Creating a realistic visual style in the production of a graphic novel DEMONS

by

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Abstract

There are a great number of stylistic approaches to comic book art, and these have evolved significantly over time. The main visual device used in a comic book or graphic novel is a sequence of images. As a visual communicative device, sequential art has a long history; we see it in ancient Egyptian pictographs, comic strips in newspapers, and most recently the digitally produced graphic novel. The evolution of technologies and artistic processes employed by the comic artist has had a substantial effect on artistic possibilities and visual style in the medium (Wyeld & Banasiak 2019). In the late twentieth century, depiction of realism had entered the visual lexicon of comic books and was eventually used to produce fully painted graphic novels as seen in *Marvels* (1994) and *Kingdom Come* (1996) by Alex Ross, for example. More recently, 3D digital tools and techniques used in 3D animations, visual effects and video games have entered the comic book artist's toolkit. This Masters thesis presents my method of producing realistically painted illustrations in the graphic novel *DEMONS*. It does this by combining photographic referencing processes with 3D computer graphics, being Blender and MakeHuman, and digital painting in Photoshop, to create my unique stylistic artwork for the graphic novel. The accompanying exegesis makes the case for the development and usefulness of these tools and techniques, and how they can be integrated in the creation of a realism styled painted graphic novel. It outlines the key benefits of these methods, including the ability to overcome current creative limitations in depicting convincing realism in sequential art.

Declaration

I certify that this thesis:

1. does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any university; and

2. to the best of my knowledge and belief, does not contain any material previously published or written by another person except where due reference is made in the text.

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Rafal Banasiak

03.02.2021

1. Introduction

Comic books and graphic novels, more broadly referred to as 'sequential art', are designed to visually communicate stories and ideas by means of presenting a series of images in an organised sequence (Eisner 2008b). As a visual narrative, sequential art shares similarities to other media that focuses on visual storytelling, such as in films, animations, photography, and illustrations, by utilising imagery to tell stories (Pimenta and Poovaiah 2010). Comic books and graphic novels are distinguished by their use of sequential graphics, which combine images and text, to communicate information.

The production processes and visual styles[1] employed by sequential artists to communicate information has evolved over time: from its early inception in cave paintings in the prehistoric era, to Egyptian tomb paintings, to the emergence of 'proto-comics' during the development of the printing press, and finally, to the introduction of printed comic books and graphic novels for mass consumption in the 1930s (Wyeld & Banasiak 2018). Originally, comic artists utilised simplistic cartoon styles to put emphasis on symbolism and transmit the information graphically. McCloud (1994) claims this style's popularity is due to its effectiveness in succinctly communicating a story visually, with minimum detail but high recognisability. More complex styles have been explored, but, a major constraint was the industry's inability to effectively mass produce complex artworks with the reproduction technologies and production budgets available at the time (Lawrence & Ross 2015).

Advancements in printing technologies in the 1970s allowed artists to reproduce highly detailed visual styles in comic books (Lawrence & Ross 2015). It opened up diversity in artistic processes and visual styles available to comic book artists. This advancement led to the production of several realism-styled painted graphic novels, including Busiek and Ross' *Marvels* (1994) and Waid and Ross' *Kingdom Come* (1996), illustrated by Alex Ross. Ross is one of the world's most renowned and highly respected comic book artists in the industry (American Academy of Arts College 2012). His artwork is often praised for its realistic depiction of iconic superhero characters (American Academy of Arts College 2012). He utilises photographic references and gouache painting techniques to produce highly detailed, realistic artwork (Waid & Ross 2008).

[1] A visual style refers to the artistic direction assigned to the project. It establishes a set of artistic principles or guides, such as colour schemes, shading technique, and depiction of space and depth, and so on, with which all the visuals in the project need to be treated with. Establishing a visual style ensures all images in the comic book are stylistically consistent.

Defining realism

From the outset, I need to define my use of the term 'realism' in my research. The term realism has a variety of different interpretations and means different things in different art forms. For example, Hodginkson (2009) argues that, in the field of animation, realism refers to creating a lifelike appearance in order to produce the illusion of life. He distinguishes this form of realism as "visual realism" which he uses to refer to visualising reality (Hodginkson 2009 p.1). However, realism can also refer to social realism, such as the depiction of serious content matter, political beliefs and values in graphic novels (Adams 2008). For example, the realistic social depictions of the conditions of the Holocaust in Art Spiegelman's *The Complete Maus, Volume 1* (1991) and Alison Bechdel's *Fun Home: A Family Tragicomic* (2006) (Adams 2008). Honess Roe (2011) claims that realism can also refer to the realistic portrayal of human experiences that are invisible to the eye, such as the use of abstraction and symbolism in an animated documentary to allow us "to imagine the world from someone else's perspective" (p. 227). For example, in *Feeling My Way* (1997), Jonathan Hodgson used animation over film footage to convey his internal thoughts and feelings on his way to work.

In this project, when I refer to realism, I mean a focus on creating a 'lifelike' appearance. There are many components involved in creating a lifelike appearance, such as capturing the effects of natural light, how light and colour behave, how light and colour are captured in a photographic image[2], and how perspective is conveyed. The subject matters are conveyed literally as observed by the human eye, such that the depiction of scenes and characters is authentic and highly recognisable by the readers.

Realism in comic books

The depiction of realism in Ross' visual art works had a profound impact on my appreciation for the medium as it revealed to me the possibility of creating an immersive experience inside a comic book. The rich detail on the environments and characters, and naturalistic[3] rendition of light and colour, created a fictional world that was highly recognisable to me. I could imagine myself inside his illustrations, watching the story unfold. As a consequence, Ross'

[2] A photographic image is the flattening of the physical world. It is what is captured with a physical camera.
[3] Naturalistic refers to the effect of imitating nature that is observed in the physical world.

artwork became a major influence on my creative endeavours in comics when I discovered it in 2016. His work set a benchmark for my creative outcomes in this research project.

Realistically painted art is rare in comic production. One reason is that realism is seen by some to be the very antithesis of the comics genre (Singer 2019). While realism began to emerge in the alternative and indie comics tradition of the 1970s and 1980s (Singer 2019, p.131) it was the stripped back realism style that came to be exemplified by artists such as Chris Ware and Alison Bechdel. Hence, Alex Ross's rich and detailed realism is not common. Another reason for this is due to the lack of expression of movement in realistically painted art. Scott Hampton (Talon 2007, p.101) argues that a photo-realistically painted panel can appear "static and unconvincing as a storytelling device". He believes that action can be conveyed more effectively with pen and ink (Talon 2007). Finally, the lack of realistically painted comic art could be due to the time it takes to produce. George Pratt (Talon 2007) remarks that producing a realistically painted comic book was a labour-intensive process due to the complexity of the artwork and the rendering of repeating detailed characters across several panels in the comic book.

The traditional, non-realistic American comic book visual style, popularised by Marvel and DC Comics in the 1950s during the medium's 'Industrial Age' (Lopes 2009), remains the most popular method of production of this art form. It dominates the industry because of its production efficiency, ease of reproduction, and narrative clarity (Eisner 1985). The process involves pencilling, inking and colouring (Jurgens n.d.). It has since been replicated in digital painting software, such as Adobe Photoshop (Williams 2009). Its transition to a digital workflow ensures the rapid dissemination demanded by contemporary publishers (teams involving pencillers, inkers and colourists working in standardised procedures to guarantee success).

Many modern digital tools currently available are yet to be tested for their benefits in the production of a realistically painted comic book. Since Ross' graphic novel productions, new digital tools and techniques, such as 3D modelling and rendering, have been pioneered by visual effects studios, animation studios and video game industries (e.g. Industrial Light & Magic, Pixar and Naughty Dog) to produce photorealistic computer-generated imagery in films[4], 3D animations[5] and video games[6]. In recent years, professional 3D software, used to

[4] Visual effects created for *Star Wars: The Last Jedi* (2017) by Industrial Light & Magic: <https://www.youtube.com/watch?v=1ZK9KLP42hE>, viewed 15 May 2020.

create such effects, have become more accessible to comic book artists. Many free software options – such as Blender, MakeHuman, Daz Studio, and Unreal Engine 4 – provide opportunities to develop high quality 3D graphics – including the creation of photorealistic virtual spaces and characters that can mimic the appearance of the physical world.

Realistically painted comics share a common goal with films and games. They can both convey a fictional world that appears to exist in reality. Therefore, the integration of digital tools and techniques used in animation, visual effects and game studios is applicable to the creation of realistically painted comic productions. Some techniques are already being employed in comic book productions. For example, artist Haberlin uses a combination of 3D tools, including Poser, Zbrush and Vue, in conjunction with Photoshop, to produce a realistically painted graphic novel *Anomaly* (2012) (Smith Micro Graphics 2013).

Producing a realistic visual style in this project

Based on the tools available, this research project explores new methods of producing a realistic art style and experiments with this in the production of the unique graphic novel *DEMONS*. It aims to discover the benefits of combining photographic imagery with digital tools, including 3D computer graphics and digital painting, to produce a realism in a unique visual art style. Using my own professional artistic background in concept art and illustration for films, visual effects and video games, I have utilised a combination of digital tools, including Blender, MakeHuman and Adobe Photoshop, to create a convincing realism in my artwork. The project comprises a creative component and an exegesis. Both components respond to the problem of how the artistic process contributes to creating what I call a 'realistic visual style'. I use my creative component as a mechanism to develop new knowledge by participating in the production of an original graphic novel using new tools. By doing so, I directly encounter problems related to creating realistic artwork, examine these problems, and discover solutions to them.

1.1. The creative component

For my creative component, I have produced the first issue of a realistically painted graphic novel. This first issue is twenty pages in length. Each page consists of realistically painted

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[5] Technology used in *Big Hero 6* (2014) by Pixar: <https://www.youtube.com/watch?v=w4WD15EgLWc>, viewed 15 May 2020.
[6] Making of *Uncharted 4* (2016) by Naughty Dog: <https://www.youtube.com/watch?v=317Kq7FVzoQ>, viewed 15 May 2020.

colour illustrations. It is digitally produced and presented in digital and print formats. I used a script provided to me by the writer David Coyle and I designed the visuals to communicate the story outlined in the script.

In this Master's project, the graphic novel is presented in a digital format only; however, the artwork and its visual style are primarily designed to be read inside a physical book. Therefore, the artwork does not utilise exclusive digital features such as sounds, animations and interactive hyperlinks to further enhance the reading or viewing experience. Also, the illustrations and text are scaled appropriately to be legible inside a book that is seventeen centimetres wide by twenty-six centimetres high[7].

The production of the graphic novel is a significant part of my research, and its main purpose is to test a series of artistic tools and processes to produce a realistic visual style. The project utilises techniques such as drawing rough sketches and collecting photographic references, an approach that has its genesis in the work of Alex Ross in the 1990s (Busiek & Ross 2010). It builds on Ross's work, however, by investigating the integration of 3D tools, techniques and processes, such as 3D modelling, lighting and rendering in Blender, character avatar creation in MakeHuman, and digital compositing and painting in Adobe Photoshop to produce realism on the page. In this way, I have developed my own unique style and method.

1.2. The Exegesis

The exegesis documents my research and artistic workflows during the making of my graphic novel. It investigates which processes and combinations of tools I used to accomplish the goals of my creative product. It provides for a critical commentary on the efficacy of the use of these techniques to build on the processes currently used in the comic book industry, using auto-ethnographic and practice-led/practise-based research frameworks. My focus is on documenting how I used these tools to create a realistic style for sequential art.

After introducing the structure of the thesis in the introduction, chapter two outlines the methodological framework I used to answer my research question. I used a mixed methodology approach, combining practice-led research with autoethnography. The practice-led approach allowed me to directly engage in the production of a realistic visual style in a comic book to test the efficacy of photography and 3D tools in producing a realistically painted graphic novel. The autoethnographic approach helped me reflect on my processes by

[7] Traditional comic book dimensions in centimetres according to Comic Books on Demand printing service (see http://www.comicbooksondemand.com.au/quotes, viewed 5 December 2020)

creating a framework within which I could examine my learning experiences throughout the project.

Chapter three provides a historical overview of visual styles in sequential art. It discusses how the production processes and aesthetics employed by various artists have evolved since the art form's inception. I have broken down the history section into three major parts: early forms; the emergence of the comic book and its mass production; and, the digitisation of comic book and graphic novel productions, including some of the more recent developments in integrating 3D computer graphics into comic books. Each part is examined to develop a chronological timeline of technological and visual advancements. The overview helps establish the historical development of realistically painted artwork in sequential art, including its origins and methods of production.

Alex Ross' production process, used to develop his level of realism in his graphic novels, are analysed in chapter four. His individual production stages, including rough sketching, photoshoots, refined line drawing, and painting, are examined in detail. Examples from his works are used to demonstrate the application of these techniques.

Chapter five establishes the production history of my graphic novel project *DEMONS*, including my artistic background in producing realistic artwork for video games and films, and how it led to a collaboration between myself and writer David Coyle. It discusses my acquisition of fundamental skills, including the study of human anatomy, and the visual language employed in comic books, which were critical in overcoming the challenges involved in executing the project. Finally, it explores my early research and experimentations with different comic book visual styles, and reveals how the discovery of Alex Ross' graphic novels had set the trajectory for my production of a realistic visual style in this project.

Chapter six explores how the produced visual style conveys realism in my project. It does this by identifying several key features that were found to be fundamental in conveying realism in my artwork. The features include: my observation of the physical behaviour of light, perspective construction, architectural form, character depiction, convincing physics, use of colour, and approach to overall visual consistency. Each feature is described in detail, including its application in my graphic novel and evaluated for how it conveys realism.

Chapter seven evaluates the improvements made by utilising photographic referencing and digital tools during the production of my realistic visual style. It examines the improvements made from using photographs, such as in depicting a convincing world and characters; then,

how 3D computer graphics were used to improve the depiction of a physical space, depiction of characters correct to scale and perspective, shot compositions, and lighting; and finally, how digital painting in Photoshop improved compositing of references and drawings during the production, and in creating realistic illustrations.

Chapter eight documents my own artistic production, including each of the stages involved: rough sketches, concept art, refined sketches, 3D construction, photographic referencing, detailed line drawing and digital painting. Each stage is described in detail, including the techniques used, my successes and failures, and the evolution of the processes and visual style over time. I use illustrations from my creative component to demonstrate my application of tools and techniques.

1.3. Contribution to the field

My original contribution to knowledge is in the innovation of techniques and style that are new to comic book production. This exegesis is a documentation of the techniques I used and highlights their advantages over previously used techniques to create a realistic visual style. The creative component demonstrates the application of techniques by producing a graphic novel that visually communicates a story. The graphic novel is also an original work of art. My research project has the potential to evolve and expand the variety in visual styles and production practices employed in the comics industry by others. Having introduced the research problem and some of its facets and outlined the trajectory this exegesis will take, in the next section the subject of the research methodology used in this project is discussed.

2. Research methodology

This chapter discusses the methodological approach used to address the research question: how does photographic reference imagery and digital tools, including 3D computer graphics and digital painting, improve the realism in my visual art style for a graphic novel? For this project, a qualitative, mixed methodology approach was used. It combines practice-led/practice-based research and an autoethnographic framework to discover new knowledge about the production of comic book art. I used a practice-led methodology by engaging in the creative process, which utilises digital techniques that are untested in the genre, to produce a creative artefact – a graphic novel – to test the efficacy of those techniques for a realistic-style painted comic book production. Autoethnography was then used to explore my own creative practice by reflecting on my experiences and rationale behind decisions made during the production of the graphic novel. To do this, I used mind mapping and interviews as a mechanism to document and reflect on my creative practice and creative outcomes. The two methodologies work in tandem to examine how photographic referencing and digital tools contribute to depicting realism in a painted comic book production.

2.1. Practice-led/Practice-based research

Practice-led research is a research methodology that allows artists to integrate creative practice into their research project design and implementation to discover new knowledge (Candy 2006). In my project, my creative artefact is the painted illustrations inside an original graphic novel. According to Smith & Dean (2009), practice-led research is used to recognise that a creative work is a form of research that can generate a range of research outputs, and that the artist's training during the engagement in the activity can develop research insights that can then be documented as research; that is, my results for the creative outcome can be used as research data, and my acquisition of skills and understanding of the art form during the project developed valuable information regarding my creative practice. Candy distinguishes between practice-based and practice-led research thus:

> *…if a creative artefact is the basis of the contribution to knowledge, the research is practice-based… If the research leads primarily to new understandings about practice, it is practice-led* (2006, p.3).

Following the work of Harper (2011), a practice-led research approach was used to create and critically interpret my methods and outcomes of creating an artefact to develop and examine

the benefits of digital tools in my artwork. Candy (2006) argues that practice-led research differentiates itself from other research frameworks in that it focuses on the nature of the creative practice and leads to new knowledge about the practice. Mäkelä (2007) argues that the creative artefact produced during the project is central to the research process. That is, the research is generated through the production of a creative artefact. Hence, during my project, it was important for me to arrive at a completed graphic novel artefact, as it allowed me to develop new knowledge about the creative process, to reflect on and recognise the inefficiencies of my creative process in illustrating a realism visual style. I found that by directly engaging in the production I was able to effectively identify the challenges involved with producing a realism style, and to test, via trial and error, which digital tools were best suited for overcoming these challenges. My failures were critical in evaluating techniques and determining practical solutions. I used results as a means to develop an understanding of what was effective for my project. This approach aligns with how Candy (2006) sees the benefits of practice-led research. For Candy,

> *Practice-led Research is concerned with the nature of practice and leads to new knowledge that has operational significance for that practice. In a doctoral thesis, the results of practice-led research may be fully described in text form without the inclusion of a creative work. The primary focus of the research is to advance knowledge about practice, or to advance knowledge within practice. Such research includes practice as an integral part of its method and often falls within the general area of action research* (2006, p.3).

The research is also practice-based in that, through the creative investigation, my work develops new knowledge. Candy and Edmonds (2018, p,64) argue that practice-based research refers to a situation where “a creative artifact is the basis of the contribution to knowledge”. Following this approach, my aim was to use the production of a realistic style to develop new knowledge that contributes to the advancement of the comic book art form. I chart my progress through the development of the graphic novel *DEMONS* using digital tools newly available to artists. My results will be primarily described in text form. Illustrations from the creative work will be used to describe my processes and results also.

2.2. Autoethnography

This thesis also incorporates an autoethnographic approach. Autoethnographic research practice is a form of qualitative research methodology that focuses on the producer’s own

experiences. Its intention is “to expand the understanding of social realities through the lens of the researcher’s personal experiences” (Chang 2013, p.108); in this case, it is about discovering new knowledge in the field of sequential art by examining my own processes and experiences during my creative practice. According to Skains (2018), autoethnography can be used in conjunction with practice-based projects because creative research questions are often connected with the artist’s identity, experience, and culture.

Use of imagery

The autoethnographic methodology used for this project shares a similarity to visual ethnography by incorporating the production and interpretation of visual imagery. Pink (2007) claims that visual imagery is a valid method for ethnographic research because it is equally as valuable to ethnographers as is written text. This is because images are an integral part of human experience due to their ability to capture elements like identity, lifestyle, culture, space, and history, all of which are key to ethnographic research. By creating and discussing images, Pink (2007) argues that the personal experiences and conversations developed from these activities can invoke new ethnographic narratives and knowledge. Following this research approach, I found the production of images to be useful in an autoethnographic context. The process of capturing photographs and painting illustrations, and then interpreting those artworks, has helped me discover my personal methods and views on what constitutes realistic artwork. For example, I found my process of interpreting photographic information onto a painted illustration to be helpful in later self-evaluating the qualities of the physical world I find important in conveying realism.

Data recording during production

In this project, past sketches, photographic references, work-in-progress illustrations, iterations, mind-maps, and the final artworks of my graphic novel are used to generate an understanding of the creative process and problems encountered during the production. Chang (2013, p.111) argues that, recalling past events, collecting artefacts, and reflecting on self can be employed as a means of collecting autoethnographic data about a topic. Physical materials of the past, including artworks and visual multimedia materials, can be used to recall past events and experiences. Therefore, I used my materials from the past to reflect on my process and retrieve valuable information relevant to my research question, such as the fundamental discoveries in the utilisation of photography and digital tools that have led to the creation of my personal artistic process and visual style.

Due to the complexity of the artistic processes used in this project, it was important to use a method for recording and organising personal data to brainstorm, explore, test and reflect on ideas to solve problems. At first, a diary was used as a way to record processes and progress as a "reflective practice journal" (McIntyre 2001, p.7). Candy argues that the

> *…introduction of structured documentation using diaries, weblogs and other recording methods is an invaluable innovation that makes the process more transparent and, at the same time, sharable in those cases where collaboration is involved* (2011, p.44).

But, I found this was ineffective for organising large quantities of information. Instead, as a visual learner, I found an 'information visualisation' approach was more effective for recording and organising the large network of ideas, thoughts and results. Hence, I developed a data visualisation technique by constructing an elaborate mind map. Mind mapping involves mapping keywords, sentences and images that radiate from a central idea (ed. Okada et al. 2008). Its flexibility in structure makes it suitable for visual notetaking and brainstorming (ed. Okada et al. 2008). According to Hyerle, mind mapping is designed for the practice of *mapping*, which is

> *...a rich synthesis of thinking processes, mental strategies, techniques and technologies, and knowledge that enables humans to investigate unknowns, show patterns of information, and then use the map to express, build, and assess new knowledge* (2008, p.73).

