374948
Mohair	5	7	35	4	6	24	68.5714286
Navajo Churro	4.5	7.25	32.625	2.9	6.5	18.85	57.7777778
Perendale	5.1	4	20.4	4.25	3.75	15.9375	78.125
Polypay	4.175	1.75	7.30625	4.25	1.375	5.84375	79.9828914
Polworth	4.8	6	28.8	3.25	5.35	17.3875	60.3732639
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Pygora	4.875	3.75	18.28125	4.5	3.375	15.1875	83.0769231
Rambouillet	4.75	6	28.5	3.25	5.5	17.875	62.7192982
Ronaldsay	4.5	6.625	29.8125	3.875	6	23.25	77.9874214
Shetland	4.75	5.75	27.3125	3.5	5.5	19.25	70.4805492
Soay	4.5	6.375	28.6875	4	5.875	23.5	81.9172113
South Down	5	6	30	3.75	5.6	21	70
Suffolk	4.5	10	45	4	9.5	38	84.4444444
Swaledale	5.1	5.9	30.09	4.3	5.25	22.575	75.0249252
Targhee	4.5	6.9	31.05	3.5	6.25	21.875	70.4508857
Teeswater	5	6.2	31	3.9	5.5	21.45	69.1935484
Texcel	5.1	6.5	33.15	3.75	5.9	22.125	66.7420814
Tunis	4.9	7.25	35.525	3.5	6.75	23.625	66.5024631
Wensleydale	5.1	5.5	28.05	4.5	4.9	22.05	78.6096257
White Welsch	4.9	6	29.4	4	5.5	22	74.829932
White Faced Woodland	5	5.25	26.25	3.6	5.25	18.9	72

Yak	4.75	7	33.25	3.5	6.75	23.625	71.0526316
Zwartbles	5	6	30	3.8	5.75	21.85	72.8333333