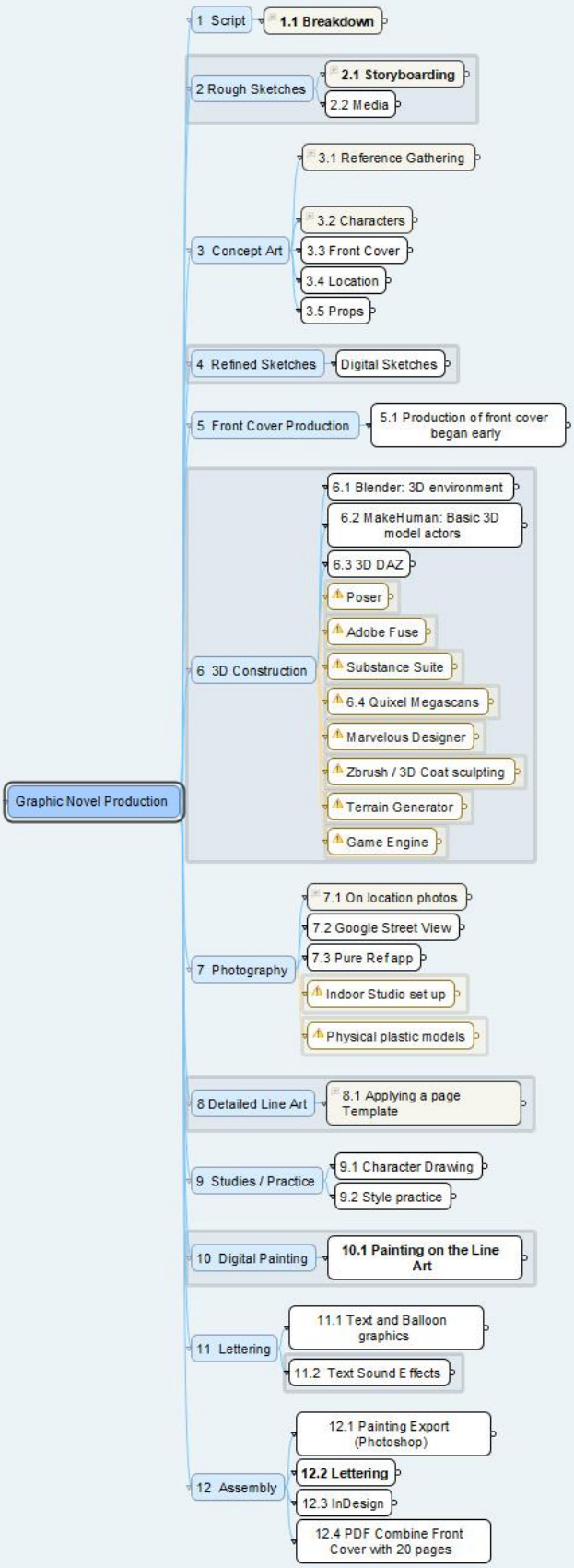
Following this practice, I used a mind map to construct a branching network of visual notes, brainstormed ideas and artistic processes, that had been collected over the course of the production of my graphic novel. The mind map became a visual representation of my research, that I found to be useful in effectively storing large quantities of individual pieces of data inside a single, structured system of branching topics. The mind map structure helped me identify gaps in my research which I could then use to generate new ideas and build new knowledge.

To construct the mind map, I used free software called Freeplane[8]. I decided to construct it digitally because the mind map needed to be large in scale to store all the collected data. The

[8] Freeplane is an open-source software application used to construct interactive, customisable mind maps inside an infinite digital canvas or board: see https://www.freeplane.org/wiki/index.php/Home, viewed 13 April 2020.

digital interface of Freeplane allowed me to navigate the mind map effectively by allowing me to expand and collapse portions of it to focus on specific areas at a time. I recorded individual pieces of information inside nodes[9], and organised them with branching topics (see figure 1a and 1b – the full mind map can be seen in appendix 1). The information included my thoughts, experiments, ideas, and results, such as successes and failures. The nodes were labelled with different colours and icons to help distinguish their meaning. For example, a red 'X' icon and red border for a failed idea and a green tick icon and green border for a successful idea, as shown in figure 1b. I also attached additional notes and images in some nodes to describe ideas in more detail. The images included visual examples of experiments, such as sketches and concepts, as shown in figure 1b. The mind map was regularly updated with new ideas and outcomes during the production of the graphic novel.

[9] A node is a balloon-shaped text box inside Freeplane with input and output connections used to connect it to other nodes in the mind map.


Graphic Novel Production
1 Script
1.1 Breakdown
2 Rough Sketches
2.1 Storyboarding
2.2 Media
3 Concept Art
3.1 Reference Gathering
3.2 Characters
3.3 Front Cover
3.4 Location
3.5 Props
4 Refined Sketches
Digital Sketches
5 Front Cover Production
5.1 Production of front cover began early
6 3D Construction
6.1 Blender: 3D environment
6.2 MakeHuman: Basic 3D model actors
6.3 3D DAZ
Poser
Adobe Fuse
Substance Suite
6.4 Quixel Megascans
Marvelous Designer
Zbrush / 3D Coat sculpting
Terrain Generator
Game Engine
7 Photography
7.1 On location photos
7.2 Google Street View
7.3 Pure Ref app
Indoor Studio set up
Physical plastic models
8 Detailed Line Art
8.1 Applying a page Template
9 Studies / Practice
9.1 Character Drawing
9.2 Style practice
10 Digital Painting
10.1 Painting on the Line Art
11 Lettering
11.1 Text and Balloon graphics
11.2 Text Sound Effects
12 Assembly
12.1 Painting Export (Photoshop)
12.2 Lettering
12.3 InDesign
12.4 PDF Combine Front Cover with 20 pages

a)

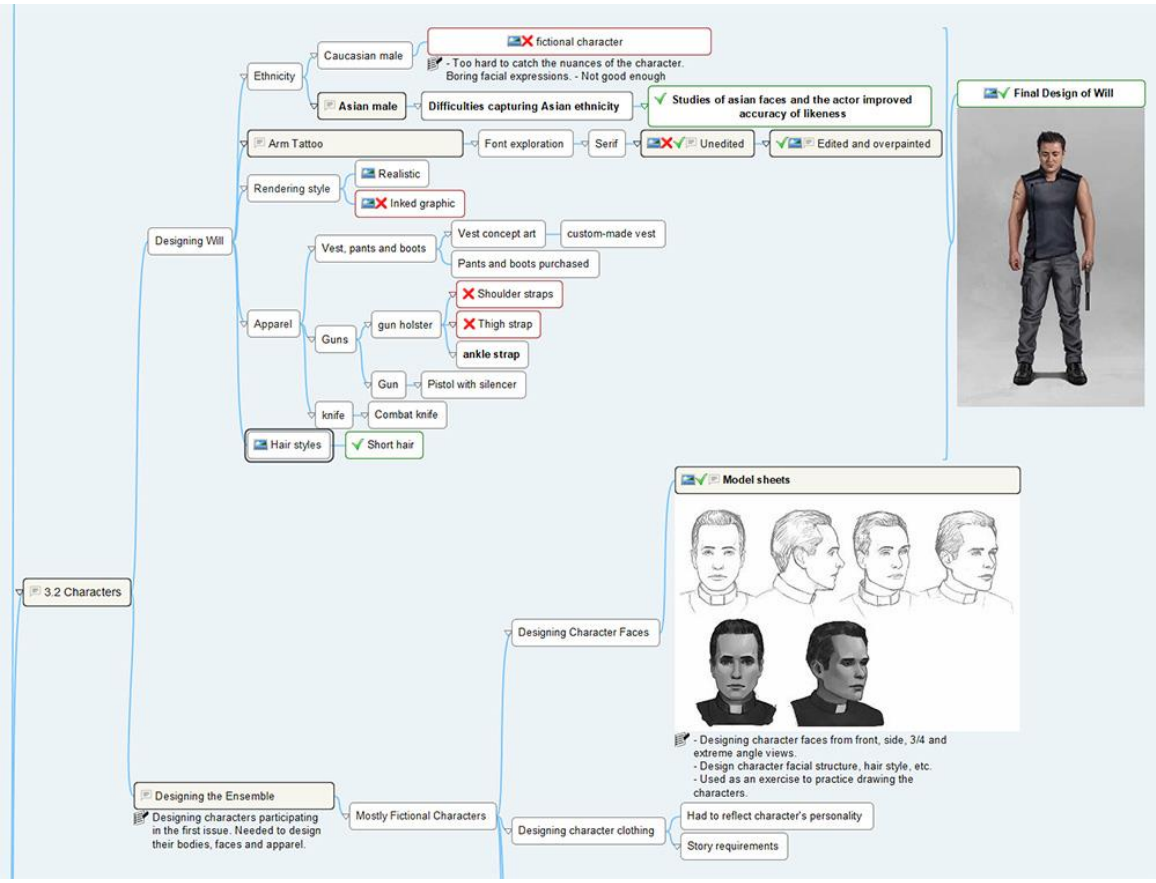
b) 

Figure 1. a) Screenshot showing a portion of my mind map in Freeplane. The project is divided into several main topics of production, which are then further branched out into sub-topics. Further branches have been collapsed and are not shown in the picture. b) An expanded portion of my mind map showing some of the branching ideas that were brainstormed when designing my characters during the concept art stage.

Data collection after production

After completing my creative component, I conducted a series of recorded interviews in dialogue with my supervisor to get at the heart of the creative processes I was engaging in. According to Anderson and Glass-Coffin (2013), interviews are a valid autoethnographic research tool that can be used to uncover new knowledge about the production process and in turn the object of study. Following Chang (2013), I used the interviews as a way to re-examine the body of research materials I had created along the process of creative development, which helped me develop a better understanding of my artistic processes and experiences. I found that the interview approach was an effective method for me to collect information because I was able to articulate my thoughts and experiences more clearly with speech. My supervisor was instrumental in drawing out every nuanced detail of the processes I engaged in in my creative practice.

During the interviews, the descriptive-realist story-telling approach was used. According to Chang (2013, p.119), descriptive realism is an approach that recalls past events as accurately as possible in great detail, such that "…researchers may engage in a story-telling style, integrating rich details to help readers reconstruct in their minds the described reality". Storytelling techniques were used to recall the rich detail of my approach to developing, trialling and applying new tools and techniques. I utilised my digital mind map during the interviews to recall details from the beginning to the end of the project in great detail. This allowed me to re-acquaint myself with the body of data and evaluate my past work and the decisions made and lessons learned along the way. For example, I was able to identify how and why I came about deciding to utilise new 3D digital techniques in my project. Re-constructing the full narrative of my production also helped me to document my process in the exegesis.

The re-constructed, rich narrative developed from the interviews and mind maps helped me arrive at conclusions about my project. For example, they helped me identify the realism style I used. I discovered that the artwork I was pursuing is not photorealism itself[10], but a combination of photography, my personal perception of the physical world, and an artistic style. From this discovery, I was able to break down and identify several key features I found to be fundamental in conveying the effects I was after in my artwork. This information was critical in understanding how photography and 3D construction helped me with conveying these features in the artwork.

Summary:

This chapter discussed the methodologies utilised to collect and evaluate my research data. It is a mixed methodological approach, utilising practice-based and practice-led research with an autoethnography to uncover the necessary knowledge regarding the use of photographic referencing and digital tools in the production of my realistic visual style in my graphic novel. The next chapter provides a background of the history of visual styles and processes used in sequential art. It examines how the advancements in technology and evolution of production processes employed by artists have influenced the development of new visual styles in comic books. Further, it explores the origins and the development of the realism style in comic books, including how it evolved as new technologies and processes became available.

[10] Photorealism refers to a painting style where the painted picture resembles the detail and precision of a photograph (TATE, n.d.).

3. A history of production processes and visual art styles in sequential art

This chapter discusses the history of sequential art and how the production processes and visual styles employed by the artists has evolved since the art form's inception. The history is broken down into three major sections, including its early forms, the emergence of the comic book and its mass production, and the digitisation of comic book productions including some of the more recent innovations in utilising 3D computer graphics. Each section is examined to develop a chronological timeline of technological and visual advancements in the field.

3.1. Early forms of sequential art:

3.1.1. Prehistoric cave paintings

The earliest type of sequential communication methods can be traced to prehistoric cave paintings which predate textual communication (Wyeld & Banasiak 2018). According to Eisner (2008b), the earliest examples of sequential storytelling involved crude drawings of scenes, often depicting animals, which may have been used in conjunction with vocalisations and performances to pass on hunting techniques and stories. These drawings, such as the Palaeolithic cave painting at Lascaux *Hall of Bulls* (n.d.), were typically hand-drawn using limited tools such as charcoal on cave walls (see figure 2). The primitive style and emphasis on symbolism were used to transmit information graphically (Wyeld & Banasiak 2018).

Figure 2. *Hall of Bulls* (n.d.) cave painting at Lascaux (Field Museum of Natural History).

3.1.2. Egyptian Tomb paintings

Collections of wall paintings found in the ancient tombs of Egypt fit McCloud's (1994) definition of image sequences used as a narratological device. For example, the *Harvest Scene* (~1400BC) found in the tomb of *Menna* in Thebes, presents a deliberate attempt to juxtapose a sequence of images intended to convey a particular narrative (see figure 3). It

recalls the events of *Menna* overseeing Egyptian farmers harvesting wheat, where some are beaten for neglecting to pay their taxes. The illustrations were painted on a layer of flattened white plaster, laid on an underlay of mud and straw over limestone walls (Davies 1936). Divided into a system of grids, the sequence was designed to be read from bottom to top, and alternating between left to right and right to left for each vertical segment.

Figure 3. The *Harvest Scene* (~1400BC), Tomb of Menna (Metropolitan Museum of Art).

Like the cave paintings, Egyptian wall art was mostly symbolic, painted onto a single flat plane without the use of perspective[11] or light and shade (Wilkinson 1983). Human figures and creatures were intentionally drawn unrealistically from mixed viewpoints – some parts of the body such as the eyes and shoulders were drawn in the frontal view, while faces, waists and feet were drawn in profile. Wilkinson explains that, in this way,

> *…each object is shown in its most characteristic form and from the most telling view, and these are assembled… in an orderly way to convey as much information as possible in the given space* (1983, p.30).

The scale of the people depicted in the scenes played a major role in describing their hierarchal status. According to White (2010), Pharaohs or tomb owners were depicted as the largest figures to symbolise their dominance. Workers, servants and animals were depicted as smaller figures. Colours were chosen for their power and attribute in aiding more meaningful communication with the Egyptian Gods. Unlike the modern comic book, the wall paintings in Egyptian tombs and monuments were never intended for public viewing (White 2010).

[11]The term perspective in this context refers to the use of traditional linear perspective techniques involving vanishing points drawn on a horizon line, in order to represent three-dimensional space and objects on a two-dimensional surface.

3.1.3. Bayeux Tapestry

Another relatively early sequential pictorial narrative is the *Bayeux Tapestry* (1080) depicting the conquest of England by the Normans in the eleventh century. It is an embroidered cloth nearly 70 metres in length and 0.5 metres in height (see figure 4). Reading from left to right, the tapestry recounts the events of the conquest in chronological order. Although it does not use panel borders, as in a modern comic strip, each segment is divided by subject matter. In this manner, it resembles, at least in part, the modern attempt to segment pictorial narrative in a comic strip (McCloud 1994).

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Figure 4. *Bayeux Tapestry* (1080), scenes 02-03.

3.2. The emergence of the comic book and its mass production:

3.2.1. The advent of 'proto-comics'

Since the advent of the printing press in the fifteenth century, the opportunity for the mass production of text and images gave rise to what Meskin and Cook (2012) describe as 'proto-comics', from which the modern comic book tradition evolved. A significant innovator in this period of the history of the comic book is the English painter, engraver and printmaker William Hogarth (1697-1764). He experimented with printing processes in the production of sequential art. His illustrated sequential prints from the eighteenth century, such as *A Harlot's Progress* (1732), and *Marriage A-La-Mode* (1743-1745), were six to eight-panel satirical picture stories designed to be viewed side-by-side in a sequence (see figure 5). Despite only consisting of a few panels, the pictures use intricate detail to communicate a story that reflects contemporary social concerns of the time (McCloud 1994). Initially exhibited as paintings, the designs were later engraved by Hogarth and published as imprints.

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Figure 5. *A Harlot's Progress* (1732). Prints by William Hogarth.

Smolderen (2014) reflects on Hogarth's sequential paintings, stating,

> *…instead of the fluid, quasi-automatic reading of a typical comic strip, we have, on the contrary, a slow read, one that invites the eye to lose itself in the details and to return to them in order to generate comparisons, inferences, and endless paraphrases* (2014, p.8).

In other words, Hogarth's work demanded that readers dwell on aspects of his illustrations in a manner not familiar to the modern comic book – from which the narrative can be deduced by quick scanning rather than prolonged investigation of the individual segments.

By the mid-nineteenth century, the first of what could be considered part of the modern genre of comic books were being produced by the Swiss artist named Rodolphe Töpffer. In his illustrated book *Histoire de Monsieur Cryptogame* (1830), many of the common features of the modern comic book were introduced: panel borders, cartooning (simplified caricatures), and the interdependent combination of words and pictures to tell a story (McCloud 1994; Wyeld & Banasiak 2018) (see figure 6).

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Figure 6. Plate 13 of the book *Histoire de Monsieur Cryptogame* (1830). Art by Rodolphe Töpffer.

3.2.2. Producing comic books and graphic novels for mass production

By the late nineteenth century, the comic book art form was being developed as a mass-produced media, such as in the Sunday newspaper. Printed on low-grade newsprint using aging and inaccurate presses, the newspaper comic strips were cheaply reproduced and not intended for archiving (Eisner 2008a). Outlcault's *Hogan's Alley* (1895) was a popular and commonly known early comic strip published in America. It featured a distinctly yellow character referred to as the 'Yellow Kid' (See figure 7). Only a few colours could be used in the early offset printing processes. This was used as a stylistic feature of his comic strip (Wyeld & Banasiak 2018). The yellow character was very popular, becoming "…the centre of a craze in New York and nearby cities" (Gordon 1998, p.14). It was so effective that its commercial value played a significant part in establishing the art form as a permanent addition to the newspaper. Another successful production, which also influenced later publications, was Winsor McCay's weekly series: *A Tale of the Jungle Imps* (1903). It demonstrates some of the earliest examples of modern panel arrangements and layering which were further developed in a later series: *Little Nemo in Slumberland* (1905) (Kukkonen 2013) (see figure 8).

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Figure 7. Comic strip *The Yellow Kid and his New Phonograph* (1896). Art by Richard Outlcault.

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Figure 8. Comic strip *Little Nemo in Slumberland* (1905). Art by Winsor McCay.

In the 1930s, the modern comic book was being published as reprints of popular newspaper comic strips (Wyeld & Banasiak 2018). Compiled into self-contained magazine publications, *Funnies of the Parade* (ed. Wildenburg 1933) was a popular production. Originally distributed as promotional 'give-aways' to advertise other products, comic books eventually began selling independently as a consumable product by publishers that began to realise their potential revenue. The new comic book style adopted genres and commercial practices from other popular forms of fiction at the time, such as the pulp magazine. This had a profound influence on the media's structure and artistic conventions (Lopes 2009; Wyeld & Banasiak 2018). The ability to produce comic books *en masse* meant quality was often a secondary concern after quantity and time to market for artists and publishers alike. In so doing, it developed a distinct craft, style and tradition which was peculiar to comic art (Lopes 2009).

By the end of 1930s, most comic books featured fully coloured pages, utilising a printing process called four-colour printing. The process required specialised laborers called

colourists, to work on down-scaled black and white copies of finished comic artwork, and test various colour combinations that would achieve the correct readable contrast. Comic book artists had no control over the colour schemes of their inked art, and so it was entirely up to the colourists to ensure the colours complemented the story and characters (Gabilliet 2005).

The superhero genre emerged between the 1930s and 1940s, a period often referred to as the Golden Age of comics (Lawrence & Ross 2015). The first issue of Joe Shuster's *Action Comics* (1938) (see figure 9), introduced the first ever superhero called Superman. Selling up to 900,000 copies of *Action Comics* each month (Goulart 2000), its success transformed the business into a major comic book industry, and the art by Shuster had helped define the visual style of future superhero comics.

Figure 9. *Action Comics #1* (1938) front cover. Art by Joe Shuster.

3.2.3. The development of detailed, realistically painted comic book productions

The realistic art style in comic books was majorly influenced by the illustrated covers of pulp magazines. Pulp magazines had developed a tradition for producing highly detailed photorealistic illustrations, which was a result of the business' competitive market and need to stand out to an audience (Lawrence & Ross 2015). Front covers for magazines, such as the *Doc Savage Magazine* (1935) by fine artist Walter M. Baumhofer had helped shape the standard for pulp art (see figure 10). Despite it proving to be an effective marketing technique, the illustrative cover was never implemented in comics. The process was reduced to simple line-drawn art instead; Lawrence and Ross suggest this was perhaps due to painted covers being too expensive to produce on a monthly basis, or the editors felt it was an unsuitable style for superhero characters. (Lawrence & Ross 2015). Pulp artists used live

models and photo references to guide their paintings - mixing medias like watercolours, oils, gouache, coloured inks and markers to capture form.

Figure 10. *Doc Savage Magazine* (1935) front cover. Art by Walter M. Baumhofer.

In 1942, pulp magazine company Fawcett published *Captain Marvel Adventures #17* (see figure 11). It featured one of the first ever realistically painted front covers in a comic book (Lawrence & Ross 2015), hence also being one of the first illustrations to depict a superhero realistically. The cover was painted by Charles Clarence Beck, who later refused to paint further covers realistically. Despite his ability to produce the art, he believed that paintings and comics do not mix. Beck commented,

> *Art prepared with too much fine details, too many gradations of tone and color, and with too much shading and technique will not reproduce properly* (Lawrence & Ross 2015, p30).

This suggests that realistic art may have been unsuitable to comics due to the technical limitation of the printing technology available at the time.

Figure 11. *Captain Marvel Adventures #17* (1942) front cover. Art by Charles Clarence Beck.

During the 1940s, comic books produced and distributed primarily in France and Belgium, known as Franco-Belgian comics, demonstrated further development of realist qualities in comic illustrations. Comic book artists depicted intricate details in their drawings to closely resemble objects in the physical world. For example, artist Victor Hubinon created authentic representations of military vehicles in *Buck Danny* (1947) (see figure 12). The illustrations of jets were accurately drawn and intricately detailed to capture the true physical construction of aeronautics (Guillaume de Syon 2004). The realistic artwork provided young readers the ability to experience American military aviation unlike any other art form available at the time. Moreover, the colours in the artworks no longer constituted intense primary colours commonly seen in American comics at the time. The palettes comprised of neutral, naturalistic colours that shared a closer resemblance to the colours observed in the physical world.