APPENDIX 2: STORY BOARD

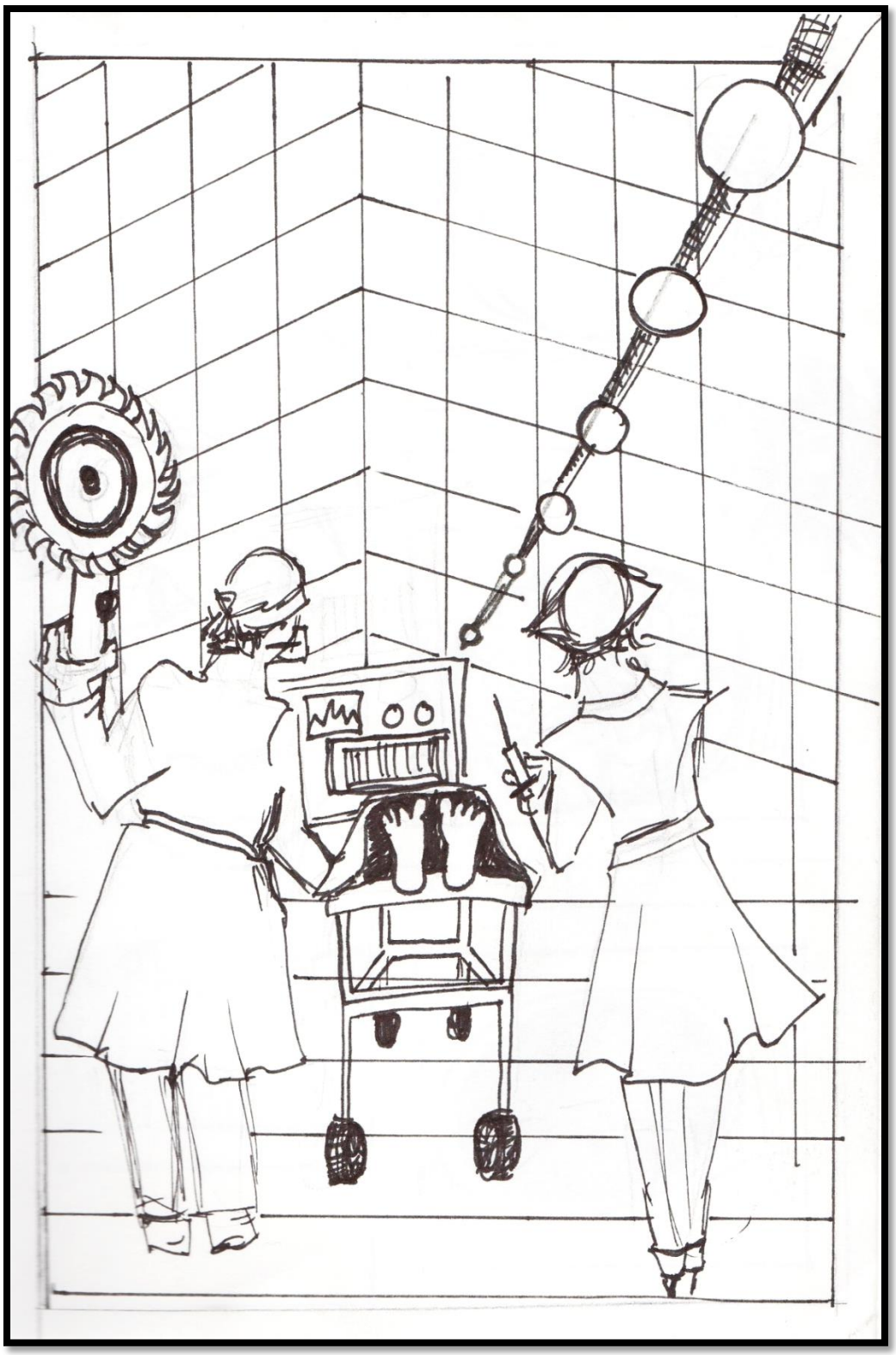


Figure 1: Kiss of Blood Storyboard

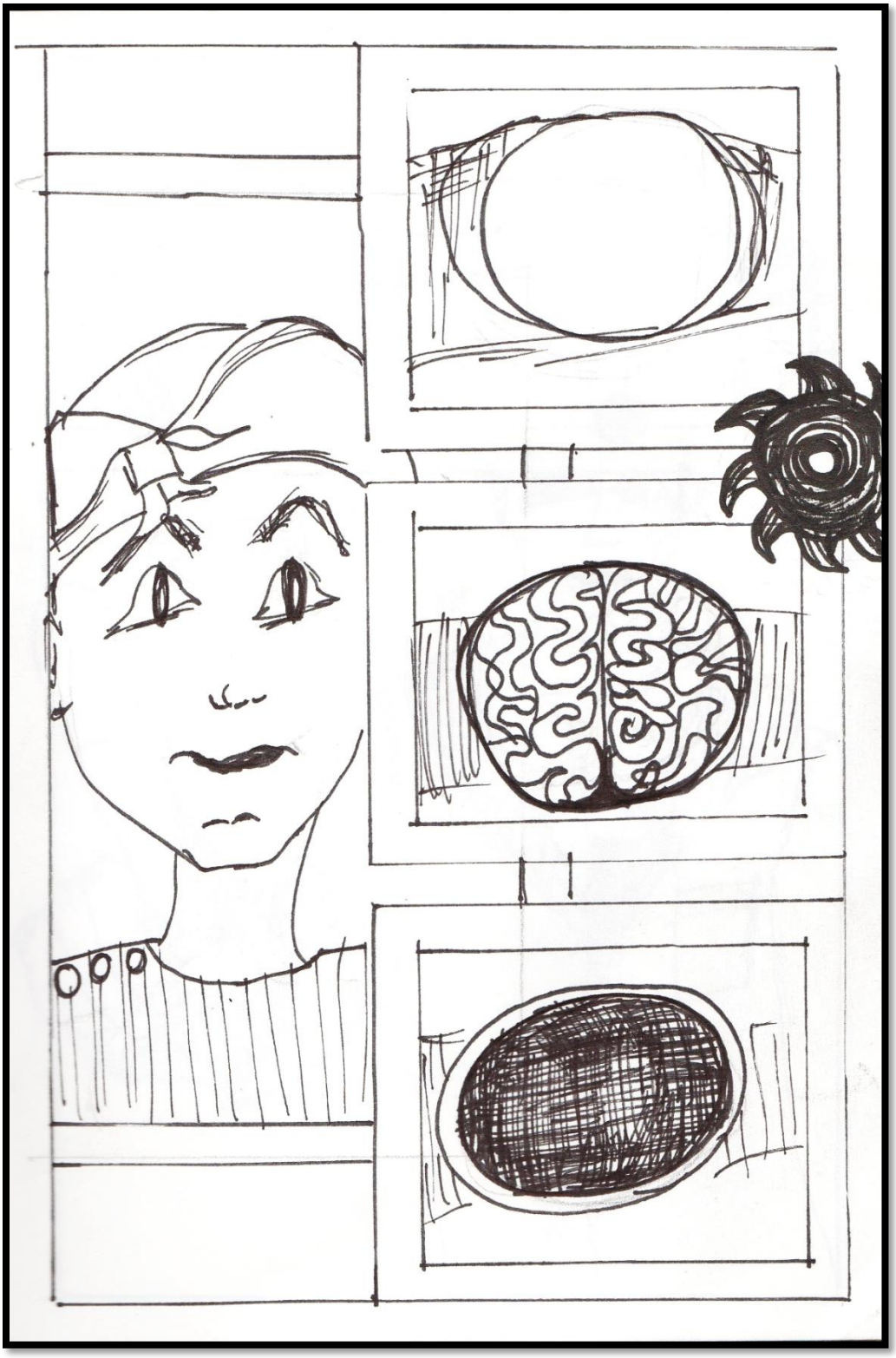


Figure 2: Kiss of Blood Storyboard

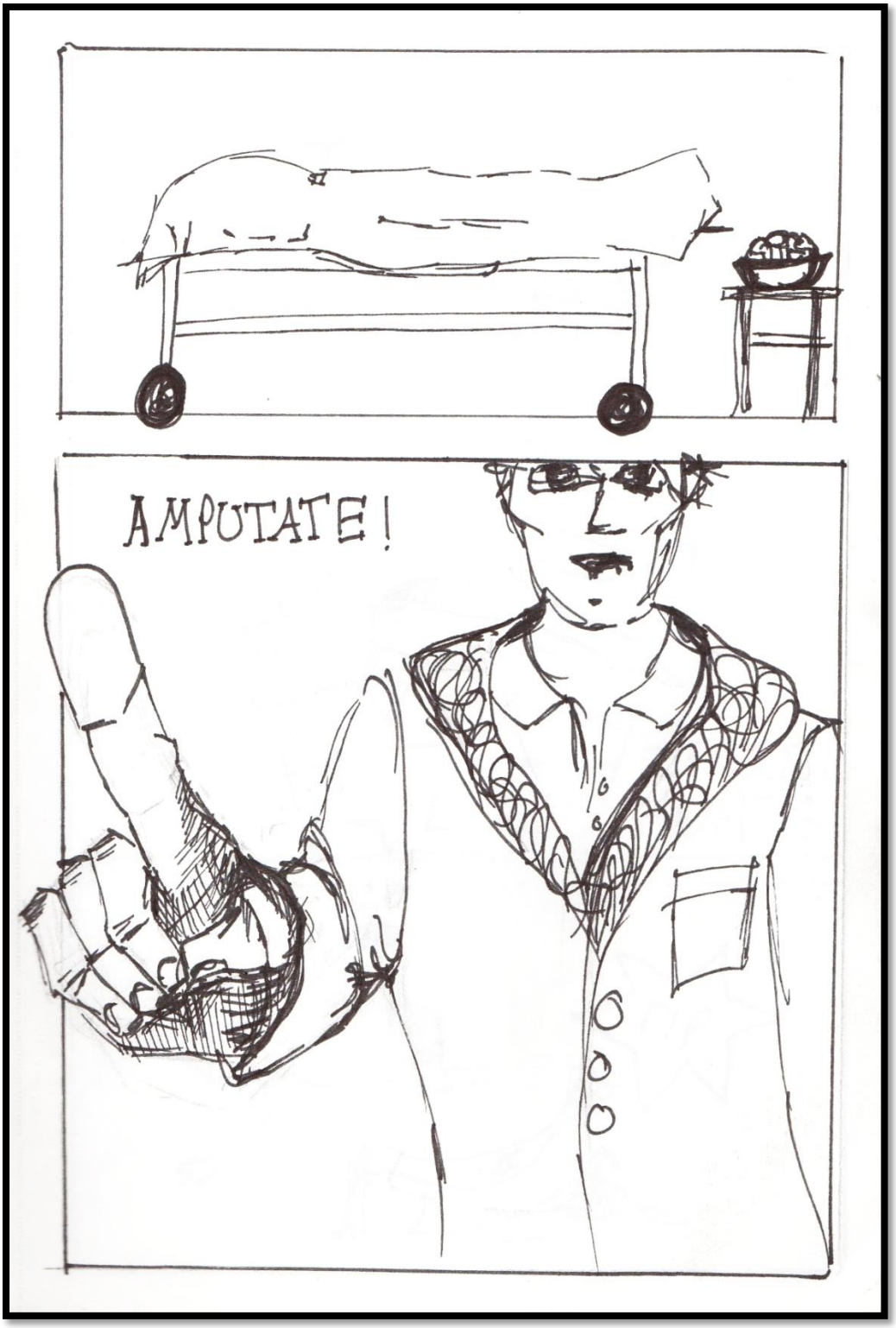


Figure 3:Kiss of Blood Storyboard

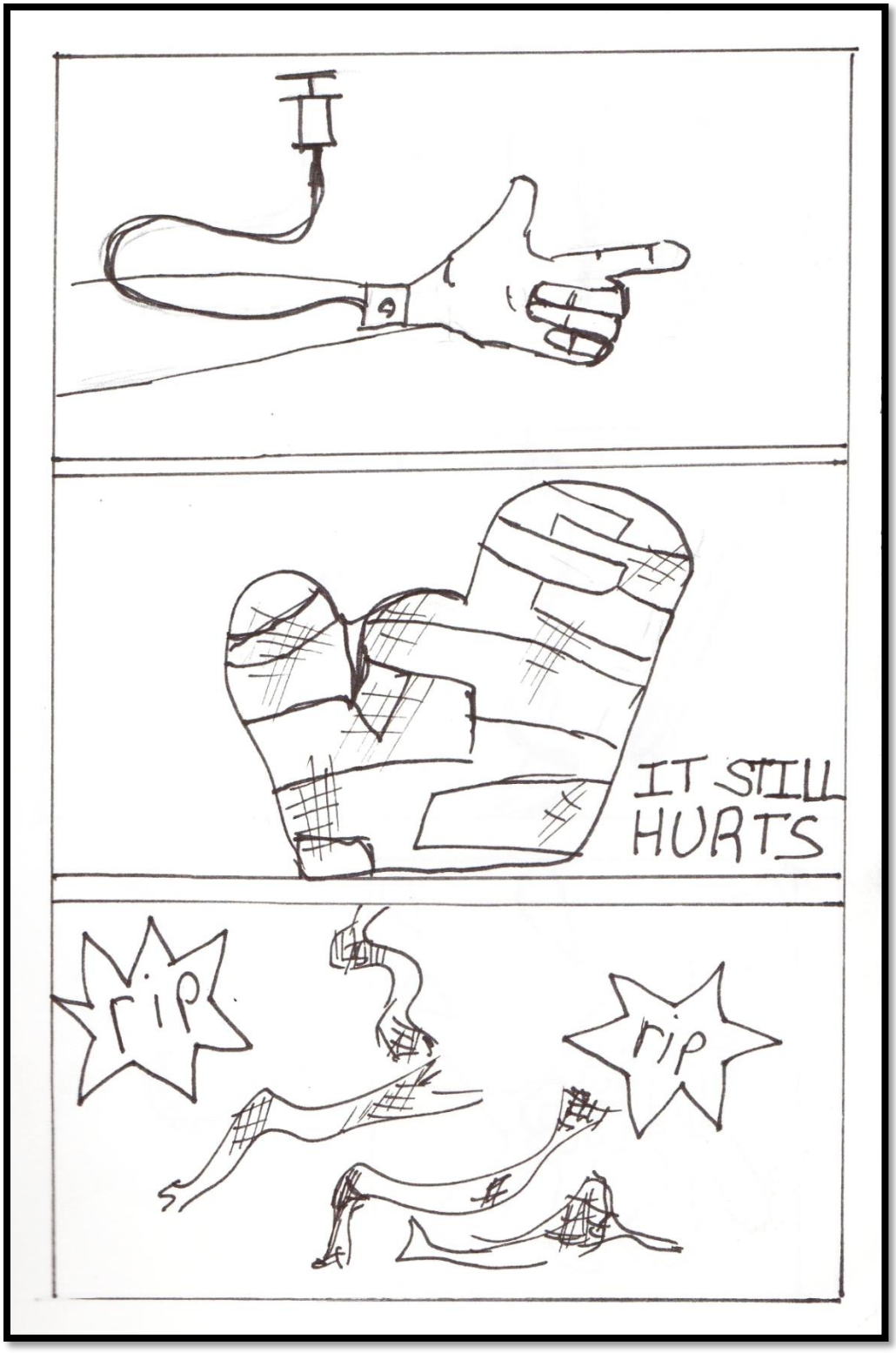


Figure 4:Kiss of Blood Storyboard

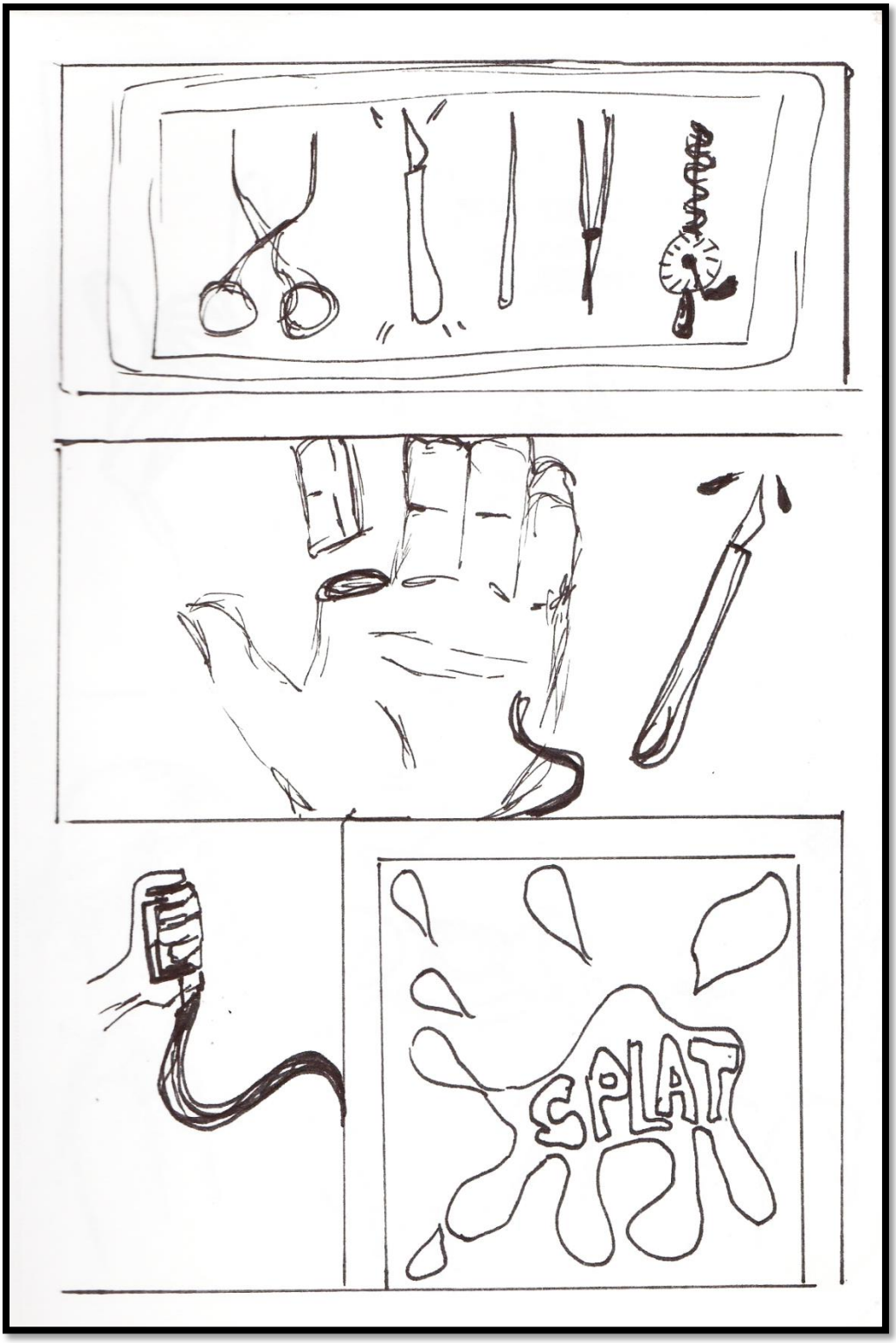


Figure 5: Kiss of Blood Storyboard

Figure 6: Kiss of Blood Storyboard

Figure 7: Kiss of Blood Storyboard

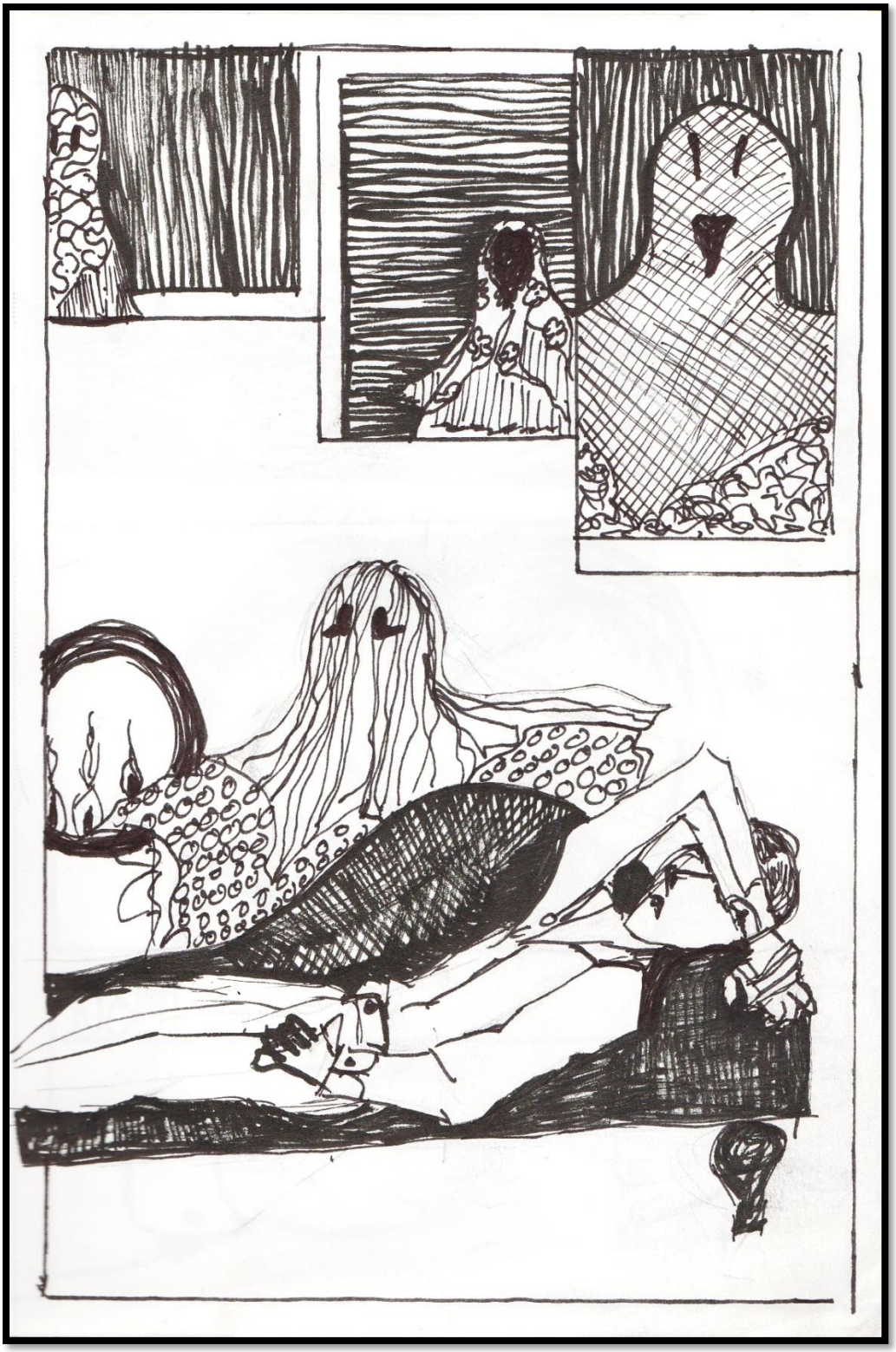


Figure 8: Kiss of Blood Storyboard

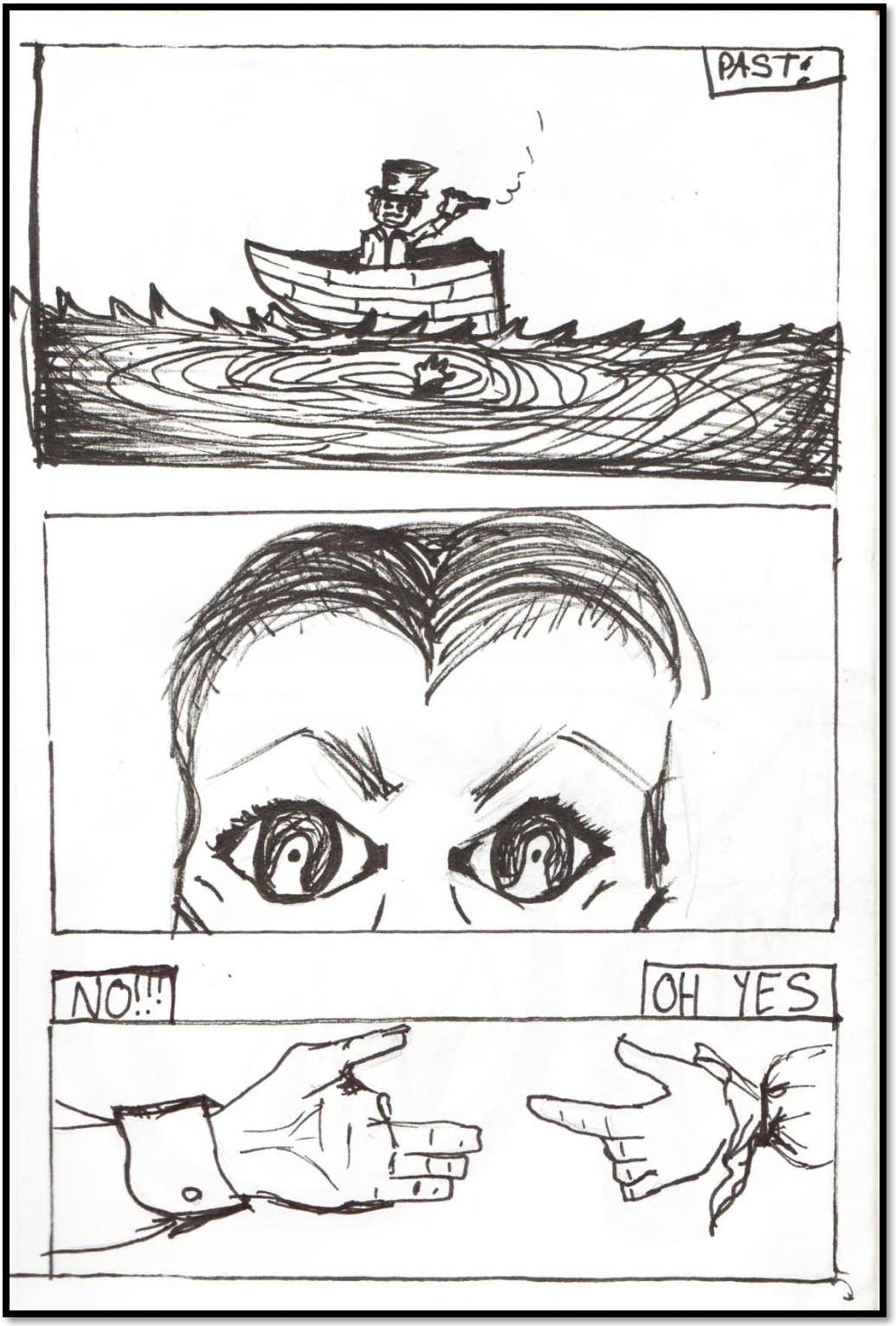


Figure 9: Kiss of Blood Storyboard

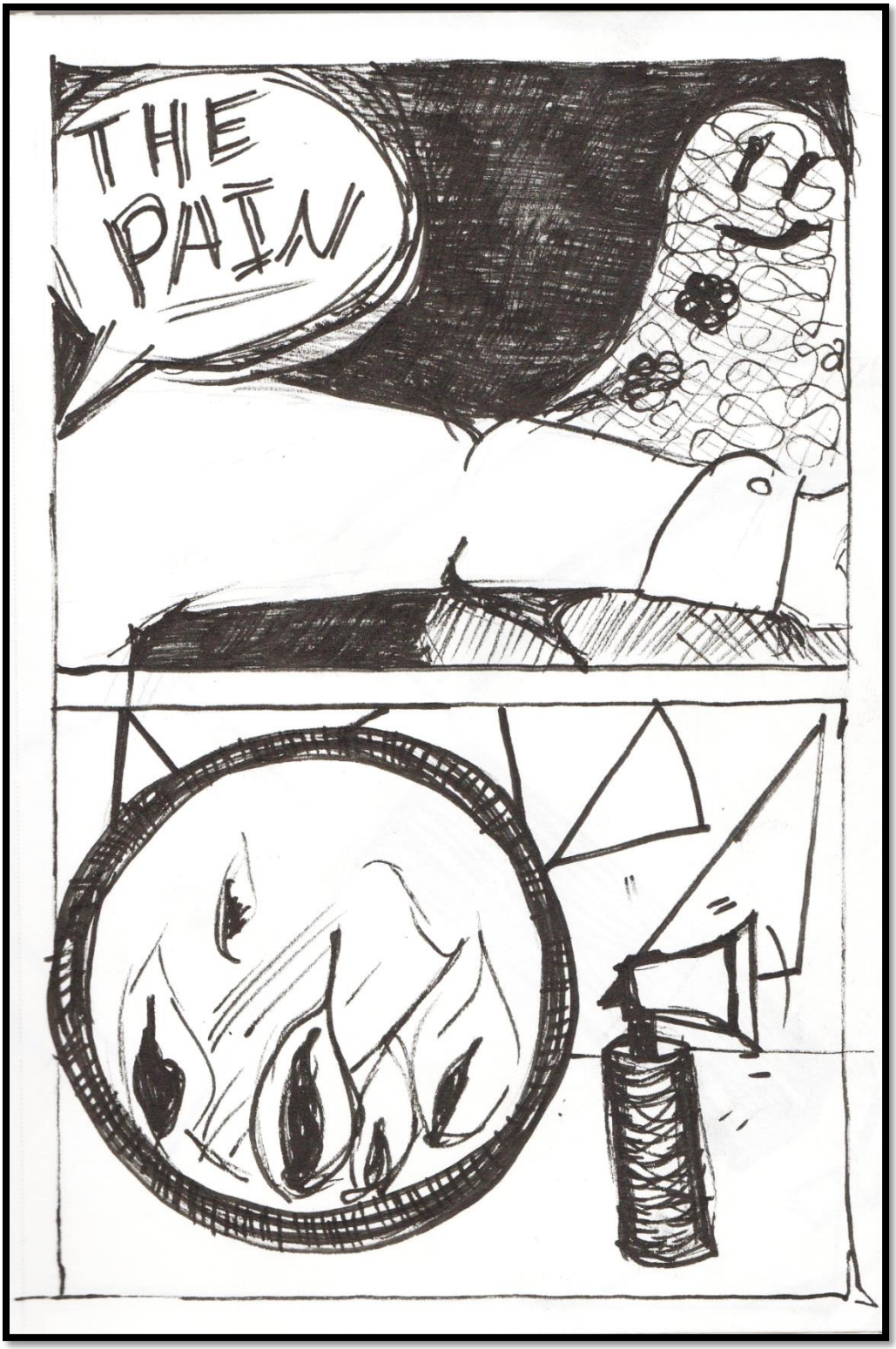


Figure 10:Kiss of Blood Storyboard