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Figure 12. *Buck Danny* (1947) cover and example interior page. Art by Victor Hubinon.

In the 1960s, artists Harvey Krutzman and Will Elder created the first ever fully painted, detailed sequential comic in America: *Little Annie Fanny* (see figure 13). The comic was a satirical series published by Hugh Hefner's *Playboy* magazine. It was not painted realistically, but was praised for its depiction of 3D form, level of detail and use of vibrant watercolours to tell the story, which was previously unseen in comic books (Lawrence & Ross 2015). This quality of artwork however could not have been replicated in regular comic books at the time, as the quality of paper and printing processes, as well as revenue, could not be matched to Hefner's magazine (Lawrence & Ross 2015).

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Figure 13. *Little Annie Fanny: Lost at Sea* (1964) interior page. Art by Harvey Kurtzman and Will Elder.

Throughout the 1970s, comics showed continuous growth in mature content and increase in adult readership. Recognising this, publisher Leonard Mogel saw an opportunity to appeal to an older demographic. in 1977, he established *Heavy Metal*, an American version of the French scifi/fantasy magazine *Metal Hurlant* (Lawrence & Ross 2015). The magazine became a platform for new unconventional, high concept, high quality art that was previously not seen in American comics. It showcased realistically painted covers and interior pages by some of the most innovative and influential artists in the business: Richard Corben, Jean Giraud, Vicente Sergelles, and Val Mayerik (see figure 14). They innovated the art of sequential storytelling, altering the public's perception of the art form. The illustrations were no longer considered as just a commercial product, but a work of art. The magazine was an immediate success, appealing to older American readers who have grown up with, but matured from the mainstream superhero comics.

Removed due to copyright restriction.

Figure 14. *Heavy Metal #10* (ed. Kelly 1978) front cover. Art by Val Mayerik.

Marvel's competing magazine *Epic Illustrated*, launched in 1980. Similar to *Heavy Metal*, it featured fully painted stories in the scifi/fantasy genre. The magazine expanded the creative space for pioneering artists, whose interests were to break away from mainstream assembly-line processes and strive to evolve the medium. For example, in *Metamorphosis Odyssey* (1980), artist Jim Starlin used mid-tone boards as a canvas, sometimes coloured, to depict coloured scenes, and painted his illustrations using only black and white media to "pull in the darks and pull out the highlights" (Lawrence & Ross 2015, p.152) (see figure 15). He used the tonal drawings to communicate the story. Starlin noted that the reproduction of colour in print at the time was an unreliable process. Since computers and scanners did not exist, the final prints were entirely dependent on the photographers who shot the pages for publications. As a result, artworks suffered from a lack of quality control as they were commonly mishandled or misinterpreted by the photographers responsible for their reproduction.

Figure 15. *Metamorphosis Odyssey* (1980) front cover. Art by Jim Starlin.

In 1983, artist Hampton released the first fully painted comic book series in America: *Silverheels* (1983) (see figure 16). Hampton believed in the realistic painting approach, stating:

> *you can actually realize an image though tone, which is the way we see the world. We see the world in tone, and not through line* (Lawrence & Ross 2015, p.160).

However, he addressed that conveying movement proved to be a challenging task in this stylistic approach. He argued that conveying action with realistic painting is more difficult than with the traditional pen and ink visual styles (Talon 2007).

Removed due to copyright restriction.

Figure 16. *Silverheels* #2 (1983) front cover and interior page. Art by Scott Hampton.

Further developments in sequential art continued in the late 1980s. Artists utilised mixed media like photography, collage mixed with watercolour and gouache painting and drawing to depict scenes in ways that seemed most effective in communicating the story. For example, in Miller and Sienkiewicz's *Elektra: Assassin* (1986) (see figure 17), Sienkiewicz would often mix styles, switching techniques from realistically painted characters to caricature drawings, to photocopies, and to kid's drawings. He limited his use of photo reference for his subjects and took advantage of the power of suggestion to encourage readers to fill in the abstracted details, thus immersing them deeper in the story (Lawrence & Ross 2015). Sienkiewicz's work suggests that he had recognised the different qualities of realistic and non-realistic styles, and applied them in a way that adhered to their individual strengths (Lawrence & Ross 2015).

Removed due to copyright restriction.

Figure 17. *Elektra: Assassin #1* (1986) front cover and interior pages. Art by Bill Sienkiewicz.

Soon after its release, *Elektra: Assassin* (1986) caught the attention of numerous media critics for its graphic and realistic depiction of violence. However, the criticism worked in favour of

the medium, as the headlines attracted the adult demographic back to comic books (Lawrence & Ross 2015). As a result, the stories told became darker, grittier and more grounded in reality. Superheroes showed weaknesses, emotions and other complexities that made them feel more human. The tonal shift had a major impact on the visual style in comics. In Morrison and McKean's *Arkham Asylum: A Serious House on Serious Earth* (1989) (see figure 18) shows this transition most vividly. The novel's use of layout, blurred panels, obscured details and stark shadows imposes a feeling of dread onto the reader, making the unseen more compelling. Regarded as the one of the best-selling graphic novels ever produced, it pushed the visual aspects of comics to new heights (Lawrence & Ross 2015). Like Sienkiewicz, McKean used a mixed media approach, blending painting with drawing and photo collage to create a mixture of realism and surrealism.

Figure 18. *Batman Arkham Asylum: A Serious House on Serious Earth* (1989) interior pages. Art by Dave McKean.

In the 1990s, superheroes began to emerge in fully painted comics. For example, in Busiek and Ross' *Marvels* (1994) (see figure 19), Ross had realistically illustrated many of the iconic Marvel superheroes using gouache painting techniques. Ross explained that the project originated from his personal desire to see other superheroes be painted realistically. He recognised others' lack of interest in painting superheroes at the time and saw an opportunity to pursue the challenge (Lawrence & Ross 2015). Inspired by the works of Norman Rockwell, Ross utilised his traditional fine arts painting techniques and photographic references to illustrate the superheroes in a realistically painted setting, thus giving them physicality. Ross noted,

> *I idealized people like Rockwell, who drew in that photorealistic style. When I was 16 or so, I said to myself, "I want to see that in a comic book!"* (Illustration History, n.d.).

Rockwell was an American artist most known for his covers made for *The Evening Post* magazine during the twentieth century. His detailed illustrations conveyed a convincing realism. Like Ross, Rockwell used photographic references to inform his painted illustrations (Schick 2009). Ross commented that he admires Rockwell's work, but his attraction to the fantastical elements of comics had led him to a stylistic departure from Rockwell's illustrated reality (Norman Rockwell Museum 2013). His goal was to render iconic superhero characters in their classic colourful costume design in hopes to revitalise the traditional American heroes to modern readers. His realistic interpretations of classic Marvel and DC characters gained him fame in the comic book industry (American Academy of Arts College, 2012). He was praised for his depiction of realism, winning several prestigious awards including the Harvey Awards and the Eisners, and has often been referred to as "the Norman Rockwell of the comics world" (American Academy of Arts College, 2012).

Ross believed the realistic painting style had an advantage in that it created a unique connection between the subject and the reader – a connection with reality on a profound level (Lawrence & Ross 2015). Ross reflected that the painted realistic style in comics is powerful but still lacks the communicative advantages that are offered by the standard inked comic book art. The reductive style created with pen and ink allows artists to communicate ideas quickly and simply to the reader.

Figure 19. *Marvels* (1994) interior pages. Art by Alex Ross.

3.3. The transition to digital comic book productions and modern techniques:

3.3.1. Comic books produced on computer

In the mid-1980s computers and digital tools became more accessible to comic book artists. The earliest digital comic productions included those of Gillis and Saenz's *Shatter* (1985) (see figure 20) (Wyeld & Banasiak 2018). Illustrated directly on a Macintosh computer using a modified version of MacPaint, the production process proved to be faster but introduced new problems (Garcia 2013). The artist was looking through a small window of the computer screen, only seeing a small portion of the page at any one time. The pages were later printed in black and white, coloured using airbrush paints, and prepared for print reproduction.

Removed due to copyright restriction.

Figure 20. *Shatter* (1985) front cover and interior pages. Art by Mike Saenz.

Saenz's next project *Iron Man: Crash* (1988) (see figure 21), was the first computer generated graphic novel. The artwork was created using ComicWorks, a program on the Macintosh II which allowed the artist to draw bitmaps on a low-resolution one-bit-plane. Every pixel was drawn by hand. Saenz then imported the images to Lithographer, a custom program developed by programmer William Bates to digitally colour the images. Saenz also used Pro 3D program to create basic low poly 3D models of a ship, a car and robots. The logos and cover art were done in a vector program Illustrator (Nielsen 1988). Unfortunately, the limitations of the computer technology created poor results. The images were very low resolution and appeared flat, and the 3D effects blended poorly with the surrounding artwork.

Removed due to copyright restriction.

Figure 21. *Iron Man: Crash* (1988) front cover and interior page. Art by Mike Saenz.

Over time, every stage of the graphic novel and comic book production had been increasingly computationally altered. This includes typesetting, layout and colouring, and replicating many of the processes traditionally performed manually. Whilst artists attempted to maintain the 'inked style' appeal of comics, the computer offered a greater palette of options with almost limitless opportunities for revision and expansion (McCloud 2000; Wyeld & Banasiak 2018).

3.3.2. The emergence of webcomics

During the earliest days of the Internet in the 80s and 90s, comic book creators began exploring its uses in distributing their work. The sufficient bandwidth allowed fully digitalised comics to be published online. Called 'webcomics', many of the early examples were simply scanned versions of printed books. In time, fully digitised productions became available (Wyeld & Banasiak 2018). This included Parker's *Argon Zark* (1995), and Farnon's *Leisuretown* (1997) (see figure 22). Farnon created his comics by digitally superimposing photographs of children's toys over photographic backgrounds such that the toys appeared human in scale. Other creators experimented with various multimedia such as hyper-text interactivity, allowing readers to choose alternate paths, or adding sounds effects and motion graphics into the panels (McCloud 2000; Wyeld & Banasiak 2018).

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Figure 22. *Leisuretown* (1997) webcomic page. Art by Tristan Farnon.

3.3.3. Integration of 3D computer graphics into comic book productions

The first fully 3D graphic novel, *Sinkha* (1995), was produced by illustrator Marco Patrito (Wyeld & Banasiak 2018). He created realistically modelled and textured 3D characters that he then posed in 3D scenes (see figure 23). According to Patrito's website (Sinkha, n.d.), the textures on the 3D models were digitally hand-painted without the aid of photo-textures, which may have been done to provide the artist with additional control over the models' appearance in the illustrations. The 3D models were then lit using virtual lights, and rendered with an unspecified program to create the final 2D illustrations. Patrito had also integrated multimedia features in the digital version of the graphic novel, including sounds and animations, to help further bring the artwork to life (McCloud 2000).

Removed due to copyright restriction.

Figure 23. *Sinkha* (1995) front cover and interior page. Art by Marco Patrito.

Over time, 3D modelling tools became more readily available, allowing artists to experiment with a more advanced set of 3D tools to improve on their established assembly-line

production processes. In Busiek's and Immonem's *Shockrockets: We Have Ignition* (2004) (see figure 24), artist Stuart Immonem utilised 3D to aid his drawings of complex mechanical structures like props, vehicles and buildings (Cronin 2007). He used a basic, unspecified 3D modelling program to model the assets in 3D, and then adjusted the angle of view to use the assets as reference for the drawings. The technique ensured consistency of complex designs across the series.

Removed due to copyright restriction.

Figure 24. Shockrockets: We Have Ignition (2004) front cover and interior page. Art by Stuart Immonem.

Other 3D programs like Poser and Daz Studio have become a popular choice among sequential artists for designing 3D digital characters. The programs specialise in the creation and manipulation of realistic 3D human avatar models and provide an advanced set of tools that minimise the technicalities present in conventional 3D character creation. The simplification of the process increases accessibility to 2D artists. For example, in *Shadows: The Awakening* (2010) (see figure 25), Kevin Richter used a combination of Daz Studio and Autodesk Maya to create an ensemble of digital costumed characters that he then posed and rendered inside realistic 3D scenes (Richter 2011). The rendered scenes were used as final artworks in his comic book.

Removed due to copyright restriction.

Figure 25. *Shadows: The Awakening* (2010) interior page and 3D process. Art by Kevin Richter.

Other projects like Haberlin's science fiction graphic novel *Anomaly* (2012) (see figure 26), was created with a combination of Poser, Zbrush, Vue and Photoshop to produce the artwork. Haberlin and his art team used Poser to build the 3D content in the novel. The program's ease of use allowed Haberlin to train his art team to effectively work within the 3D pipeline – something that other available modelling suites were lacking (Smith Micro Graphics 2013). The team also took advantage of Poser's online community authored content to populate their scenes more effectively. Haberlin argued that the lack of this content made 3D processes less practical for comic book production in the past (Smith Micro Graphics 2013). The 3D models were then rendered and exported to Photoshop. The images were converted to black and white, laid out on the page and separated into panels. Finally, the 3D renders were overpainted with colour and shading, effectively removing the appearance of 3D and substituting it with a painterly, realistic quality.

Removed due to copyright restriction.

Figure 26. *Anomaly* (2012) interior pages and process. Art by Brian Haberlin and Geirrod Van Dyke.

Summary:

This chapter has provided a background to the history of production processes and visual styles utilised in sequential art media. It is apparent that, as new technologies and production methods were employed by the artists, new visual styles had emerged. It showed that artists have already started to experiment with modern digital tools, such as 3D modelling and digital painting, to develop new visual styles and processes previously not used in the medium. The overview had also helped to establish the historical development of realistically painted artwork in sequential art, including its origins and existing methods of production. In the next chapter, Alex Ross' artistic process in creating realism style is analysed in more detail. Each stage of his production will be investigated, including his use of rough sketching, photoshoots, detailed line drawings, and painting.

4. Analysis of Alex Ross' visual style and production process

This chapter discusses Alex Ross' production processes and how he develops realism as a visual style in his comic books. His processes involve several stages: rough sketching, photoshoots, detailed line drawing, and painting. Each of these is examined in detail.

4.1. An overview of Alex Ross' artistic processes:

In the new reprints of Busiek and Ross' *Marvels* (2010) and Waid and Ross' *Kingdom Come* (2008), Ross includes several pages at the end of each book outlining a brief overview of his artistic process (Busiek & Ross 2010, n.p.; Waid & Ross 2008, pp.222-223). The process involves him drawing rough sketches to develop ideas, conducting photoshoots to gather references, producing detailed line drawings to refine his ideas, and rendering the final illustrations with gouache paints. In the breakdown, Ross reveals his methods for utilising photographic essays as a referencing tool to inform his drawings. He includes examples of original photographic images he captured for scenes in his productions, with the final painted illustrations next to them. The comparison shows how the photographic reference inspired his depiction of characters in his final painting. He borrowed details from photographs, but also painted other areas from imagination.

4.1.1. Analysis of Alex Ross' use of rough sketches

Ross uses sketching of his initial ideas as rough pencil thumbnails[12] as a mechanism for solving compositional problems[13], such as the layout of the artwork and the location of the focal point (see figure 27). The thumbnail sketches vary in size and ratio, but some are as small as five by seven centimetres. Each thumbnail represents the layout of an individual comic page (Busiek & Ross 2010). The number of panels per page varies. Typically, it might

[12] A thumbnail refers to a rough sketch used to rapidly visualise ideas without committing to a refined drawing. They are loosely drawn with little detail, and communicate the main idea clearly (Doyle 2018). In Ross' process, he would sometimes draw several thumbnails to brainstorm ideas for a single scene. The thumbnails helped him find the most effective idea (Busiek & Ross 2010).

[13] A pictorial composition is the arrangement of visual elements inside a two-dimensional frame. Thus, a compositional problem refers to the challenge of arranging visual narrative elements within the frame to effectively communicate an idea to the viewer. This involves establishing the centre of interest, the perspective, and secondary narrative elements. The flow of narrative elements within the sequence is organised so that it corresponds with standard reading conventions, which in the Western culture is left to right, and top to bottom (Eisner 1985). It also involves clustering of elements into groups to simplify the layout of the drawing. "…The simpler the design, the easier it will be for the reader to understand and enjoy it." (Lee & Buscema 1978, p.110)

range from four to five panels. A benefit of using this technique is that Ross can produce images quickly whilst not being concerned with imperfections in the drawing (Ross 2018b). Yet, the thumbnail can still be used to communicate the story. This allows the writers and editors to check the pacing of the story prior to producing the final artwork (Waid & Ross 2008). According to Ross (2018b), he visualises or imagines his ideas based on an understanding of the natural environment. He uses his thumbnails to plan what to include in his photoshoot – lights, actors, costumes and props – in a real-world setting.

Removed due to copyright restriction.

Figure 27. Example of Ross' thumbnail sketch (Busiek & Ross 2010).

4.1.2. Analysis of Alex Ross' use of photoshoots

Before he commits to his imagined ideas, Ross' uses photoshoots to develop his ideas further. He uses his photographic essays to bring his imagination to reality. In his YouTube video (Ross 2018b), Ross explains how trusting one's instincts alone can often lead to errors.

From the photo images of Ross' *Marvels* (1994) photoshoot environment, it appears that he uses a typical, domestic, lounge-room-size studio space, approximately four by four meters with a two-and-a-half-metre high ceiling (see figure 28). Several items of furniture are present, including bookshelves, a large desk, and painting equipment on one side of the room. The centre of the room is mostly empty and appears to have been used to conduct the photoshoot sessions. It provides Ross with enough space to stage his scenes.

Removed due to copyright restriction.

Figure 28. Photographs showing parts of Ross' studio space he used for conducting his photoshoots (Busiek & Ross 2010).

The studio appears to be lit from two light sources – a single diffuse, incandescent ceiling light (a surface mounted fixture) that floods the space with a mostly even illumination, and a single point-light source, such as a desk lamp or spotlight used to cast strong, directional shadows. The people or 'actors' in the photographs hold a pose in the centre of the studio space. They are replicating the poses of figures or 'characters', in Ross' pencil drawings. The actors are wearing outfits or 'costumes', that resemble the costumes worn by the characters in his illustrations. Some actors also hold items or 'props' in their hands that resemble props held by the characters in Ross' illustrations.

The ceiling light illuminates the actors so that their body posture, costumes and props can be properly exposed for the photograph. The additional direct light source – desk lamp or spotlight – is brighter than the ceiling light. It is used to define the three-dimensionality of the actors' faces and bodies, by illuminating their form from a single direction, such that any topography captured casts strong shadows. The lamp is moved about the studio space to illuminate actors from different directions. The position of the lamp depends on Ross' artistic intent. It differs between scenes depending on the goals of each illustration.

The lamp tends to be oriented according to the angle of a primary light source in Ross' imagined scene, such as the angle of the sun in an exterior setting. The lighting in the photo reference must match Ross' original sketches, so the shading can be copied directly from the photo reference onto his illustration. The photo reference is used to maintain lighting consistency across different sketches of the same scene from different views.

Ross uses the shading in shadows and angles resulting from the positioning of the light to invoke an emotion or feeling. For example, to communicate a character as mysterious or highlight their 'otherness', Ross uses the light source to cast a shadow over the eye socket region so that the eyes are no longer visible in the painting (see figure 29). He places the light source above the actor's head during the photoshoot. The actor's brow ridge casts a shadow over their eyes, thus obscuring them. This shadow effect is captured in his photographic reference and then copied to his illustrations. Ross further exaggerates this effect in his artwork by removing tonal details in the shadows completely, thus eliminating the effects of indirect, bounced light observed in the natural environment.

Figure 29. Ross' illustration from *Kingdom Come* (1996) showing his use of lighting and shadows to obscure a character's face.

In another example, during the making of *The Human Torch* character in *Marvels* (1994), Ross positioned the lamp light source directly above the actor, creating a high contrast effect between the lit and shadowed areas on his character's face. He then extracted the negative from the photograph (see figure 30). According to Ross (Busiek & Ross 2010, n.p.), the negative helped him imagine how "…a light may appear to be coming from within the body".

Removed due to copyright restriction.

Figure 30. Ross' photograph of an actor which he then used to illustrate The Human Torch character in *Marvels* (1994).

Ross' process for recruiting actors involves casting his friends who closely resemble his imagined characters physically or facially. He then adjusts their appearance in his drawings to match his designs (Busiek & Ross 2010). When Ross photographs his actors, he aligns the viewfinder at an angle as close as possible to that depicted in his sketch. The photos that look most like his drawings are the most useful to him. He states,

> *I can do frankly a much better painting based upon an exact photo I'm rendering instead of something I'm just sort of reimagining* (Ross 2018b).

The photos are printed in a small format: approximately ten by fifteen centimetres. It appears Ross is using small images to reduce the amount of information available and so he can see everything in the image at the same time. This means he has a good overview of the image's content and is not distracted by superfluous detail. Selecting individual photos, he places them next to his drawing board on which he paints his final artwork. In my own practice, I adopted this technique. And it helped me evaluate the scale and proportions of my actors' individual features relative to the rest of their body. It also stopped me being distracted by less important details captured in a photograph, such as skin blemishes or individual strands of hair.

Ross' video (Norman Rockwell Museum, 2013) shows how he is not using just live models, he also uses objects of similar looking form and shape. For example, he uses toys and miniatures such as superhero figurines that he has collected over the years. He poses them and lights them the same way he would live actors to achieve the same effect. For example, the miniatures such as Silver Surfer, that is made of a reflective chrome material, he lights to

obtain convincing reflections, compared to a live model that does not have a metallic material (see figure 31) (Busiek & Ross 2010).

Figure 31. Ross' photograph of Silver Surfer figurine that he used to illustrate the character in *Marvels* (1994).

From this, we see how he expands on his library of photographic reference material to obtain more convincing renders of complex forms with complex materials.