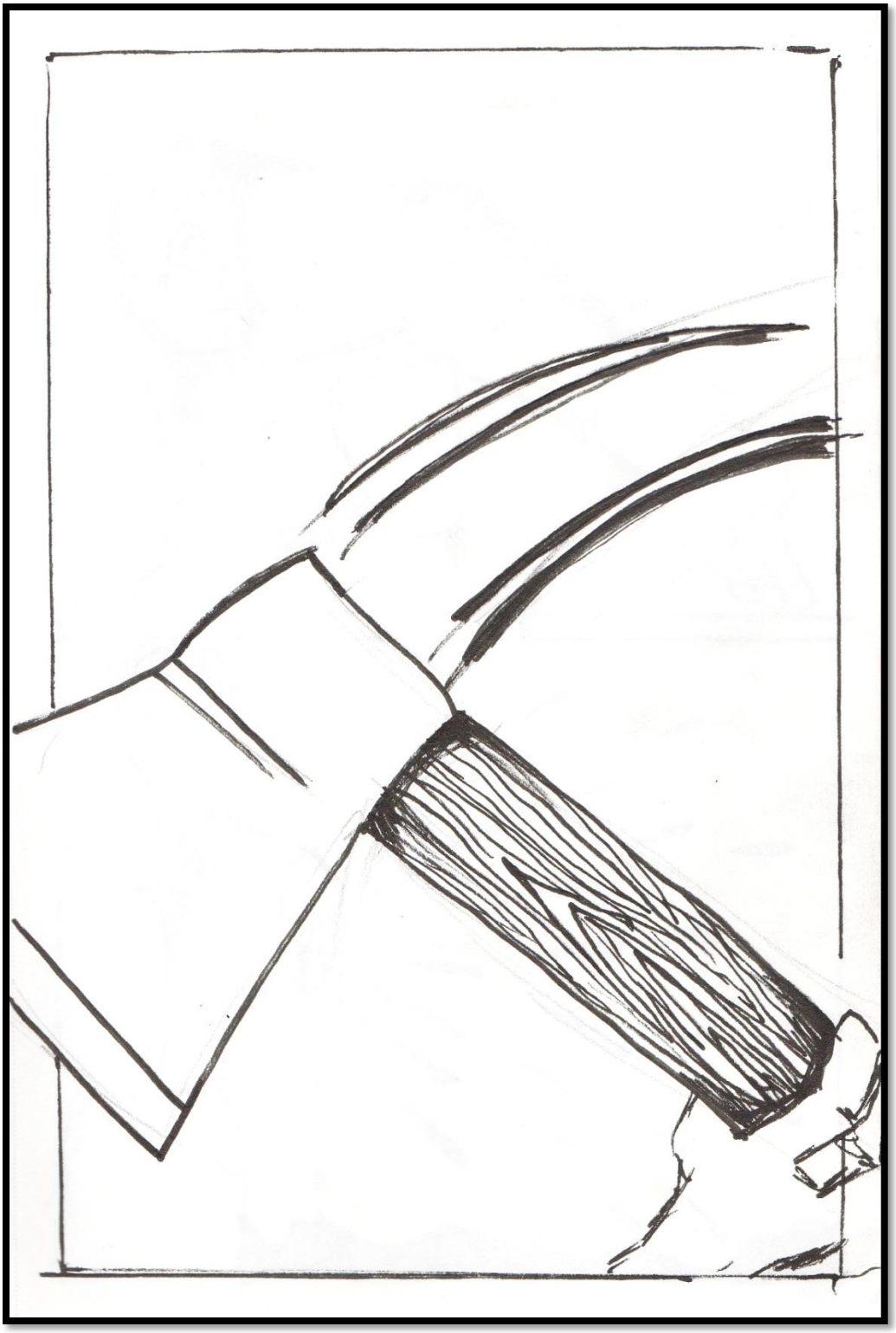


Figure 11: Kiss of Blood Storyboard

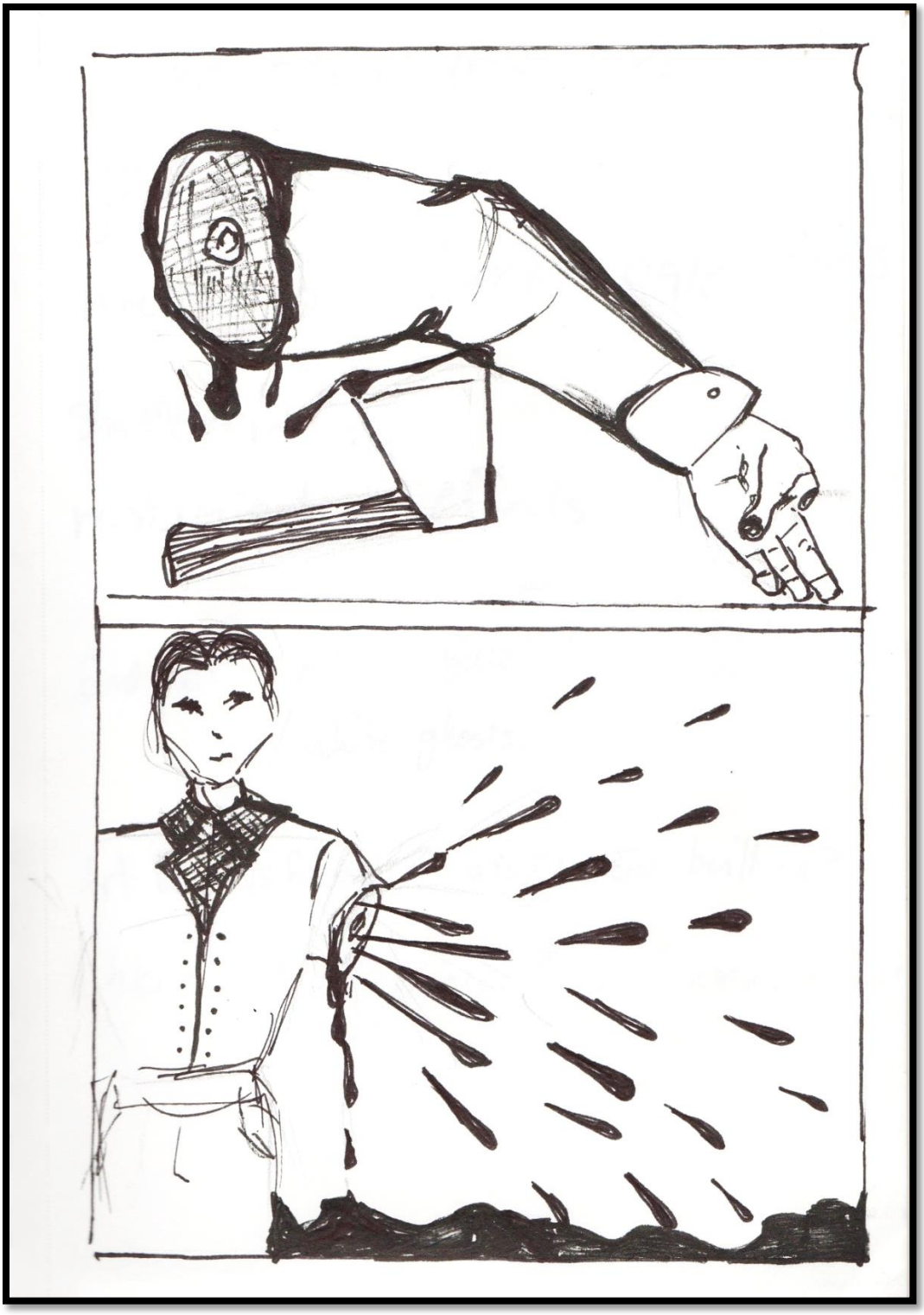


Figure 12: Kiss of Blood Storyboard

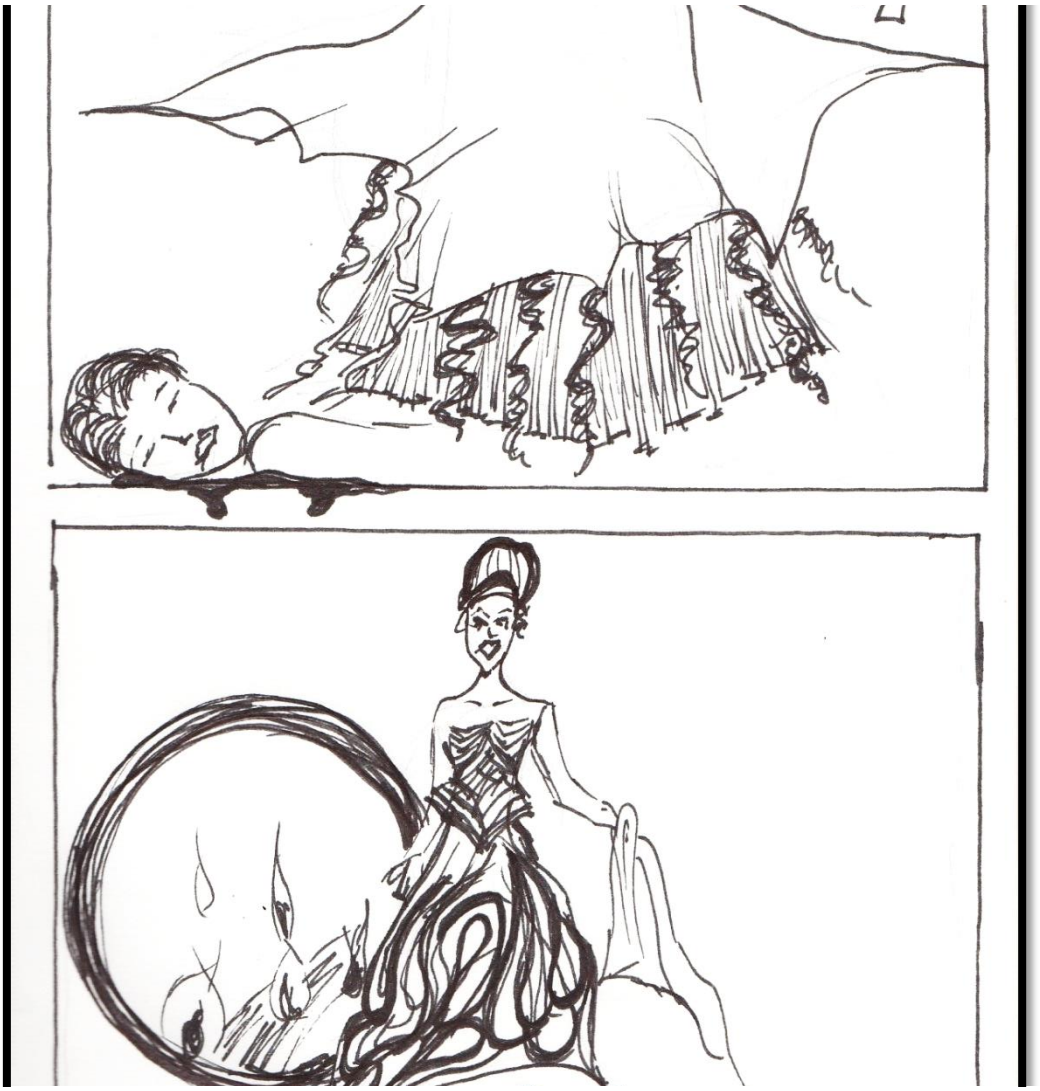


Figure 13: Kiss of Blood Storyboard

APPENDIX 3: POSTERS

Figure 15: Alexandre Grün, Le Grand Guignol à 9h tous les soirs 20 rue Chaptal, 1868, Poster, Wikimedia Foundation, https://fr.m.wikipedia.org/wiki/Fichier:Grand-Guignol-1890.jpg

Figure 14: Adrien Barrère, Le Baiser de Sang, 1929, Poster, Wikimedia Foundation, https://commons.wikimedia.org/wiki/File:Grand-Guignol-L%27homme_qui_a_tu%C3%A9_la_mort-1928.jpg

Figure 15: Adrien Barrère, L'homme Qui a Tué la Mort, 1928, Poster, Wikimedia Foundation, https://commons.wikimedia.org/wiki/File:Grand-Guignol-L%27homme_qui_a_tu%C3%A9_la_mort-1928.jpg

Figure 16:Paul Colin, La Main de Singe, 1930, Poster, Swann Auction Galleries, https://catalogue.swanngalleries.com/Lots/auction-lot/PAUL-COLIN-(1892-1986)-LA-MAIN-DE-SINGE--TH%C3%89%C3%82TRE-DU-GRAND---?saleno=2439&lotNo=454&refNo=720561

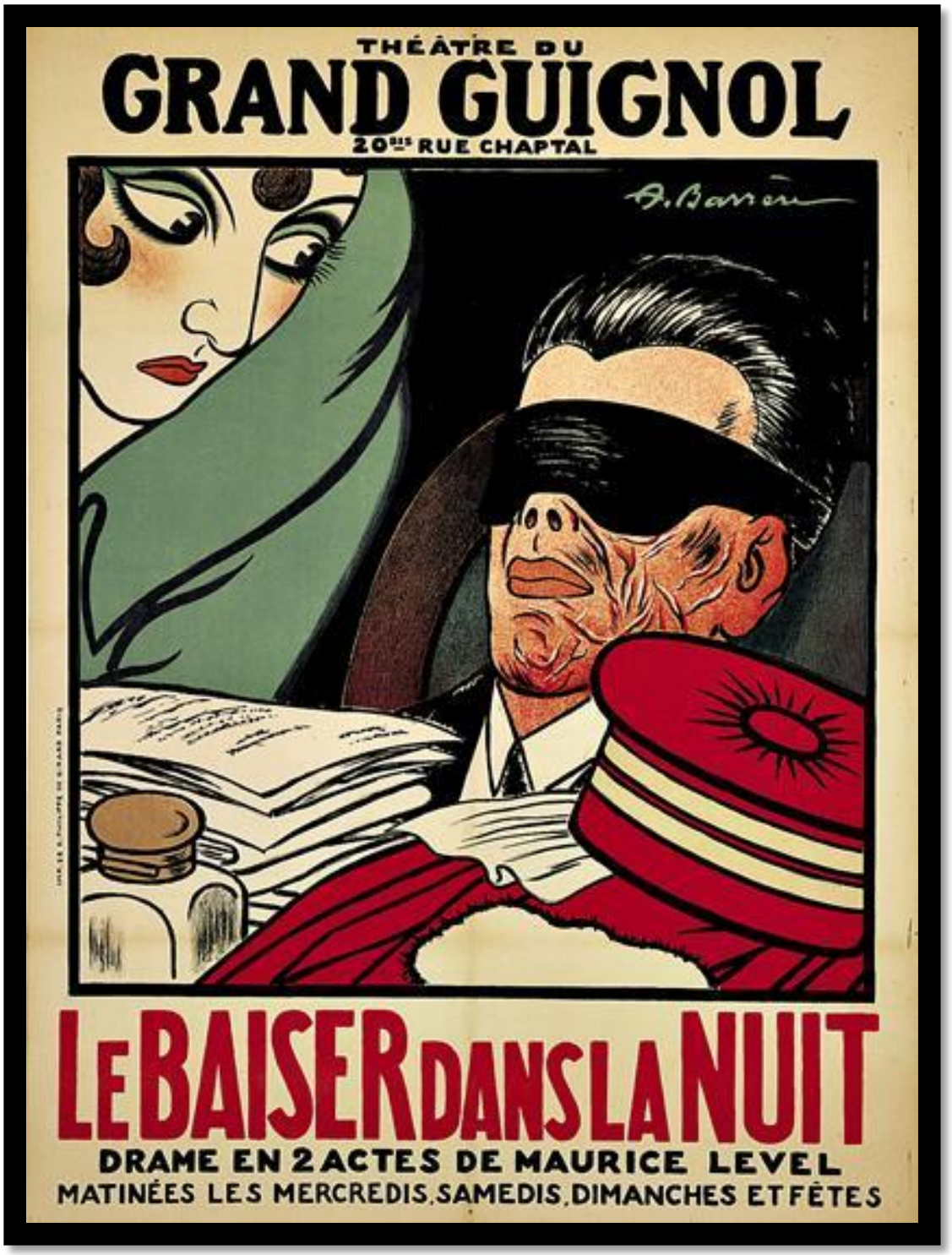


Figure 18: Adrien Barrère, Le Baiser dans la Nuit, 1920, Poster, Verblog, http://www.christianlegac.com/2021/05/publicites-les-grands-affichistes.adrien-barrere.html

Figure 19: Adrien Barrère, Harakiri, 1919, Poster, Verblog, http://www.christianlegac.com/2021/05/publicites-les-grands-affichistes.adrien-barrere.html