4.1.3. Analysis of Alex Ross' use of detailed line drawings

After the photoshoots, Ross begins a tight line drawing[14]. It is drawn with a pencil on a Strathmore 500 series 4-ply watercolour bristol board[15] approximately thirty by forty centimetres, on which he paints the final artwork (see figure 32) (Ross 2018a). He uses the bristol board paper because it soaks the gouache evenly during his painting process to create a smooth texture. Unlike the small thumbnails, the large drawing area allows him to add finer details and precision to his drawing.

[14] A tight line drawing refers to a precise outline of the final illustration (Ross 2018a).
[15] A bristol board is a thick type of paper made of several sheets glued under pressure to provide a stiff working surface (Strathmore 2018).

Removed due to copyright restriction.

Figure 32. An example of Ross' tight line drawing of a page from *Kingdom Come* (Waid & Ross 2008).

He copies the images in his photographic essay onto the bristol board to refine his design ideas. The detail captured in the photographs reveal to him effects in the natural environment that he would have otherwise been unable to imagine fully (Ross 2017a). This includes the likenesses and expressions of characters, the folding of cloth on posing actors' costumes, and the complex reflections from shiny curved surfaces. For example, a character in *Kingdom Come* (1996) is based on the likeness of Ross' father Clark Norman Ross. Ross photographed his father using his photoshoot process to capture the complexities of his face. He then copied the details onto the line drawing to replicate his father's likeness and persona onto the drawn character (see figure 33).

Removed due to copyright restriction.

Figure 33. Ross' photograph of his father Norman Clark, and a line drawing of the character (Waid & Ross 2008).

By copying only the core details from a photograph, Ross could express the key idea or purpose he was trying to establish for his painting (Spry 2016). For example, to paint an

illustration depicting an angry character, Ross may photograph an actor expressing anger. It appears what Ross is doing is analysing the features of a photograph that defines an angry expression on an actor's face: the lowering and angling of the brows, the shape of frown lines, the squinting of the eyes, shape of the nose, the shape of the smile lines**,** the shape of the mouth, and so on. By combining these observable features in his drawings, he recreates a recognisable expression (see figure 34). The accurate rendering of these features in the illustrations ensures a convincing expression can be communicated to the reader.

Removed due to copyright restriction.

Figure 34. An example showing how Ross interprets facial features from a photograph onto a character in the illustration (Busiek & Ross 2010).

According to Ross, he never directly traces photographs onto the final illustrations. In this way he retains creative control over the borrowing of details from photographs so that his original idea is unchanged in the final illustration. He states that, all the artwork he creates is "…as good or as bad as I can draw it" (Ross 2017a).

4.1.4. Analysis of Alex Ross' use of painting

Ross paints his final illustrations with gouache paints using several paint layers. The first layer is a monochromatic value study, which is usually painted in greyscale or a dominant colour of the illustration. Ross uses this layer to render the lighting and forms convincingly, prior to being concerned with colour (Waid & Ross 2008). The paint is applied onto the watercolour bristol board on which the final line drawing is drawn.

The monochromatic study is then painted over with coloured gouache paints by applying transparent washes of colour over the shading. It appears that Ross does this to solve problems gradually. He starts by establishing the shading in the illustration to create legibility, and then progresses to colouring by applying varying hues of colour onto the

greyscale to depict the individual materials convincingly. Finally, he employs airbrushing[16] techniques to add grading effects like light bloom or smoke into the illustrations (Waid & Ross 2008).

4.2. Evaluation of Alex Ross' artistic process

Ross uses traditional media in his artistic process. His primary tools include pencils, gouache paints and airbrushing. He does not report using digital tools like Photoshop or 3D computer graphics (Ross 2017b). By contrast, my artistic processes for this project build on Ross' processes by exploring modern digital painting and 3D construction techniques – replicating some of his techniques and style digitally. I found these tools to be useful in addressing some of the artistic challenges present in painting a realism style with traditional tools. These challenges, and my developed processes for overcoming them, will be described in more detail in later chapters.

Summary

This chapter provided a detailed overview of Alex Ross' artistic process that he uses to create a realistic art style in his graphic novels. It examined each stage of production, including rough sketching, photoshoots, detailed line drawing, and painting. It also addressed that he only uses traditional media to produce his artwork and has not experimented with integrating any digital tools into his workflow. By contrast, I am experimenting with digital tools in my own project to build on Ross' techniques and develop new methods for creating realism in my artwork. The next chapter establishes the background to my graphic novel project *DEMONS*. It provides an overview of how the project came about, my artistic background at the time, my early artistic training and struggles in learning the comic book style, early visual style exploration, and how Alex Ross' graphic novels influenced the realism visual style I developed for my project.

[16] Airbrushing is the process of spraying paint onto a surface using an air-operated tool called the airbrush. The paint is fed from a container attached to the airbrush and passed through an air conduit where it is mixed with high-pressured air. By pressing and moving back the trigger on the airbrush, the paint and air mixture is ejected through the front nozzle in the form of a fine spray, which paints a soft gradient on the surface (Benko 2014). The soft gradient effect is unique to the airbrush and Ross may be utilising the tool to paint soft lighting effects in his artwork.

5. *DEMONS* project background

This chapter provides an overview of the development of my graphic novel project *DEMONS*. It discusses the origins of the partnership between myself and writer David Coyle, including my artistic background in films and video game projects, and how it led to our collaboration on the graphic novel. It discusses the acquisition of fundamental skills, including the study of human anatomy, and the visual language employed in comic books, that was critical in overcoming the challenges involved in executing the project. Finally, it explores how the research into visual styles in comic books, and my early stylistic experimentations, led to the development of a realism visual style for my project, including how the discovery of Alex Ross' artwork influenced this outcome.

5.1. Stakeholders in the production

In 2013, writer David Coyle was directing his original film production, *Enfilade* (War on Convention Films 2014a). He needed some matte painting assistance for several visual effects in his film. He approached me because he was searching for a digital artist who was knowledgeable about painting and convincing physical world effects to aid his production.

At this time, I was a digital artist studying a Bachelor of Creative Arts at Flinders University. I was involved in several digital media and screen topics, and my assignments included producing realistically painted concept designs and illustrations for film and video game projects. The tasks were part of pre-production and pre-visualisation stages of production. At that time I only used Adobe Photoshop software in the production process. A combination of digital painting and photo-bashing[17] techniques were utilised to produce highly detailed, realistic artwork. I specialised primarily in environment painting and design, but had limited experience in character art.

The original aspirations for my becoming an artist stemmed from a fascination with inventing and realistically visualising imaginary worlds. Storytelling through environmental detail, instead of character interactions, was an appealing process to me. Illustrating environments requires a strong fundamental understanding of the behaviour of light and colour in the physical world. This subject was fascinating to me. I found Gurney's *Color and Light* (2010)

[17] Photo-bashing is the process of collaging photo textures of figures and backgrounds to create photo-realistic concept art (Webster 2015). Details are borrowed from photographs to accelerate the process of rendering a realistic image. In my own process, I use high resolution photographs, which I capture myself, or purchase from online photo pack sources, such as *photobash.org*, or download from public domain image search engines, such as *pixabay.com*.

and Vickery's *Practical Light and Color Theory and Application* (2007) explanations of the physical behaviour of light useful. For example, I learnt that the scattering of sunlight in the sky creates an ambient blue light that illuminates shaded areas in an outdoor environment. During my University studies, the necessary knowledge to convey realistic environment illustrations began to develop.

When Coyle saw my university artwork, he recognised my abilities in painting realistic illustrations. He decided I would be suitable for the matte painting role he needed. He asked me to create several photorealistic matte painting backgrounds for his film *Enfilade*. We collaborated on the film for about two months. Communication with Coyle was effective, and his ambition for a high-quality production helped us form a strong partnership. I gained his trust after I completed the matte paintings according to his creative requirements. Collaboration with Coyle continued during another film project later that year, a television commercial for *St. Vincent De Paul Society* (War on Convention Films 2014b). In that role I produced a photorealistic matte painting for a visual effect appearing in the final shot.

The DEMONS project

In 2014, Coyle pitched to me his major production *DEMONS*. It is an original story he wrote several years prior to our collaboration. The script was originally written as a screenplay for a feature-length film. However, he was exploring alternative production options, because producing a feature film is an expensive endeavour. Therefore, he decided to adapt it to a graphic novel as it was more economically feasible, but also gave him the opportunity to disseminate his story to his intended target audience: readers interested in high-concept, morally ambiguous narratives and vampire fiction.

Moreover, the comic book medium provided a unique visual quality of superimposing speech balloons and text over the artwork to convey the story – something that was not used in the film medium. Coyle recognised this quality and sought to utilise it to emphasise one of the story's unique aspects, which is storytelling through several contrasting perspectives. This was later achieved by colouring the characters' speech balloons with a unique colour, such as red, white and grey, to distinguish which factions they belong to. For example, grey speech balloons are used to label characters who are affiliated with the anti-vampire force organisation, while red balloons are used to label vampires (see figure 35). The colour of each character's speech balloons can change to other factions as their views on the world or

motivations change throughout the story. Therefore, the effect is used to communicate to the readers aspects of the story that are invisible in the images alone.

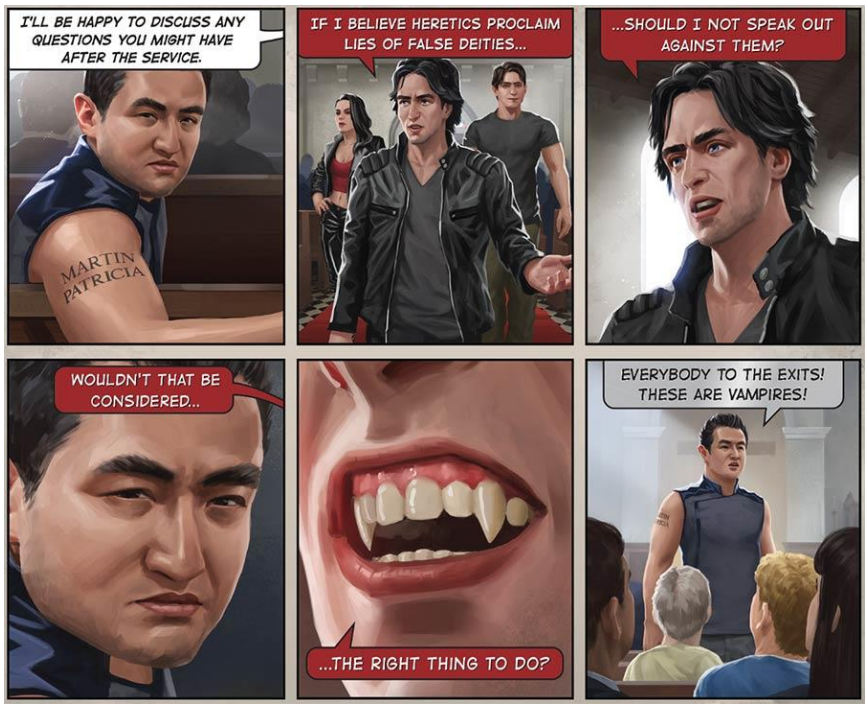

Figure 35. Example from the finished illustrations showing how speech balloon colours are used to label characters to different factions.

Coyle was confident in my artistic abilities and offered me an opportunity to illustrate the production for him. It should be noted that the idea of painting the project realistically was not considered at the time. My painting skills were not developed enough to complete detailed, realistic illustrations at a sufficient pace for a comic book production; hence, the realism style was impractical.

Initially, I found Coyle's proposal a daunting prospect. I had not worked on a comic book production before. This was going to be a difficult brief to follow and would require a big commitment, particularly for someone who had never worked on a comic book before. I had not even read comic books and was not familiar with the medium or the processes involved in creating the artwork. Also, I struggled with drawing convincing human anatomy and had difficulties with drawing human faces. Hence, I anticipated a long learning process. However, the challenge was also appealing.

Moreover, one of the tools I needed to learn for this project – 3D modelling – was not my primary area of expertise at the time. Professional concept artists in the industry, such as Maciej Kuciara (2020), were frequently utilising 3D modelling packages to produce realistic

artworks. His artistic outcomes, which he shared online[18], inspired my interest to explore the basics of 3D construction.

Implementing 3D in this production was considered early on. But, a 3D workflow requires a significant amount of time to produce, which could delay the final artworks. Also, I was unfamiliar with other comic book productions that utilised 3D construction in their processes. It was assumed that artists did not have the time to create assets in 3D to then draw from, due to the rapid turnaround expectations in common comic book production practices. It seemed like an unnecessary time investment. Hence, initially, the idea was rejected.

Prior to developing the visual style for the project, I decided to develop two necessary skills: fundamentals of the comic book medium, and also the ability to draw convincing human anatomy.

5.2. Skills:

5.2.1. Learning the comic book medium

I found it was necessary for me to understand what a comic is and what the comic book language constitutes before I could develop a suitable style for the project. I needed to learn about the medium's fundamentals, such as the basics of comic book grammar, graphic design, and pictorial sequences to communicate a narrative. To understand these, I studied several books, that were commonly recommended by comic book artists. For example, McCloud's *Understanding Comics: The Invisible Art* (1994) and *Making Comics: Storytelling Secrets of Comics, Manga and Graphic Novels* (2006), Eisner's *Comics and Sequential Art* (1985) and *Graphic Storytelling and Visual Narrative* (1996), and Lee and Buscema's *How to Draw Comics The Marvel Way* (1978). These are the foundation books for artists currently working in the industry. They establish the fundamentals of what a comic book is and the language employed to tell its stories. For example, they explore subjects like page structure, depiction of time and space with panels, symbolic graphic design, character stereotypes, speech balloon lettering and grammar, and other essential details that form a comic book.

Rigorous research material used to study comic book visual styles is not peer-reviewed. What is available that meets the rigors of academia analyses literary devices of comic books, such as styles of comic book writing, comic book genres, or the portrayal of political or social issues in comic books. Such material was not relevant to my research project because it did

[18] See www.artstation.com/maciej, viewed 15 February 2020.

not discuss the production methods of images inside comic books, specifically the artistic techniques utilised by the artists to visually communicate stories – which is what is the focus of my research.

Another critical part of the process involved reading graphic novels that are regarded as popular and influential in the industry, such as Moore and Gibbons' *Watchmen* (2014), Enis and Dillon's *Preacher* (1996), Canales and Guarnido's *Blacksad* (2000), Spiegelman's *The Complete Maus, Volume 1* (1991) and Vaughan and Staples' *Saga: Volume One* (2012). Visiting local comic book shops also helped me explore variety in comic book visual styles. Their aesthetics influenced the development of my own vision for this project.

Depiction of time in comic books

One of the visual theories of comic book design I utilised in this project was the depiction of time using panels. McCloud (1994) argues that panel layouts and placement of speech balloons inside each panel can be used to communicate time in comics. He claims that unlike film media, time and space work in unison to create the illusion of elapsed time. Since images are read left-to-right in the western culture, the panels are arranged left-to-right on the page to communicate different moments in time in the correct order. Also, the length of the speech balloon dialogue can indicate how long an action is taking in each panel. I later used this framework to design a panel structure in my project that could convey two actions happening at the same time (see figure 36). The scene depicts the central character crossing himself in front of an altar whilst the church choir is signing in the background. The large panel of the choir is intentionally overlayed by the individual smaller panels showing different moments in time of the character crossing himself. This is done to convey that his action is happening at the same time and for the same duration as the choir singing the lyrics in the speech balloons above. Moreover, the smaller panels are arranged in a cross shape to convey the cross motion performed by the character more effectively to the reader. The method in which this scene is communicated is unique to the comic book medium and would not be possible in other media, like film.

Figure 36. Example from page 2 of my project showing my use of panel layout to convey two actions happening at the same time.

Utilisation of text and images in comic books

Another aspect I studied was how the unique combination of text and images differentiate comic books from other digital media, such as animation and film. For example, Hillary Chute (2008), argues that the comic art form requires higher cognitive involvement from the reader due to the labour intensive, back-and-forth decoding of image and text sequences, and filling in the gaps between images required to derive meaning. McCloud (1994) refers to this cognitive phenomenon as ‘closure’, which is the reader’s or viewer’s ability to observe parts of something to then perceive a larger, unseen whole. In visual media, the viewers must utilise their past experiences and understanding of the world, as well as their imagination, to create mental connections between disconnected images with text. The differences observed between these images help the viewers interpret and imagine aspects that are unseen, such as motion, space and time. McCloud (1994) claims that comic books rely heavily on closure because it allows readers to understand the narrative from images and text that only show intermittent parts of the story. Unlike film where images are presented continuously at high frame rate to create illusion of motion on the screen, comic book readers become active participants in the narrative by repeatedly interpreting gaps between panels to understand the narrative. Chute (2008) claims that this process may lessen the ease of consumption of comic books compared to films, which may reduce the reader’s immersion to the story.

During the development of my graphic novel, closure and cognitive participation became important elements to consider when communicating a narrative efficiently. To ensure the reader's ability to recognise connections between panels quickly, I implemented visual continuity across all illustrations such that all the characters, props and environments were painted consistently. This was done in hopes to increase the reader's immersion to the narrative.

5.2.2. Understanding human anatomy

Drawing realistic depictions of characters is a significant component of any comic book production. The artwork is needed to depict a convincing variety in likenesses and persona. The process involves drawing characters from multiple camera angles, such as front, profile, and birds-eye view shots – and from different distances, such as, medium shots, close-ups, and extreme close ups. Such drawings also need to depict convincing human emotion, which can be used to communicate the story.

Learning this technique was a challenging undertaking. My fundamental knowledge of drawing a convincing human face and head was not yet developed. I found it a daunting subject matter to study because it required substantial learning and practice. During the process of drawing initial sketches, Coyle realised my struggles with human anatomy and recognised the severity of the problem. Hence, significant time was dedicated to practicing drawing the human form for the first three years of production. Books on drawing human anatomy, including Hampton's *Figure Drawing: Design and Invention* (2010), ImagineFX's *Anatomy Essentials* (2016), and Zarins and Kondrats' *Anatomy for Sculptors: Understanding the Human Figure* (2014), were used to study components of human anatomy. This included the skeletal structure, human proportions, gesture drawing and the forms and functions of major muscle groups. As shown in figure 37, photographic references were used to study and practice these anatomical features. I had also attended several figure drawing classes and workshops held at Concept Design Workshop (CDW) school in 2015 and 2016. During these classes, I practiced my skills by studying live, nude models. This knowledge had facilitated my ability to draw more convincing characters from imagination.

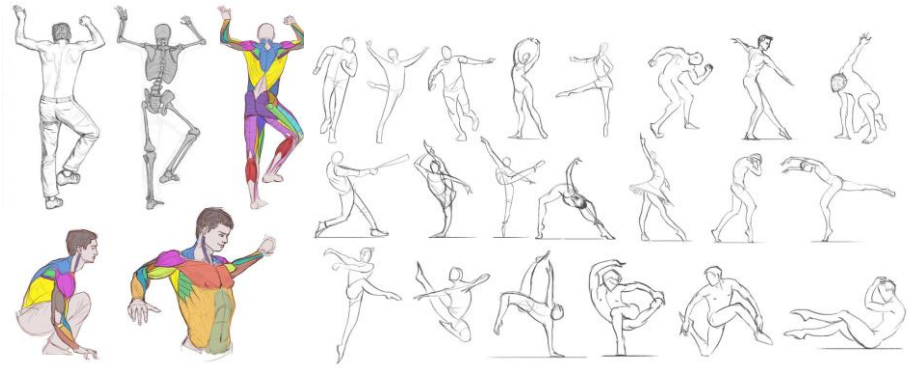

Figure 37. A sample of my anatomical studies (third party photographs removed due to copyright restrictions).

5.3. Visual style explorations:

5.3.1. Early artistic inspirations

My research on visual styles began soon after being introduced to the project. It involved exploring different comic book artists and visual styles to find an aesthetic that appealed to me and that was suitable for a comic book. My visual style also needed to be thematically appropriate to the tone of the story, which was a mature, dark, thriller.

Mignola's *Hellboy Volume 1: Seed of Destruction* (1994) was one of my earliest inspirations (see figure 38). The sharp black-inked shading and flat colouring in the comic book depicts a dark mood resembling a film-noir aesthetic. The abstraction of details into simple shadow shapes was particularly appealing. It seemed suitable for my project. It was also simplistic; it appeared to require little time to produce, meaning rapid turnaround efficiencies were possible and it was highly legible.

Removed due to copyright restriction.

Figure 38. *Hellboy Volume 1: Seed of Destruction* (1994) cover and interior pages by Mike Mignola.

Mateu-Mestre's *Framed Ink: Drawing and Composition for Visual Storytellers* (2010) was another inspiration. It is an instructional resource for artists. It teaches methods of simplification by deconstructing complex images into primitive shapes. This process aims to improve the design of image compositions by capturing the core idea of the picture with fewer elements, thus improving legibility. His illustrative style shared similarities with Mignola's (1994) style – a sharp black and white inking style using abstraction techniques: obscuring unnecessary areas of the picture, and capturing only the necessary details to communicate the story effectively.

I dedicated several weeks to experimenting with Mignola's (1994) and Mateu-Mestre's (2010) visual styles. I imitated the black inked aesthetic using digital tools in Adobe Photoshop. Black-shaded areas were painted with round Photoshop paint brushes over a white canvas (see figure 39). A medium-sized Wacom Bamboo tablet[19] was used to paint digitally. The stylus' pressure sensitivity[20] was used to control brush size. The tablet is entry-level quality and offers limited control features, but it does not produce lag[21] or technical limitations that slowed or restricted the production.

[19] A graphics tablet is a computer input device used to create hand-drawn graphics on the computer. This is done by drawing on the tablet's surface with a stylus pen. The user's input strokes are then converted and displayed on the computer screen (Computer Hope 2017). For this project, I used Wacom Bamboo Fun Pen & Touch CTH 661, medium-sized tablet (Wacom 2009).

[20] Pressure sensitivity refers to the pressure applied to the stylus pen against the tablet surface. It is a feature of Wacom tablet products, which can be used to control the behaviour of brushes in Photoshop. For example, brush size, brush opacity and brush colour (Wacom 2010)

[21] Lag refers to a delayed response from the computer after receiving the user's input command (TechTerms 2013). In this context, the input command is the pressing of the stylus pen on the tablet surface to activate the paint brush tool in Photoshop.