Figure 20: Hélène, Avery Raine

Figure 21: Adrien Barrère, Les Pantins duVice, 1920, Poster, Verblog, http://www.christianlegac.com/2021/05/publicites-les-grands-affichistes.adrien-barrere.html

Figure 22: Adrien Barrère, Les Pervertis, 1920, Poster, Verblog,
http://www.christianlegac.com/2021/05/publicites-les-grands-affichistes.adrien-barrere.html

APPENDIX 4: COSTUMES

Figure 23: Final Rendering: Dr. Volguine, Professor Leduc

Figure 24: Final Rendering: Male and Female Medical Team, and Nurse Sketch

Figure 25: Final Rendering: Brain Surgery Patient

Figure 26: Final Rendering: Joubert

Figure 27: Final Rendering: Dr. Volguine and Professor Leduc, Act II

Figure 28: Final Rendering and Redesigned, Maid

Figure 29: Ghost Sketch and Demo

Figure 30: Final Rendering, Hélène

Figure 31: Professor Leduc and Dr. Volguine in Costume, Photograph Courtesy of Julia Wasilewski

Figure 32: Medical Nurses in Costume, Photograph Courtesy of Julia Wasilewski

Figure 33: Joubert in Costume, Photograph Courtesy of Julia Wasilewski

Figure 34: Maid in Costume, Photograph Courtesy of Julia Wasilewski

Figure 35: Professor Leduc and Dr. Volguine in Costume, Act II, Photograph Courtesy of Julia Wasilewski

Figure 36:Front of House in Costume, Photograph Courtesy of Julia Wasilewski

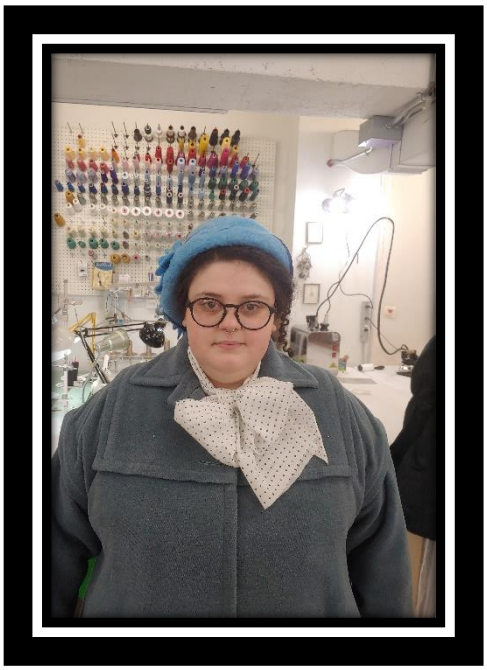
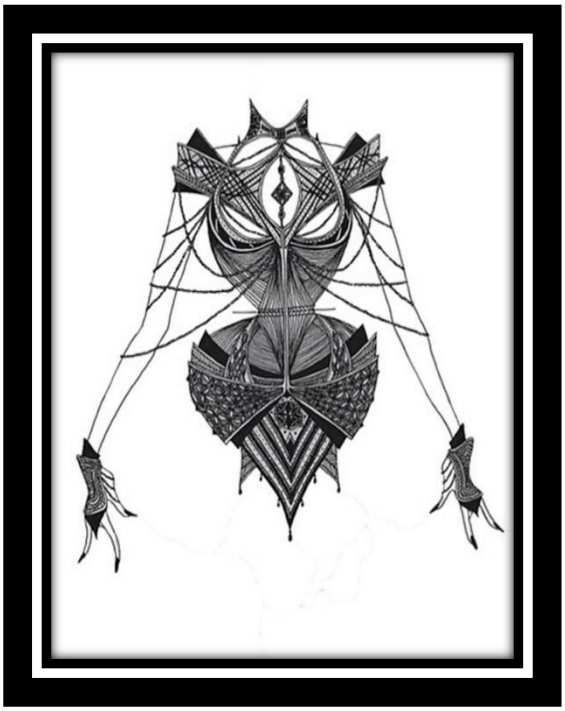


Figure 37: Top: Understudy for Volguine
Right: Understudy for Maid

Figure 38: Ghost in Costume, Photograph Courtesy of Julia Wasilewski

Figure 39: Dresses by Iris van Herpen https://www.irisvanherpen.com/



The Homicidal Heiress, Illustration by Hogan McLaughlin, https://www.irenebrination.com/irenebrination_notes_on_a/2011/05/hogan-mclaughlin.html

Figure 40: Hélène in Costume and Ghost Veil, Photograph Courtesy of Julia Wasilewski

Figure 41: Avery Raine Modeling Hélène's Dress: Photograph Courtesy of Oliver Petti

Figure 42: Hélène in Costume, Back: Photograph Courtesy of Julia Wasilewski

APPENDIX 5: RECIPE

Foaming Gelatin

Recipe developed by Carla Simon

30g Gelatin

60g Water

30g Glycerine

30g Honey

Cheap Powdered Foundation Makeup (ratio to the desired amount*)

1TBS Dish Soap

In a microwavable bowl: Bloom gelatin by dissolving gelatin into water and microwave for one min.

Use a silicone spatula or spoon to mix in glycerine and honey.

Keep mixture warm; microwave one min at a time to evenly heat the ingredients.

When the mixture is smooth and warm, add dish soap.

Beat with a hand mixer; the mixture should double in size.

This compound is reusable by melting. The gelatin will revert to a pourable mixture by cutting the form into 1" squares and microwaving. ** If the mixture does not dissolve well or becomes too sticky, add a few tablespoons of water.

* I multiplied the recipe times eight to cast one arm. I used one cake of powdered foundation to colour the entire batch.

** Water will dissolve the foam. An older finished piece will break down slower due to more water evaporating.

I prefer the 4-6 incarnation of a batch. The water has evaporated, making the finished product lighter. After 7-9 batches, water must be added to the bowl when melting, or the mixture becomes too sticky to use.

“Bloody Mary” Stage Blood
Recipe developed by Bridgitte Hoger and Carla Simon

32oz Bottle Red Washable Paint

4gal Water

1gal Glycerin*

1gal Chocolate Syrup

5 TBS Red Mica Powder

Thin paint with 1L water in a large bowl, mixing until any chunks have dissolved. Then mix in all other ingredients. It makes a pretty stage colour and flows easily through pumps and tubes.

Make larger batches in a 5 gal bucket; only add the first portion of water to dissolve the paint. Mix ingredients minus the water. Divide the batches into separate, 5 gal buckets. Divide the remaining water and mix into buckets accordingly.

Note: Adding less water made a thicker but more expensive blood

*Glycerin in a gallon can be purchased at a Pharmacy.

APPENDIX 6: 3D PRINTS

Figure 43: 3D Form Used to Mould Felt for Matching Hats, Photo Courtesy of Colin Thomson

Figure 44: Top: Alginate Plaster Cast Comparison to Bottom, 3D Scan and Print of Same Actor

Figure 45: Brain Surgery Demo

Figure 46: Brain Surgery Special Effect

Figure 47: 3D Prints: Top; Hand Saw, Hélène's Spine
Bottom; Lava Lamp Cover, Brain Fluid Container, Photographs Courtesy of Julia Wasilewski