Figure 39. Black inked aesthetic experiment on page one of issue one.

My early experiments revealed a problem with executing a simplistic black-and-white style. I felt the depictions of characters were not convincing, and the three-dimensionality of the spaces, including form and depth, were unable to communicate the spatial characteristics I wanted them to. It resulted in a flat, unconvincing depiction of the physical space. These experiments revealed that, despite the prominent use of shadows to obscure areas of the artwork, knowledge of fundamental human anatomy and perspective was critical if I was going to execute the scenes realistically or convincingly. Moreover, the simplification of forms into black-and-white tone required specialised skills in graphic design to communicate the story clearly. Due to my inexperience and ongoing difficulties with this method of illustration, the style was abandoned.

5.3.2. Challenges encountered in finding a visual style

During the first year of production (2015), I found it difficult to establish a visual style that was appealing and effective. This is because most styles I saw in the comic books I investigated were different to my personal aesthetic taste. Concept artists working for video game and film productions, including John Wallin Liberto[22], John Grello[23], Craig Mullins[24],

[22] See https://www.artstation.com/captflushgarden, viewed 26 March 2020.
[23] See https://www.artstation.com/ionic, viewed 26 March 2020.

Jamie Jones[25], and Dorje Bellbrook[26], were my major artistic inspirations. Their artwork is detailed, and convincingly depict the sorts of realism I was seeking. However, this type of visual style was impractical for my comic book production because of the time required to produce the artwork.

5.3.3. The discovery of Alex Ross' art style and its influence on the production

My first breakthrough in production occurred in March of 2016, when Coyle showed me the work of Alex Ross. He gifted me *Kingdom Come* (1996), one of Ross' superhero graphic novels. It was painted in a style that really appealed to me. It utilised a convincing depiction of realism to communicate a story. Unlike many of the other comics I had explored, Ross did not use black inking techniques or outlines in his artwork. This gave his artwork a more three-dimensional quality. Seeing his work for the first time was a major revelation for me. I realised that a complete, fully painted, two-hundred-page graphic novel was achievable after all. Ross' style was significantly more complicated when compared to Mignola's. Yet, the appeal of Ross' artwork motivated me to pursue a similar level of complexity in my own production.

Ross' artwork set a benchmark for my project. It conveyed the convincing detail, three dimensional forms, and naturalistic lighting and shading that I was looking for in my own work. The scenes depicted appear to be grounded in the physical world. However, Ross' illustrations are not photorealistic – they are stylised to create realistic effects. For example, it appears Ross simplifies parts of the paintings that he considers less important in order to highlight the focal areas (see figure 40). Hence, Ross' artistic input enhances the efficiency of communicating the story to the reader with his graded scale of detail related to importance. I found this to be an effective technique in visually communicating a narrative inside a comic book. Therefore, I made the decision to pursue a similar style for my own project. Four weeks were dedicated to studying Ross' illustrations. His other graphic novel *Marvels* (1994) was also studied. It was exciting for me to imagine my world be rendered at such a high level of detail. However, the level of artistic sophistication required to illustrate Ross' style was also an intimidating challenge.

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[24] See http://www.goodbrush.com/, viewed 26 March 2020.
[25] See https://www.artpad.org/, viewed 26 March 2020.
[26] See https://www.artstation.com/dorje, viewed 26 March 2020.

Removed due to copyright restriction.

Figure 40. Example of Ross' illustration from *Marvels* (1994). The background buildings are simplified, while the foreground characters are detailed and recognisable.

Summary

This chapter discussed the origins of my graphic novel project *DEMONS*, the stakeholders involved, and my early artistic skill acquisition, which was necessary in producing a comic book. It also explored the early aesthetic influences and experiments and discussed how the discovery of Alex Ross' visual style radically shifted my aesthetic goals. The next chapter examines the outcome of my production, which is the realistic visual style developed for this project. It identifies and discusses the key features that I found to be critical in conveying realism in my artwork.

6. Developing a realism styl*e*

This chapter describes how my realism visual style was achieved in this project. It does this by outlining several key features that were critical in conveying realism in my artwork. The features include: my observation of the physical behaviour of light, perspective construction, architectural form, character depiction, convincing physics, use of colour, and approach to overall visual consistency. Each feature is described in detail, including how I applied it to the illustrations in my graphic novel.

6.1. Defining realism in this project

The visual style I developed for this project relies on a particular form of realism. I determined that the artwork should be recognisably based on the physical world, but not in a photographically realistic manner. Instead, it is a unique combination of my perception of the physical world, and what is captured in the photographic image. The subjectivity of my interpretation of the physical word adds a unique personal signature to the style, and thus the artwork I define as real in this project is, to some extent, subjective to how I see and interpret the world. This relates to Thierry Groensteen's (2010) argument that any hand drawn image contains the artist's signature style that is created by their unique perception and interpretation of the world.

During the development of my style, several key features were identified that helped me achieve my stylistic goals. They were used as rules or guiding principles to ensure that the artwork conveyed realism as the project defines it, and that the visual cues were consistent throughout the project. The following sections describe in detail each visual feature.

6.2. Behaviour of physical light

When addressing the behaviour of physical light, I am referring to the light that behaves in the physical world, *and* how it is captured in a photographic image. These are two distinct entities. Both need to be unpacked. For this project, it was important for me to understand the behaviour of light in the physical world, but also the light captured in the photographic image, because it was used as a reference when painting inside the studio. Thus, my decisions about how my imagined spaces were illuminated are based on my observations of the physical world, combined with or in conjunction with the photographic references.

6.2.1. Light observed in the physical world

In the physical world, the environment is flooded with light. The light that illuminates the world is rarely direct. It is almost always secondary. It reflects off surfaces and particles in the Earth's atmosphere before it reaches our eyes (NASA, 2020). According to the particle-wave duality theory of light, it behaves in two ways: either as a particle that bounces off surfaces, and as a wave (Harris & Freudenrich 2013). Hence, we can think of light as having mass. Photons have mass and weight and can interact and bounce off surfaces. As a wave, like radio waves, they have energy but no mass and so they pass between the atoms of some substances. For example, sun light consists of seven colour wavelengths in the visible spectrum including: red, orange, yellow, green, blue, indigo and violet. When sun-light passes through the Earth's atmosphere, the wavelengths emitting blue light are scattered across particles in the air, causing the sky to appear blue (NASA, 2020).

Depicting materials

The physical world is made of many different materials. Each material has a unique appearance because the light behaves differently when reflected from them. For example, a reflective surface, such as a mirror or chrome, reflects the surrounding environment sharply. This is because the surface is smooth and so the light particles hitting the surfaces are reflected at an angle that is equal to the angle at which they reflect away from the surface (Robertson & Bertling 2014). By contrast, a matte surface, such as clay, appears flat because it is a rough surface and the light particles hitting the surface are scattered in many directions; thus, the reflected light is diffuse. A lightly textured surface, such as a semigloss surface, diffuses the reflected light more subtly and so the reflections of the environment appear blurry (Robertson & Bertling 2014). Therefore, as the roughness of a surface increases, its reflectivity becomes more diffuse. Moreover, the reflective appearance of a surface is also dependent on the viewer's angle of view. This is due to the Fresnel effect[27] – the light is bouncing off at a grazing angle in relation to the viewer, hence sharp reflections appear more intense (Unity, 2019).

In my illustrations, I used shading to convey different materials observed in the physical world. The shading is used to control the transition from highlights (lightness) to shadows (darkness) – a tonal gradient. By manipulating the shading of surfaces, different materials can

[27] Fresnel effect is a visual phenomenon that is observed when looking at an object's surface at a grazing angle. At this vantage point, the surface appears to become more reflective. For example, the surfaces near the edge of a spherical object are more reflective than its centre (Unity, 2019).

be conveyed. Sharp gradations depict shiny surfaces, while soft gradations depict matte surfaces. An example of a shiny surface is a gold metallic wedding ring (see figure 41a). It is painted with high contrast – the sharp tonal transitional around the form are reflections of the surrounding environment captured on the surface. An example of a rough shiny surface is the square-tiled floor inside the church (see figure 41b). It reflects the bright windows back onto the surfaces to create a shine, but it is not a sharp reflection due to the roughness of the surface. An example of a matte surface is the exterior diffuse walls of the church (see figure 41c). It does not reflect the environment. This variety in material types is used to convey realism in my artwork.

a)

b)

c)

Figure 41. a) An example of a shiny metal surface. b) an example of a rough shiny tiled-floor surface. c) an example of a matte wall surface.

Depicting textures

I use texture[28] to add visual interest to surfaces and depict materials more convincingly. An example of how I use texture in an illustration is the wood grain on a wooden surface (see figure 42). However, in my illustrations, most textural details needed to be simplified or omitted to create a better representation of how I perceive the physical world. Firstly, the detail of textures in the artwork is dependent on how far the surfaces appear to be in the illustrations. The further a surface appears to be from the camera, the less visible its texture becomes. For example, in figure 42, the wood grain on the pew surface is intricately detailed because it is seen from up close. However, in later panels where the pews appear further away, the textures are no longer visible and the surfaces appear to be mostly a flat brown colour. I chose this stylistic approach because it created a more accurate representation of how I naturally perceive texture from varying distances. Therefore, the absence of textures on distant objects created a more realistic looking image to me.

[28] A texture refers to a colour or shading variation on a surface. Materials and texture are two different entities, although they influence each other to communicate the physical properties of a surface.

Figure 42. An example of wood grain texture used to convey a wooden bench surface around the golden Bible.

Secondly, textures are simplified or omitted in areas of the painting that are outside the focal area. Doing so reduces contrast, and in turn, increases the legibility of the focal point. For example, in figure 43, the surface textures on the stairs in the foreground and the church walls in the background are simplified or flattened to increase the legibility of central characters in the image. I chose this stylistic approach because it is a better approximation of how I naturally see the physical world. That is, I am unable to see the surrounding detail in my peripheral view when focusing on a subject. Incorporating this effect into the artwork created a more realistic appearance that resembles real life experience.

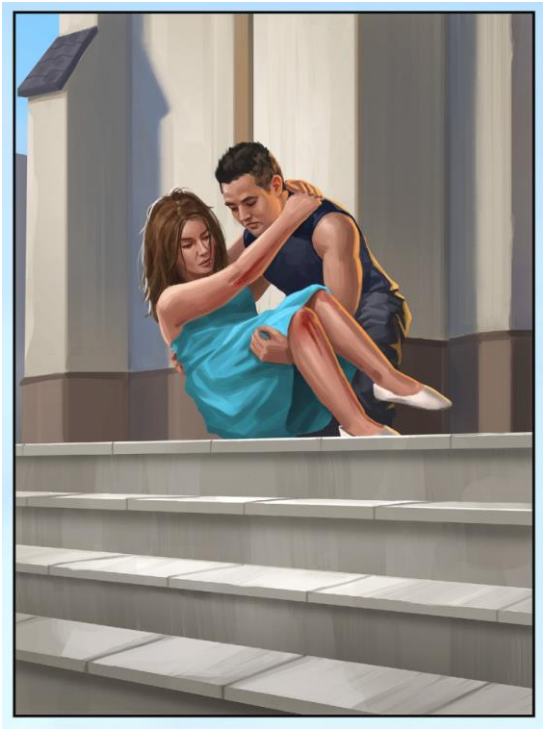


Figure 43. An example showing how textures outside the focal point of the image are simplified to reduce contrast.

Bounce lighting

When light reflects onto surfaces in the physical world, it takes on the colour of that surface, and then reflects onto surfaces around it. This creates a bouncing light effect (Robertson & Bertling 2014). I found that this effect was important in conveying convincing, realistic lighting – it tends to unify the objects in a scene. If the effect was missing, the scene would appear less realistic. This is because in the physical world, the total colour of a surface of an object is determined by its local colour[29] and the colouring created by the lighting (Gurney 2010). By painting the bouncing light effects on surfaces, objects appeared to be more physically present in the same space because they were affected by the same bounced light. Hence, I applied it in my illustrations. Transparent layers in Photoshop were used to paint reflected colour over the surfaces where bounced light would likely appear. For example, an intense red carpet in the central aisle of the church reflects red light onto the side wooden surfaces of pews nearby (see figure 44).

[29] Local colour refers to the colour of a surface of an object unaffected by lighting (Gurney 2010).

Figure 44. Example of bounce lighting effect in my illustration. The red light bounces from the carpet onto the sides of pews.

6.2.2. Light captured in a photographic image

A photographic image is the capturing of light onto a flat, light-sensitive surface. In digital cameras, such as a DSLR, the light is captured on a sensor that records light entering the lens and converts this to an electrical signal (Gillmor 2018). With digital images, the gamma level can alter an image's contrast ratio. The quality and calibration of the computer monitor can also affect the appearance of images. Nonetheless, what I find appealing about this medium is that it can remove some of the information to capture the *essence* of what the light is doing in a scene. For example, a photographic image can create an overexpose effect due to the camera's limited dynamic range, compared to the high dynamic range of the human eye. This limitation can be used to simplify the exterior of an environment when exposing an interior scene by blowing out the exterior light (as shown in figure 44). I used this limited dynamic range of light and dark observed in photography to create similar effects in my artwork.

6.3. Perspective construction

6.3.1. Depicting a 3D space

A component of my artwork's realism is the use of a 3D perspective view. I use it in an attempt to help the audience recognize the spaces as having the possibility of existing in the

physical world. Linear perspective[30] is used to construct spaces in a convincing 3D space. The 3D renders provide more precise perspective information to draw from.

6.3.2. Three-dimensional depth

Perspective is used to convey depth in my illustrations. This is done by simplifying the background details so that they lose their three-dimensional quality over distance. For example, a large crowd of people can be depicted as a mostly flat silhouette shape in a hazy background to convey that they are further away (see figure 45).

Figure 45. Example of me utilising the flattening effect on the background crowd of people to convey depth in the image.

Atmospheric hazing perspective is a technique I used in this project. This hazing effect is observed inside Earth's atmosphere created by the particles present in the air (Gurney 2010). It contributes to the perception of depth in the physical world. Light that is reflected off distant objects, such as a mountain, is diffused by the atmosphere before it reaches the eye. Once observed by the viewer, the light appears less intense and is tinted blue. Hence, mountains in the distance appear more blue, and flatter because their shadows are brighter, and highlights are darker. I used this hazing effect in my illustrations to communicate depth more effectively. Objects close to the camera display high contrast, and objects further in the distance, such as the city skyline seen in figure 46, display less contrast and become bluer.

[30] Linear perspective is a mathematical system used by artists to depict three-dimensional objects and space on a two-dimensional surface. This is done by drawing a series of straight, horizontal and vertical intersecting lines that radiate from one or several points on a horizon line. The effect represents the perspective as perceived by a viewer from a fixed position (Robertson & Bertling 2013)

6.4. Architectural form

In my graphic novel, a modern city setting is used to convince the audience of a real, relatable space. This is done by depicting a variety of building types. They are used to convey different regions of a city. For example, tall modern skyscrapers in the distance are used to depict a central business district, residential buildings the city's surrounding suburbia, and large warehouses and industrial facilities as an industrial district (see figure 46).

Figure 46. A wide shot illustration from page 20 showing an overview of the city setting. Different building structures are painted to depict different regions of the city.

6.4.1. Architectural styles

Variety in architectural style between buildings helps convey a sense of history in my imagined world – similar to what may be observed in the physical world. For example, the design of modern buildings is often geometric, compared to older buildings that may have more organic, ornamental, decorative elements. This difference in architecture can be used to indicate that they have been constructed at different times. Moreover, the difference can be used to convey that the buildings were individually constructed by different architects. For example, each skyscraper can have a unique shape and façade.

The image references I gathered online, and the photographs I shot so I could design realistic architectural styles, were used to observe the structural variations between buildings, such as variations in window patterns (see figure 47). These differences are reflected in my illustrations. For example, a variety of unique skyscraper buildings were designed in 3D to create a realistic cityscape (see figure 48). This cityscape was used as the front cover illustration of issue one.

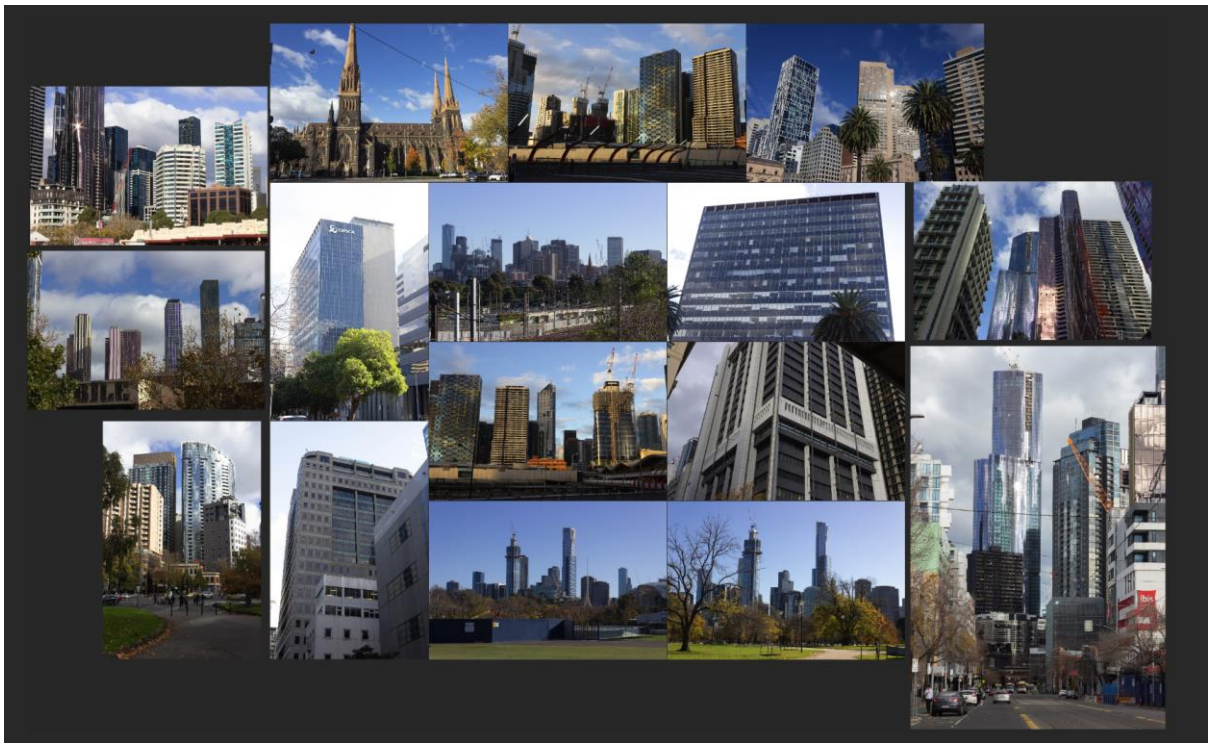
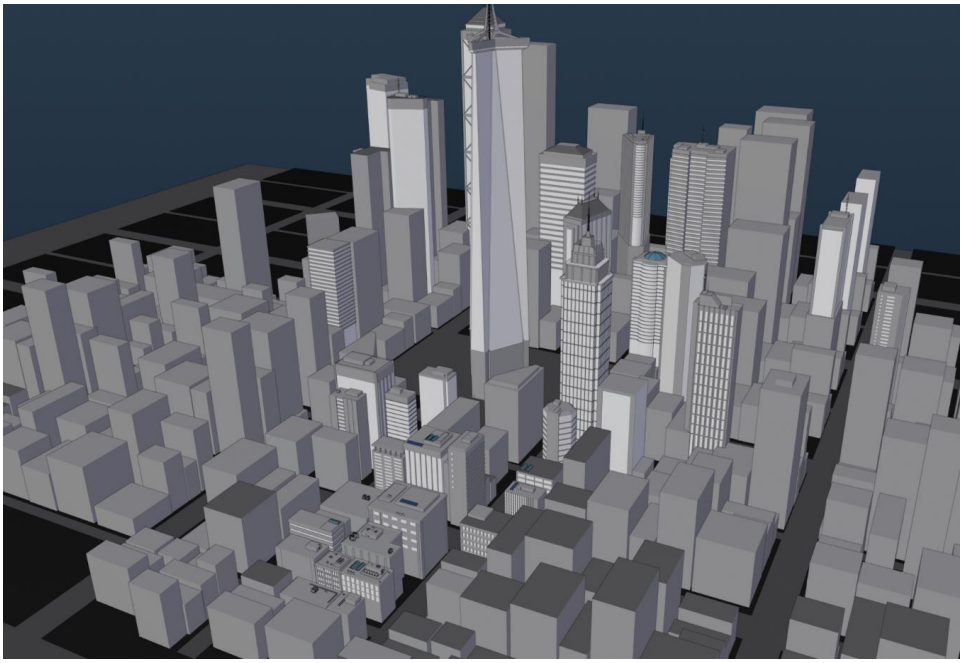


Figure 47. A series of photographs I took to gather reference of architectural styles observed in high rise buildings.



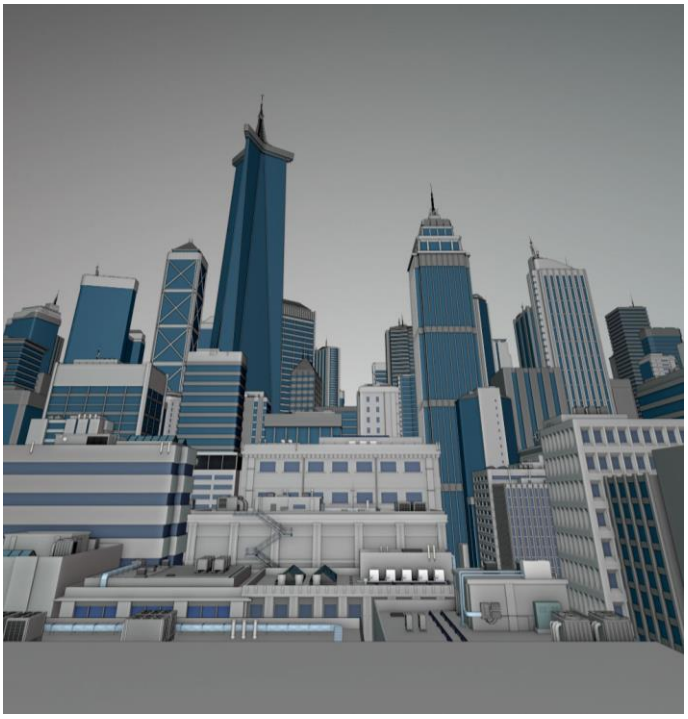


Figure 48. Viewport renders of my 3D cityscape environment constructed in Blender.

6.4.2. Physical construction

Whilst I felt it was important to capture convincing construction in the depictions of buildings, it was not critical to research specific building construction methods – only the visual cues I needed to imply structural form. As the first issue of the graphic novel takes place inside a church, its construction needed to be similar to a church in the physical world. In order to gather the necessary references, I visited and photographed a local Adelaide church of similar size and layout. Individual interior structural features were photographed,

such as the roof rafters, walls, stone support columns, and so on. The photographic references were then used to paint similar features inside how I imagined a church could convey a convincing physical structure (see figure 49).

Figure 49. A wide shot of the interior church structure.

6.5. Character depiction

A component of producing visual familiarity to the physical world is creating convincing depictions of characters. I felt my drawings of imaginary characters needed to look like they could belong in the physical world. They needed to have distinct features, such as age, gender, race, body weight, body height, hair style, costuming and makeup. Also, they needed to project a particular persona – embody an emotional expression. Body proportions needed to be convincing. Anatomical features, such as human muscles, body fat, and skeletal structure needed also to appear natural. For example, the size of muscles on muscular characters should not be too exaggerated or disproportionate to the body. I found that the use of photographic references was an essential resource for conveying these features most effectively.

Conveying unique personas

I tried to use a unique persona for each of the characters in the comic book. Several techniques were used in an attempt to convince the reader that a character has a particular persona. For example, the central character is meant to be quiet, brooding, and distant from

other characters around him. But he is also a strong, fearless and determined hero. In order to depict this persona, a straightened body posture, muscular body build, and stable stature, was used. The head is depicted as bowed down, with no direct eye contact with other characters (see figure 50). If the character was skinny, the bowed down head would not convey the menacing character I was after. Instead, a muscular character with the head bowed down was used because I felt this looked more menacing. Hence, body build becomes an important factor.

Figure 50. Concept art showing the design of the central character in issue one.

6.6. Convincing physics

Illustrations needed to imitate the laws of physics of the physical world, such as gravity, velocity, acceleration, explosions, and so on. For example, the depiction of a large explosion inside the church needed to appear believable (see figure 51). To create the effect, a YouTube video (Military Archives, 2016) was studied to understand the destructive capabilities of a military fragmentation grenade. From this reference, it was found that a grenade would not be suitable for producing the desired, large explosive effect I was seeking to imitate in my sketches. Hence, the explosive device was re-designed as a C4 explosive. A C4 explosive had

more powerful destructive capabilities than a grenade, and so the effect would be more convincing.

Figure 51. An explosion effect created by a C4 explosive device.

6.7. Use of colour

The colours of surfaces in my illustrations needed to be similar to those observed in the physical world. To do this, I observed the colours of objects, people and environments in the physical world to understand their natural appearance. For example, I observed the colour of Caucasian skin tones so I could realistically paint Caucasian characters in my illustrations. When studying colours in the environment, such as the interior of the church, a camera was used to capture my observations. The photographs were un-filtered[31] to provide me with an approximate representation of the colours I observed. Then, during the painting stage, Photoshop's eye dropper tool was used to sample the colours captured in the photographs and identify them in the RGB colour space[32]. I used the hue cube[33] to identify the location of the colour in the colour spectrum. Yet, due to varying exposures and colour balance settings affecting the colours in the photographs, the colours were sometimes inaccurately captured.

[31] Photographs that have not had their colours altered using filters, colour grading or incorrect white balance.
[32] RGB colour space is an additive colour mode that mixes varying amounts of red, green and blue lights to generate a colour.
[33] A hue cube is a square colour field in Photoshop that displays the location of the currently selected colour in the colour spectrum. It is located in the 'Color' panel in Photoshop.

To mitigate this problem, I referred back to my observations of the physical world and adjusting the sampled colours to estimate the natural colours of objects.

Colour saturation

When studying the interior of the church through observation and photographic references, I found that most colours in the environment were approximately thirty to forty percent saturated. Therefore, to create a realistic representation of the space, the interior church scenes were painted with colours that were also within that saturation range. Highly saturated colours were used sparingly to direct the reader's attention towards the focal points in complex images. This was done by painting the saturated colours only around the focal areas. For example, the saturated red carpet highlights the figures in the centre of a complex image depicting a fleeing crowd (see figure 52). By keeping the rest of the image more desaturated, the saturated areas stood out more prominently due to the colour contrast. I found this to be a useful strategy in improving the legibility of detailed images.

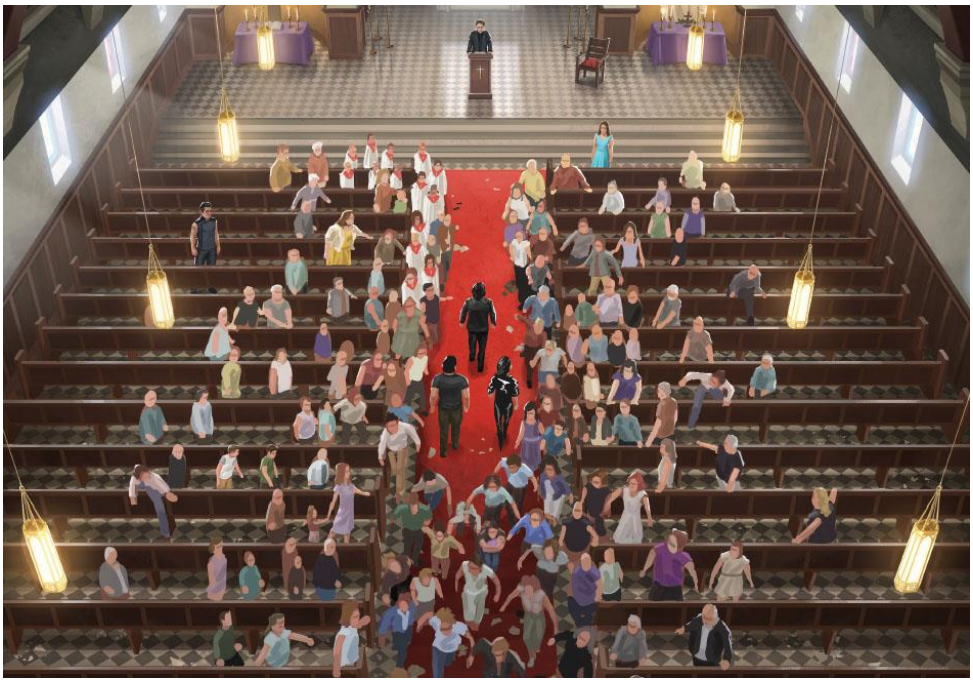


Figure 52. Example of the use of saturated colour to enhance the visibility of the focal point.

6.8. Visual continuity

6.8.1. Consistency in position and design

I found that an important aspect in conveying a physical world in comic books is to convey visual continuity across panels. Firstly, the positions of objects need to be consistent across all panels in a comic book. For example, the position of set dressing and props in the three-

dimensional space needs to be consistent. If inconsistencies occurred, such as static objects changing position between panels, the readers may be confused by the sudden disappearance of objects. This is particularly challenging in a realistic style, as the amount of detail in the environment can be difficult to translate accurately from multiple camera angles. However, I found that maintaining spatial consistency between panels created a sense of physicality in my imagined world – static objects and architecture are fixed in the same physical space and do not move around unnaturally. Thus, the appearance of physical reality can be conveyed more effectively.

When objects re-occurred in multiple panels, their design needed to be also consistent. This was especially important when illustrating character heads and faces throughout the comic book. Once the design of each character's likeness was established to the reader, it needed to remain identical in later panels to ensure the readers recognised and *believed* in the personas being projected in the artwork. Therefore, the proportions, the 3D form of the head, and facial features were precisely translated in different camera angles to maintain a consistent appearance. Photographic references of actors' heads were used to aid this process. If a character's face changed between panels, the readers may be distracted by the sudden shift in likeness, or be unable to recognise them as the same person, thus being unable to consider them as real or believable. Also, the designs of iconic, repeating props, such as the golden Bible, also needed to be consistent throughout the panels so that it was easy to recognise and resemble a convincing physical object (see figure 53).

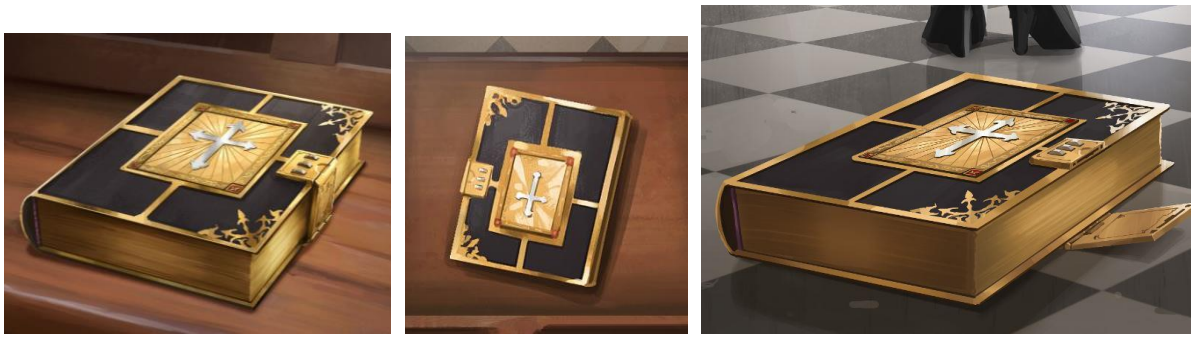


Figure 53. Example showing consistency in design of the golden Bible throughout the comic book.

Lastly, the colours of objects needed to remain consistent between panels. For example, a character's skin colour in an unchanged lighting set-up needs to be identical across all the panels. Otherwise, variations in colour appear disturbing for the reader – distracting them from the story. To achieve this, when I start painting a new panel, I used Photoshop's colour

picker to sample colours from previous panels, and use the newly sampled colour in the new panel. This ensured consistency across all panels.

6.8.2. Spatial constraints

Spatial constraints refer to the physical limitations of three-dimensional spaces established in the artwork. All action sequences and character placements needed to be planned to fit within the boundaries of a particular space. This is especially important where it is applied to enclosed indoor spaces, such as the inside of a church, because it limits the width, height and length available in the environment. For example, if the space needed to be suddenly modified in a single panel to accommodate an action sequence, such as the length of the church needing to be extended to make room for a shot of a fleeing Mass congregation as shown in figure 85, the readers may find it difficult to understand the size of the space clearly. Therefore, it was important to maintain the same scale in the space throughout the comic book.

Summary

This chapter defined the seven features that I used to develop my realism style. These include my observation of the physical behaviour of light, perspective construction, architectural form, character depiction, convincing physics, use of colour, and approach to overall visual consistency. I found these to be effective at conveying the type of realism that I was after for this project, which is a highly recognisable style that imitates what is observed the physical world and what is captured in the photographic image. In the next chapter, I evaluate the improvements made from combining photographic referencing with 3D construction techniques and digital painting to create the realism I sought for this project.

7. Evaluating the benefits of my use of photographic referencing and digital tools

This chapter evaluates the improvements made from utilising photographic referencing and digital tools during the production of the realism style I developed for my graphic novel project. It examines how photographic references were used to improve the depiction of a convincing, realistic, world and characters; how 3D computer graphics was used to improve the depiction of a physical space, characters in correct scale and perspective, shot compositions, and lighting; and finally, how digital painting in Photoshop improved compositing of references and drawings during the production, and in creating my realistic illustrations.

7.1. Improvements made with photographic referencing

7.1.1. Depicting a convincing world

Photographic references gathered online and captured on-location were key in constructing a convincing world that was recognisable to the reader. For example, during the concept art stage, images of recognisable objects, such as pews, pulpit and the altar were collected (see figure 54). The images were used as a reference when designing objects in the illustrations so that they were recognisable to the reader.

Figure 54. A sample of image references used to design the church interior.

High-resolution photographs were beneficial in recording the intricate details of the physical world that would otherwise be impossible to memorise from observation. For example, complex fabric deformations on an actor’s costume needed to be referenced to render the costume convincingly in the illustrations (see figure 55).

Figure 55. A reference photograph of an actor wearing a costume. The photograph captures the complex creasing of the vest and pants.

Photographs were also used to record the large variety of designs observed in the physical world, such as the variety in architectural styles observed in a real city (as shown previously in figure 47), and in fashions worn by people at a Mass congregation. Capturing this variety was key in conveying a convincing realism. Photography was used to provide me with the necessary references to incorporate this variety in my illustrations.

I discovered that photographic referencing is not limited to photography alone. Video footage, such as YouTube videos, was also useful in demonstrating how objects move and react in the physical world. For example, a YouTube video of a large explosion filmed in slow motion was used to study how a fireball expands and changes in appearance over time (The Slow Mo Guys 2013). The reference was used to render a convincing explosion effect in my illustration (shown previously in figure 51).

7.1.2. Depicting convincing characters

My early attempts in drawing fictional characters without a photographic reference revealed that I had difficulties with depicting convincing characters from imagination. One of the main difficulties I encountered was maintaining a consistent likeness of characters throughout the comic book. Drawing a character's face from several camera angles whilst maintaining a consistent likeness was a challenging task. Initially, 3D reference was used to address this

issue. 3D character models were used to gather reference of faces and bodies from various camera angles (see figure 56). However, I felt that the depiction of characters in the 3D reference alone was unconvincing. The 3D models I used were generic and lacked the facial complexity to convey the realistic expressions or personas I sought. Also, the models' limbs and torso were often distorted due to the human rig's[34] anatomical inaccuracies and technical limitations. Due to these distortions, the 3D models were unsuitable for referencing convincing body postures. Therefore, the 3D reference alone was insufficient for capturing the realism I sought.

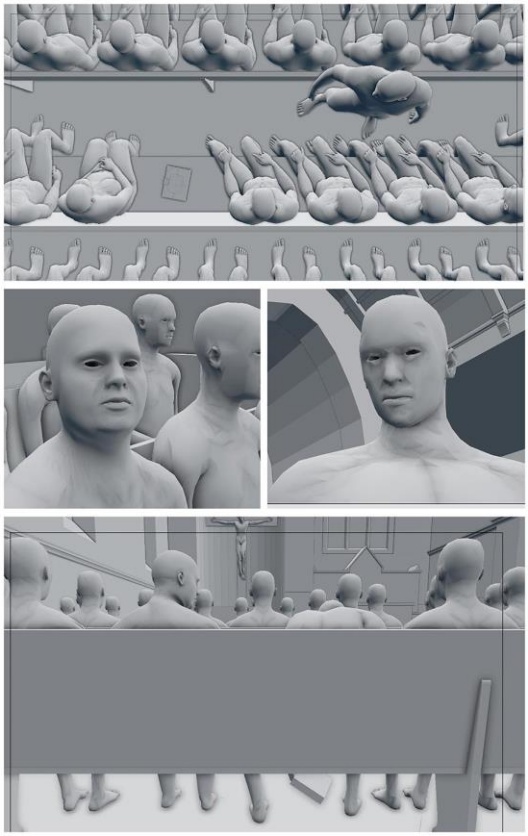


Figure 56. A series of reference images showing faces and bodies of 3D character models from various camera angles.

I found photographic references of actors to be necessary in conveying convincing characters. Photographs contain critical information, such as the subtleties on actors' faces and body posture, which can be used to convey varying expressions, such as anger and sadness. Therefore, the photographs were used to add details to my drawn characters to convey more

[34] A human rig is a bone structure in computer graphics that mimics the function of a physical human skeleton. It is used to pose and animate 3D human models.

convincing personas, and 3D references of characters were only used as a loose reference for scale, location and perspective in the 3D environment.

7.2. Improvements made with 3D computer graphics

7.2.1. Depicting a physical space

3D modelling in Blender provided an opportunity to convert complex two-dimensional designs of environments into 3D scenes. This process was helpful in refining the spaces as more accurate representations of a real physical space. For example, the construction of the interior of the church in the virtual world helped me refine the scale and layout of the space. Combined with photographic references, the design of the church could be more intricately modelled so that the architectural construction and layout resembled a real church more closely. The 3D view also provided an optimal method for previewing and iterating the space to ensure that it could facilitate all the action sequences described in Coyle's script.

Visual continuity

It is difficult to maintain consistency when painting many different characters from many different camera angles inside a complex environment. Utilising 3D tools helped me overcome this challenge. By constructing the environment in 3D and placing characters and props inside the 3D space, I was able to gather accurate references that showed the positioning of architectural features, characters and props from each camera angle (see figure 57). The 3D renders were used as a reference when painting the 2D illustrations to maintain visual continuity between panels. The visual continuity was critical in conveying realism in my artwork. Without the utilisation of 3D construction and creating 3D references to work from, achieving visual continuity would have been extremely time consuming and difficult to execute using more traditional, manual, methods.

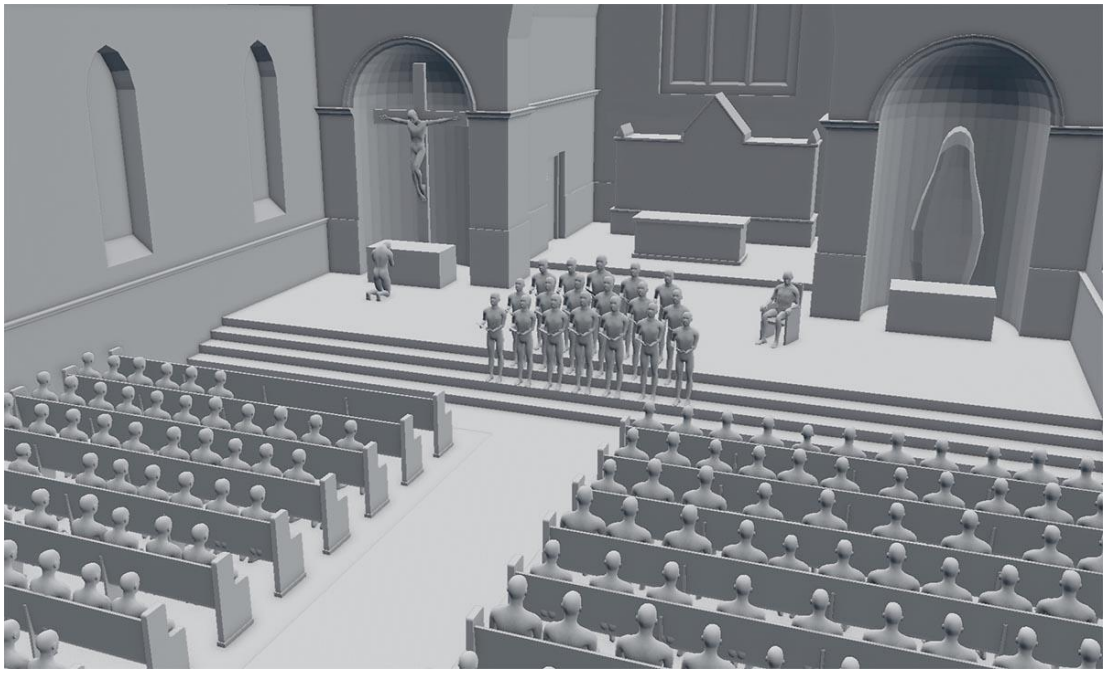


Figure 57. Example showing the complexity of a 3D scene in Blender with dozens of characters and props positioned throughout the environment.

Managing a complex 3D scene

The 'Objects Layer Manager'[35] add-on[36] extended Blender's layer functionality by unlocking its layer limit from twenty layers to an unlimited number. This enabled me to create the necessary fifty layers to contain and selectively reveal hundreds of posed character objects in the scene for every unique camera shot (or panel) in the comic book (see figure 58). Without this add-on, the layering strategy would be impossible to accomplish, and the complexity of the scene would be difficult to manage.

[35] An add-on designed to help manage large number of layers in Blender. Objects in the scene can be linked to each layer. Layers can be renamed, and their visibility and editability can be toggled on and off with buttons. This controls the visibility and editability of objects linked to the layers (Salado 2015).

[36] Add-ons in Blender are script files written in python programming language. They are used to extend the program's functionality by adding new tools and processes to create effects. The add-ons are grouped into two categories: official (written by Blender developers) and community (written by Blender community members). The add-ons can be edited, installed, enabled and disabled in Blender using the 'Add-ons' section in user preferences menu (Blender, 2019a).

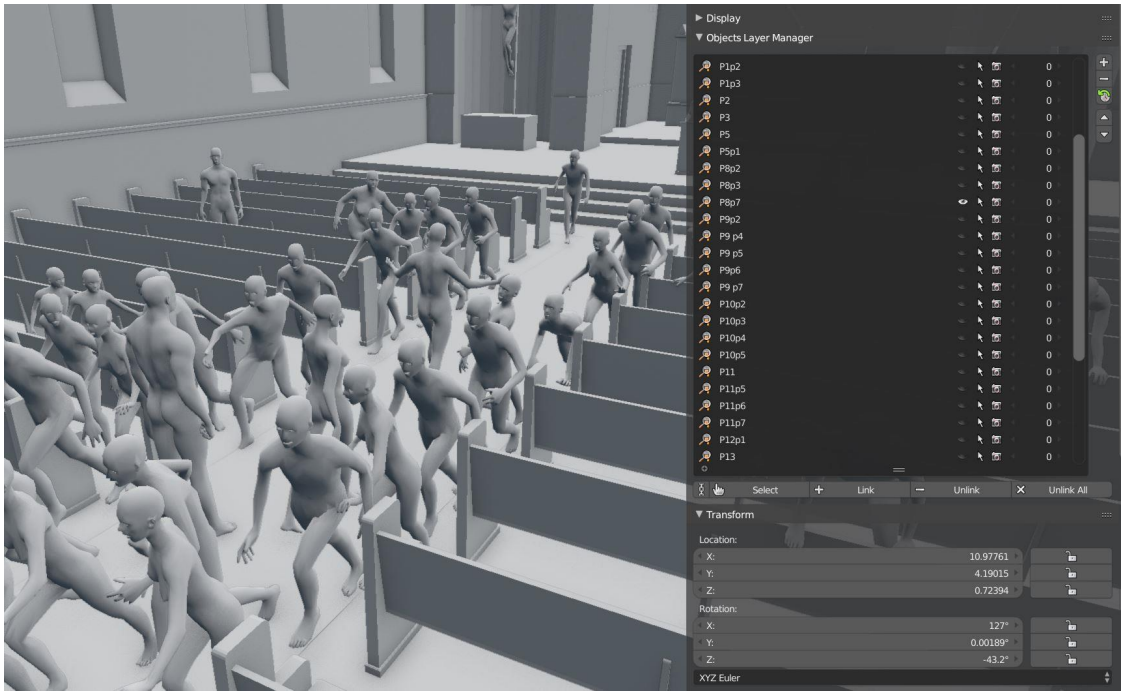


Figure 58. The ‘Objects Layer Manager’ add-on is shown on the right of the picture. Layer ‘P8p7’ is revealed to show all the character models for panel seven of page eight.

Rendering the 3D space

The ‘matcap’[37] shading mode and screen space ambient occlusion[38] effects rendered inside Blender’s viewport (see figure 59) were useful in creating highly legible previews of my 3D scenes (see figure 60). The effects enabled me to bypass standard rendering procedures, which is normally time consuming due to the computational complexity of ray-traced rendering[39] in Blender. As about sixty camera shots had to be rendered to create reference for all panels in the first issue, rendering with standard procedures was impractical for my graphic novel production due to time constraints. Therefore, rendering the images quickly enabled me to render all the necessary images in time.

[37] The matcap shading mode shades the surfaces of a 3D object using an image that is mapped onto the objects’ surface normals[37] (Blender n.d. a)

[38] Screen-space ambient occlusion is a feature in Blender’s viewport that simulates the occlusion of light in the physical world by darkening areas near crevices and corners of the geometry. Ambient occlusion is normally simulated in a high-quality render, but this is quick approximation of the effect designed to help preview 3D geometry during the modelling process (Blender, n.d. a).

[39] Ray-tracing is a rendering technique used in computer graphics to simulate the behaviour of light in the physical world. The effect is created by emitting light rays from the virtual camera through each pixel in an image plane (the image plane represents the final rendered image). The interaction of each light ray in the 3D environment is then simulated. The program calculates the light ray’s reflections and refractions on surfaces it encounters until it reaches a source of light. These calculations determine the colour of each pixel in the rendered image (chaosgroup, n.d.).

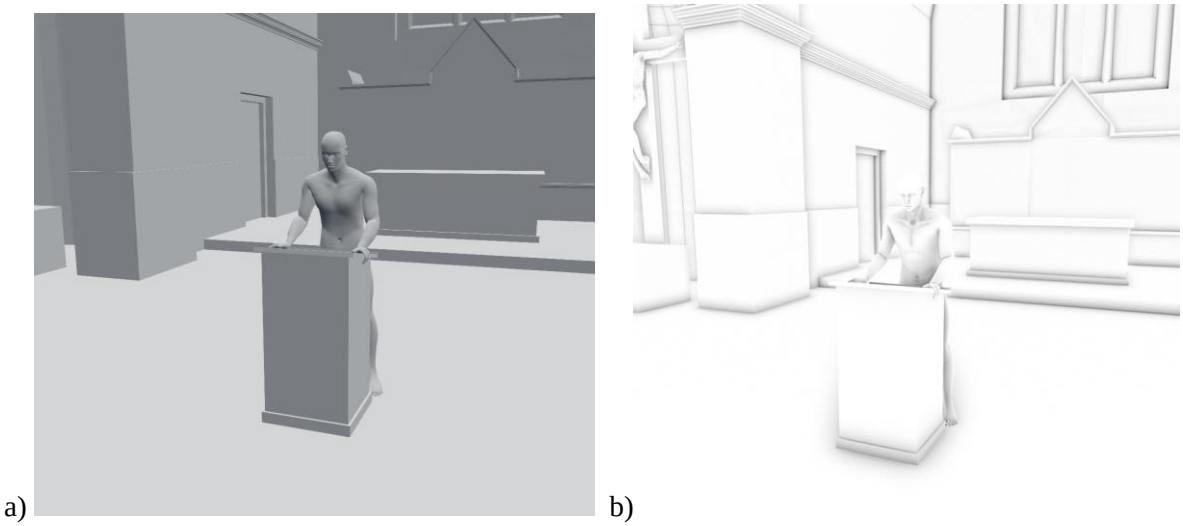


Figure 59. a) Example of matcap shading inside Blender's viewport. b) Example showing the screen space ambient occlusion effect.

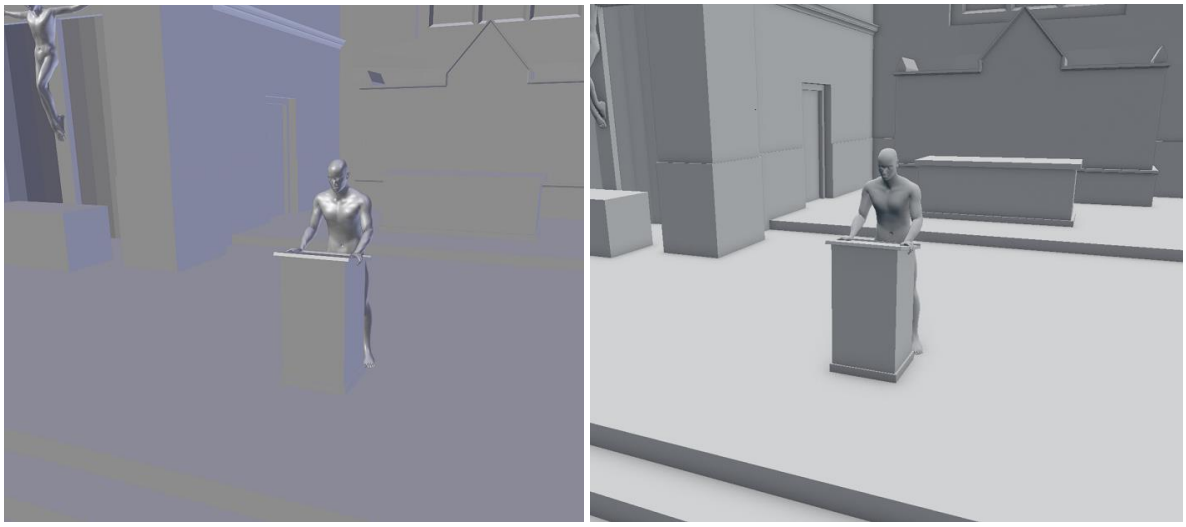


Figure 60. A comparison showing Blender's default viewport shading (left) and the matcap shading with screen space ambient occlusion enabled (right). The combination of matcap shading and ambient occlusion effect create a much more legible preview of the 3D scene compared to the standard viewport shading.

7.2.2. Depicting characters in correct scale and perspective

I felt that by posing 3D avatars inside Blender's 3D scene directly, I had more control over the quality and realism of the production. Firstly, the foreshortening of a character avatar at high or low camera angles was often more convincing than my drawn sketches from imagination. The inclusion of 3D character models inside the scene also improved the realistic depiction of the scale of objects. This is because the human models were in correct scale (average height of 1.7 meters), and the 3D assets inside the church were modelled in

relation to the scale of these human models. For example, the size of pews, tables and chairs inside the church were constructed in relation to the scale of the character models. Thus, the precise depiction of perspective, scale and continuity in the 3D created a more convincing reference that I could use to paint the final illustrations.

Generating character models rapidly with MakeHuman

The freeware MakeHuman software provided fast and reliable generation of high-quality human 3D models (see figure 61). The simple user interface was useful for rapidly generating unique 3D avatars with varying characteristics, such as age, gender, proportions, height, musculature, body fat, and so on. These options were used to develop the diverse cast of characters in this project, shown in figure 62. The consistency in model topology and quality ensured a reliable workflow for producing the many characters models for this project.

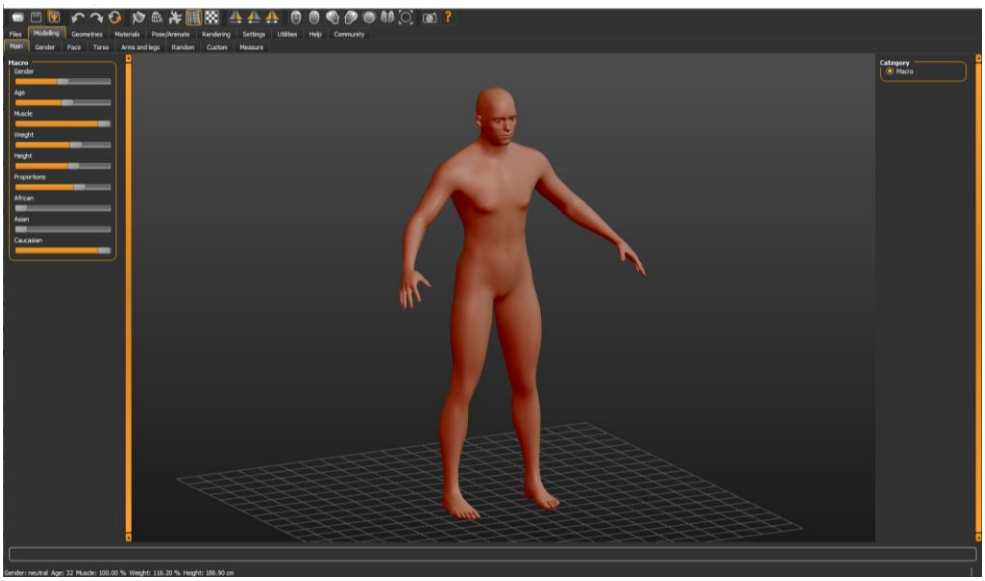
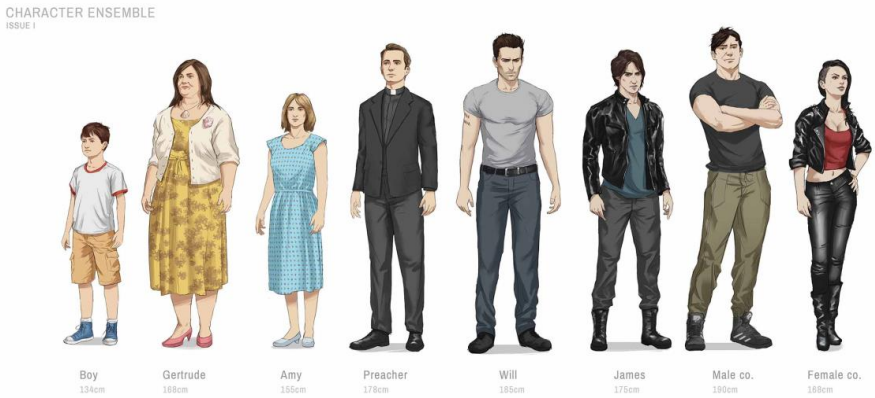


Figure 61. Screenshot showing me generating a 3D character avatar using MakeHuman software.



a)

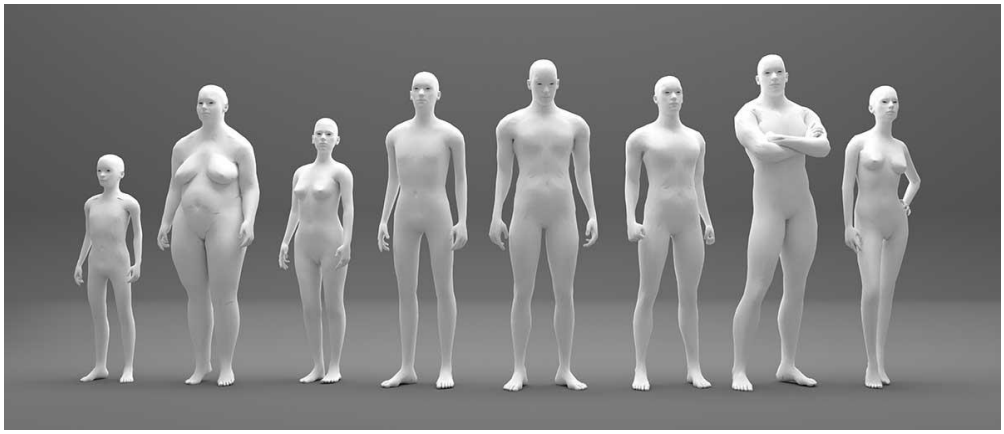
b) 

Figure 62**.** a) My designs for the main characters in issue one. b) 3D Character avatars generated in MakeHuman for each character.

The ‘Mhx2 - MakeHuman exchange’ add-on for Blender provided a reliable method for exporting 3D character models from MakeHuman to Blender. The models were imported to scale and without distortions to their geometry. Once imported, the add-on automatically generated an easy to use human rig inside the avatar model that was useful in rapidly posing the models (see figure 63). The inverse kinematics[40] integrated into the rig system enabled an intuitive and efficient method for posing the characters in the various action poses I needed.

[40] Forward and inverse kinematics are two different methods of posing characters. In forward kinematics, the bones are posed by manually rotating the individual bone joints. The position of child bones is determined by the rotation of their parent bones. Hence, the end point of the chain is determined by the combined rotations of all individual bones in the chain. By contrast, in inverse kinematics, the bones are posed in a reverse order. The end point is positioned first, and the connected bones in the chain follow by automatically re-orienting themselves. Inverse kinematics are often used to pose human limbs. For example, to pose a character’s arm grabbing an object, the hand bone is positioned at the desired location first. The upper arm and forearm bones automatically rotate to follow the hand bone (Unity, 2020).

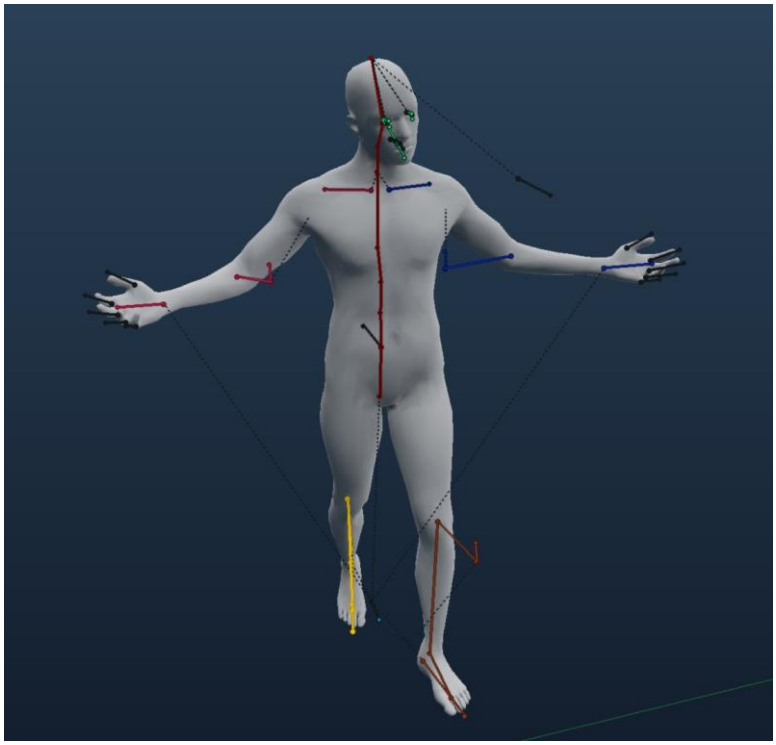


Figure 63**.** An automatically generated human rig inside the MakeHuman avatar model. The coloured bones are controllers used to pose the model.

7.2.3. Improving shot compositions

Blender's virtual cameras provided me with the creative freedom to experiment with camera angles from any vantage point in the 3D environment. The process of operating a virtual camera was similar to operating a camera in the physical world, because it shared similar settings to a physical photo camera. The cameras' position, angle and focal length were adjusted to explore more impactful compositions, such as enhancing a dramatic effect, improve legibility, or convey three-dimensional depth in an image more convincingly. For example, an interaction between two characters could be captured from several camera angles to explore which point of view communicated the interaction most effectively (see figure 64). Unlike a physical camera, however, the virtual cameras could be moved into the air, and through walls and floors to capture camera angles that would otherwise be impossible to capture in the physical world. For example, extreme, high angles, such as a birds-eye-view could be captured by simply positioning the camera above the scene.

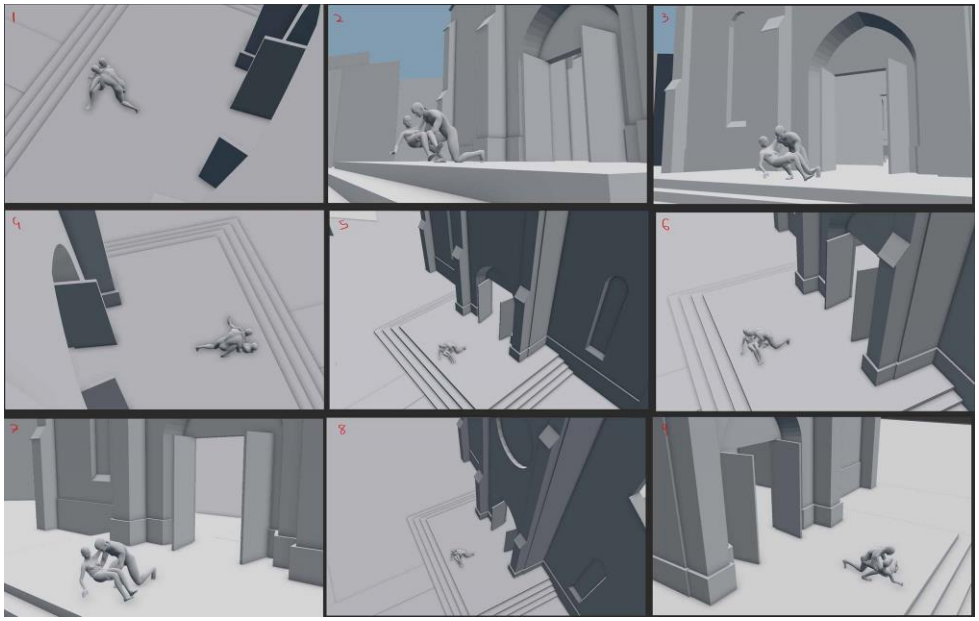


Figure 64. A series of camera angles I experimented with in 3D to frame an action in a panel.

7.2.4. Improving lighting

The virtual lights, rendered with Blender's ray-tracing Cycles engine, were helpful in interactively experimenting with lighting situations to develop and preview convincing lighting scenarios. Despite the slow render times, the shadow simulations were useful for gathering shadow references when painting realistic shadows cast by complex forms, such as a human figure (see figure 65). The renders were also useful in painting consistent shadows from different camera angles. Therefore, the 3D lighting improved visual continuity between panels.

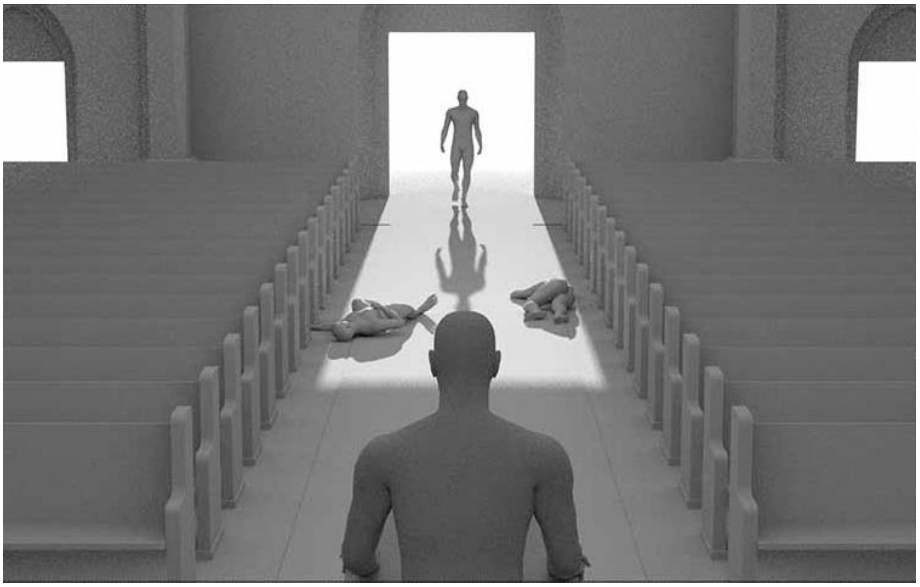


Figure 65. A rendered image of the lighting simulation in Blender. The image was rendered with the

ray-tracing engine Cycles.

7.3. Improvements made with digital painting

7.3.1. Efficient compositing of references and drawings

Throughout this production, Photoshop layers were used to store all the sketches, 3D reference material and painted illustrations in a single Photoshop file for each page in the comic book. The layer structure is shown in figure 66. During the detailed line art stage, Photoshop layers were used to draw over the 3D renders to add details in the environments and characters in the final drawings (see figure 67). 3D images were traced to extract perspective information so that the drawings conveyed a convincing three-dimensionality Thus, less time was spent on drawing out perspective grids and solving challenging perspective problems during the drawing and painting stages of production.

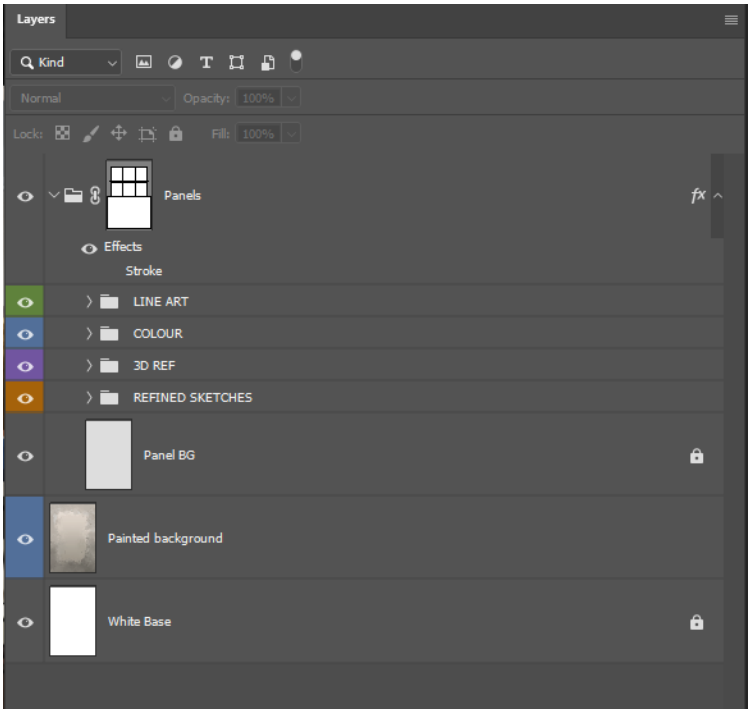


Figure 66. The layer structure inside one of my pages' Photoshop file.

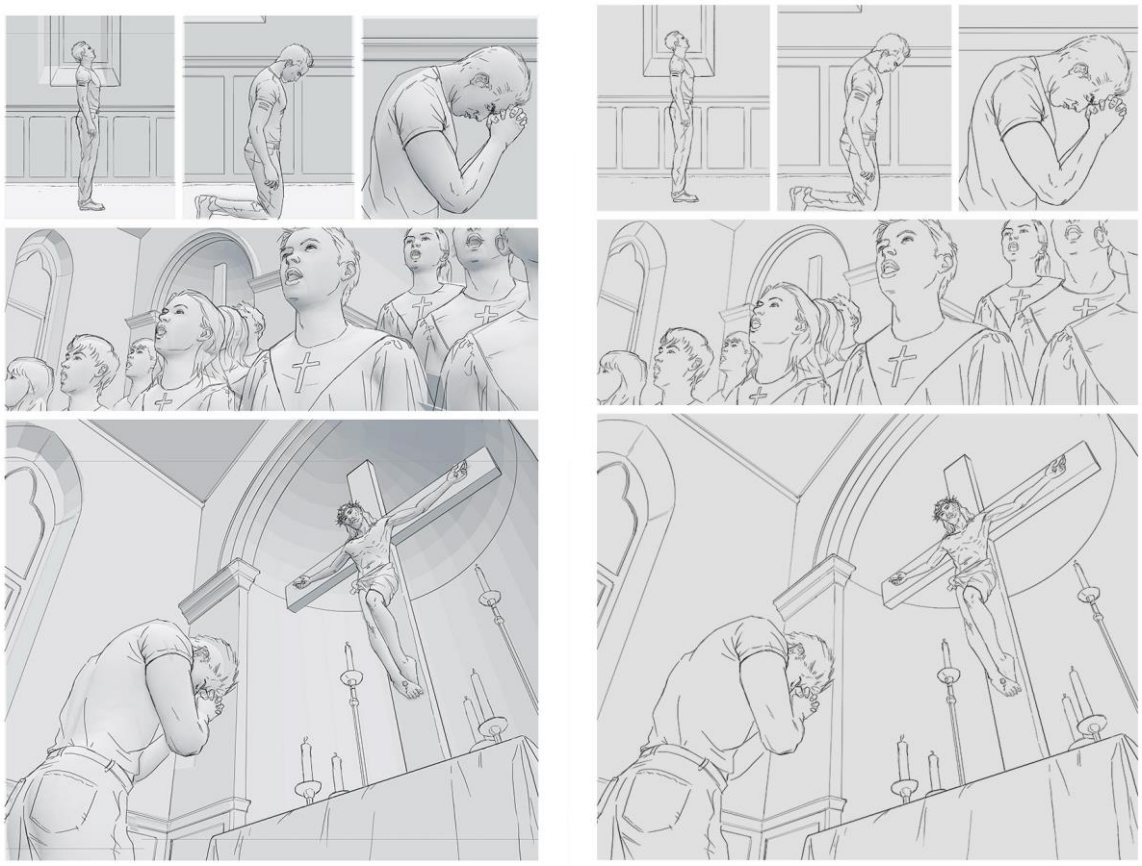


Figure 67. Example showing how the 3D renders were traced to extract perspective information onto the detailed line art drawings. The left image shows how the 3D reference is vaguely visible during the tracing process.

Photographic references could then be loaded into Photoshop as separate files, reduced in scale, and placed to the side of the screen to provide additional reference while drawing details, such as character likenesses and material creasing on costumes (see figure 68).

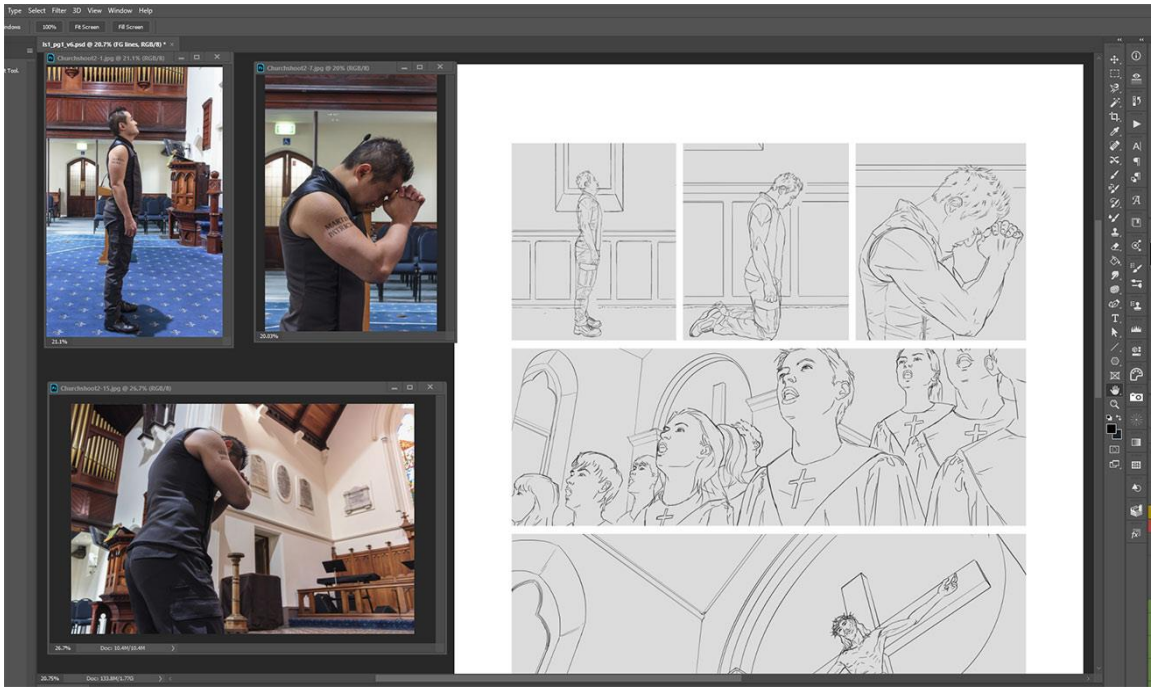


Figure 68. My arrangement of photographic references and drawing workspace on the screen in Photoshop.

7.3.2. Creating realistic illustrations

The variety in painting tools, including the brush, mixer and smudge brush, provided an efficient way of applying and blending colours to imitate the painterly quality I was after. The transitions between patches of colour could be subtly controlled using pressure sensitive brush strokes to imitate traditional textures, unlike the uniform digitised effects seen in the Gaussian blur. During the painting stage, Photoshop's colour picker was used to sample colours from photographs to study naturalistic colours more closely. Combined with observational studies, this process helped me produce a more realistic colour palette in my illustrations.

Previewing legibility

Legibility is a major challenge when painting highly detailed realistic art. The textural detail can increase contrast and distract the reader from the focal point. Therefore. Photoshop's soft-proofing feature[41] was used to quickly preview contrast levels by converting the image to a greyscale representation of the artwork (see figure 69). Toggling the 'dot gain twenty

[41] Photoshop's soft-proofing feature is used to preview how an image will be reproduced in print. It simulates the printer's colour conversion digitally and displays the colour output on screen. The soft-proofing feature is activated using the 'Proof Colors' option under the 'View' menu (Adobe, 20017a).

percent'[42] setting with a shortcut keystroke was an efficient method for checking the contrast while painting. By utilising the dodge and burn tools[43], the shading could then be adjusted to improve the legibility of artwork. This high legibility ensured the realism in the artwork communicated the story more clearly to the readers.

Figure 69. Example showing how the soft-proofing feature was used to display a coloured comic page in greyscale. The image on the right shows the page when soft-proofing is enabled.

Summary

This chapter evaluated the improvements made from my use of photographic referencing and digital tools during the development of my realism style for this project. I found that the combination of photographic references and 3D computer graphics provided vital reference

[42] Dot gain refers to a darkening effect observed on printed images. This is due to an increase in the size of halftone dots during the printing process (LinkedIn Learning, 2017). The increase in size of halftone dots is expressed in percentage value. For example, dot gain of twenty percent refers to a twenty percent increase in halftone dot size in print (Kainos Print, n.d.). The 'Dot gain twenty percent' preset in Photoshop's proof setup appears to be used to preview this darkening effect. However, I found this preset to be effective at previewing my artwork in greyscale to adjust the shading.
[43] The dodge and burn tools are used to lighten and darken images in Photoshop. They are based on traditional techniques utilised by photographers when editing photographs in a darkroom. The photographers would hide the surface from light to lighten it (dodge) and expose the surface to darken it (burn) (Adobe, 2017b).

for creating a convincing depiction of the physical world, and for illustrating believable characters, expressions and anatomy. Without these references, the process of creating highly detailed illustrations would have been more time consuming and difficult to execute. The digital painting workflow I used facilitated an easy integration of all the references by organising the images inside layers or by placing them next to the canvas during the drawing and painting stages of production. Also, colours were sampled to generate realistic colour palettes, and the painting tools were sufficient in producing a high quality, legible, and personal illustrative style that depicted the overall realism I sought. In the next chapter, I will discuss my artistic processes employed to produce my graphic novel. The process consists of several stages – each stage will be described in detail, including the challenges encountered and techniques I used to overcome them.

8. Detailed production processes used in this project

This chapter discusses the production processes utilised to complete the first issue of the graphic novel project. It defines the roles of writer Coyle and myself in the production, and then provides an overview of the artistic processes used to create my realistic visual style. The processes are divided into several stages, including rough sketches, concept art, refined sketches, 3D construction, photographic referencing, detailed line drawing, and digital painting. Each stage is described in detail, including the challenges encountered and techniques used to overcome them. I use visual examples from the project to describe my application of tools and techniques.

8.1. Defining stakeholders' roles

Coyle's role in the production was that of writer. Prior to starting this project, he provided a completed script suitable for the graphic novel. During production, he described to me the context of each scene, including the characters' motivations, their relationships to each other, and what they need to do at any given moment in the story. For example, there are actions that characters need to perform or emotions that they need to express in every single panel in order to convey the story correctly. He would also describe what every comic book page needed to have. For example, the dialogue and interactions needed to happen within the span of the page to tell the story at an appropriate pace.

It was my job as the artist to visualise Coyle's script with convincing human anatomy, perspective, composition, lighting and rendering. As the script was already complete, I could dedicate my time to the visualisation process alone. This involved translating Coyle's story and text into images. It was my responsibility to develop a suitable visual style and artistic process.

8.2. My artistic process for *DEMONS*

My production pipeline for this project can be summarised in the cycle diagram in figure 70. The process begins with the script provided by Coyle, as it provides the necessary information to start the artistic process. Then, the production of the artwork progresses through a series of production stages, starting from the rough sketches through to the digital painting to complete each illustration. The lettering[44] and assembly[45] stages completed at the end of the process are not covered in this research project as this thesis focuses on the visual style of illustrations alone. Each issue raised in the production followed this cycle.

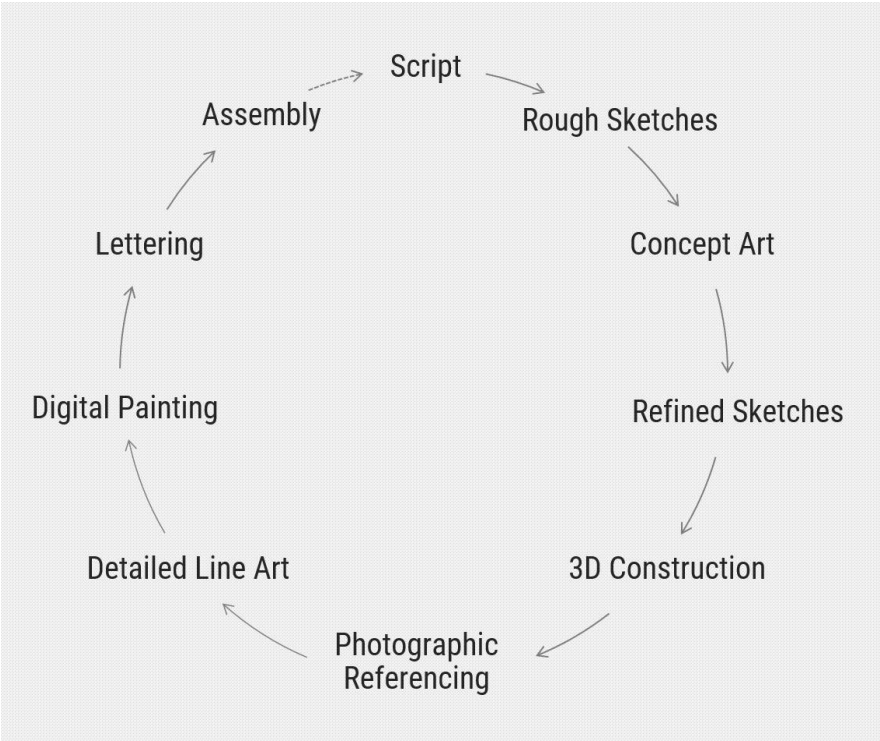


Figure 70. A cycle diagram summarising my production pipeline.

8.2.1. Producing the rough sketches

Rough sketches are loosely drawn sketches used to rapidly storyboard the comic book at the start of production. The sketches are drawn digitally on a blank canvas in Photoshop, using a

[44] In comic book production, lettering is the process of adding words into the comic book artwork. This includes drawing speech balloons, writing dialogue text inside the balloons, and creating sound effect text. The letterer copies the text from the script provided by the writer, and formats it according to accepted comic book lettering traditions (Piekos, n.d.). In this project, I was the letterer and Coyle was the script writer.

[45] The assembly stage involves compositing speech balloons and sound effect text over the painted illustrations. Also, all the pages, including the front and back covers and interior pages, are compiled in order into a book format. This process is completed using Adobe InDesign. Once assembled, the InDesign document is exported to a pdf document and submitted for printing. In this project, I was responsible for the assembling process.

Wacom Bamboo tablet and stylus pen. Each page is sketched inside a separate Photoshop file[46]. In Photoshop, the canvas dimensions are set to eleven by seventeen inches, imitating the standard American comic book bristol board size used by industry professionals, including Ross (Waid & Ross 2008). The process starts by first breaking down the page into panels. A problem encountered during this stage is the arrangement of panels. Referring back to the script, it can be used to outline the breakdown for all the panels and dialogues for every page in the comic book. Then, the arrangement of panels can be drawn. Inside each panel, sketches of human figures are then drawn to identify placement of essential elements like characters and objects (see figure 71). The panels were drawn chronologically during an in-person meeting with Coyle.

Figure 71. Rough sketch of page five drawn in Adobe Photoshop using a Wacom tablet.

The digital canvas' scale and resolution

[46] Photoshop's artboards feature may be investigated in future to consolidate all pages of a single issue inside one Photoshop file. Doing so may further speed-up production. The artboards feature was released in the 2015 version of Photoshop Creative Cloud (Adobe Photoshop, 2015). Its utilisation may speed up production efficiencies during production of future comic book issues. It can be used to add multiple canvas pages or 'artboards' inside a single Photoshop file. I may use this feature to rapidly iterate on several comic book pages simultaneously, as opposed to opening them as separate files.

The canvas resolution was initially set to four hundred pixels per inch. Since the artwork is a raster[47] image, the high pixel density enabled the inclusion of fine details in the sketches. This resulted in drawings being over-detailed with some unnecessary visual information. Depicting difficult technical subjects like human anatomy and perspective during the sketching process had interfered with the conceptualisation of the panels. They were taking too long to produce. This reduced the overall production efficiency.

It was decided, rough sketches only need to include the most crucial visual elements on a page. Therefore, the primary shapes of a composition are prioritised. Primary shapes are large visual masses in the illustrations that establish the layout of the overall composition. They are the silhouetted outlines of essential visual elements, such as the shape of a human figure or large architectural features, seen in an illustration. Secondary and tertiary details are loosely added to contextualise these shapes. For example, I add hints of the character's eyes, nose and mouth to communicate the direction the characters' heads are facing. However, most of these details are not critical at this stage as they do not influence the layout, hence they are avoided to increase efficiency[48].

Therefore, the resolution was halved to two-hundred pixels per inch. This reduced the number of pixels available. Working on a low-resolution canvas prevented the addition of intricate detail because finer brush strokes became pixelated. Hence, only essential elements were drawn, such as the position of characters, architecture, props, and speech balloons inside the panels – all drawn in the most simplistic style possible (see figure 72). This allowed for rapid brainstorming between myself and Coyle. It was important that Coyle could understand the drawings so that he could provide the detailed feedback needed to facilitate a smooth production flow.

[47] Raster images, also referred to as bitmap images, are images formed by an array of bits arranged inside a rectangular grid of pixels. When viewed at one hundred percent zoom level in Photoshop, the raster image appears sharp and smooth. But at higher zoom levels, such as three hundred percent, the pixel pattern is revealed, and the image appears less sharp and edges appear less smooth (Adobe, 2016b).

[48] Primary, secondary and tertiary shapes are terms used to describe different levels of detail in a picture. The primary shapes refer to big details, secondary refer to medium details, and tertiary refer to small details. The size of a detail is determined by its size in the picture (Blevins 2017).

Figure 72. Rough sketch of page drawn using a simple drawing style on a low-resolution canvas. Note the simplification of the sketches to communicate the essential details, such as the positions of characters, architecture and props in the panels.

8.2.2. Producing the concept art

‘Concept art’ is the production design stage of production. The essential designs are conceptualised at this stage, including characters, costumes, props and locations. The drawings are produced in separate files and as separate artwork for *visualising* ideas. The concept art images are later used as a reference when illustrating the final artwork.

Researching references

At the start of the concept art stage, image references are gathered to study objects. The rough sketches drawn previously are used to inform what needs to be researched and then painted in the final illustrations. For example, as the environment in the first issue takes place inside the church, references were sought of subjects such as the interior and exterior of a church, the singing choir, the Mass congregation, an altar, and so on. To find these images, online image search engines were used, including Google Images, Pinterest, Flickr, Pixabay, and CG

textures. The images found formed the basis of my image reference essay[49] and were critical in creating realistic depiction of the objects in my paintings.

Designing the church interior and exterior

The initial interior design of the church was sketched in the rough sketch. It was drawn as if from several camera angles to establish the basic layout and architecture of the space. The images of different churches and components of a church collected online were used as a reference. They included images of an altar, pews, stained glass windows, pulpit, organs, several smaller decorative elements inside a church, and so on (see figure 73). They were used as visual inspirations to provide ideas for constructing a space identifiable as being the inside of a church.

Figure 73. A sample of image references used to design the church interior.

Small details like the arrangement of altar candles, decorative flowers at the altar, details on the statue of Jesus, and ornamental motifs in the architecture, were recreated in my illustrations for a convincing representation of a church. They had to fulfil the design requirement for creating a convincing world in the final production. It needed to include all the characteristics of what a church interior in the physical world looks like, including the architectural construction and layout.

Designing the church Mass congregation

To design the church Mass congregation, reference photographs of a church Mass were used. What people were wearing and how they congregated in the space of the church were closely

[49]An image reference essay refers to a collection of images that cumulatively communicate a story. In this context, the online images I collected describe the designs of my imagined environments, characters and props.

studied. For example, there was variation in the formal and casual attire among attendees. Some dressed in vibrant colours, others in dark or monochromatic colours.

From these photo references I was able to imagine how I would depict a large congregation inside the church. With my library of ideas, I was able to create dozens of unique drawings of people. It was important that my characters did not appear too similar to one another, as this would not create the convincing variety I was after. For example, ideas for different fashions, likenesses, hairstyles, body shapes – all needed to be developed.

To convincingly illustrate my characters, I had to learn to draw faces. To do this, hundreds of online portrait photographs of various people were collected and studied. A collection of my renditions can be seen in figure 74. I included people of various ethnicities, age, gender, body type and so on. This helped me memorise many different face shapes, proportions, and characteristics. Loomis' (1956) method of constructing the human head in *Drawing the Head and Hands* was used to simplify the head construction process (see figure 75). I began my studies by drawing a series of construction lines according to Loomis' (1956, pp.21-87) method. I used it to establish the basic proportions of an average head in the correct perspective. Then, I deviated from these proportions to reflect the facial characteristics of the portrait I was studying. I used the construction lines to precisely position facial features like the eyes, nose and mouth. This helped me capture the likeness more effectively.

Figure 74. A sample of portrait studies drawn from photographic reference.

Removed due to copyright restriction.

Figure 75. An average male head construction method by Loomis (1956, pp.21-26).

When painting the congregation inside the church, my knowledge was utilised to design dozens of unique characters from my imagination (see figure 76). I mixed and matched different facial features to invent a variety of different likenesses among a large crowd of characters. For example, different characteristics, such as age, facial structure, ethnicity, hairstyle, skin colour, and so on were mixed and matched to create a convincing diversity of likenesses in the scene. Understanding these individual characteristics and their variations gave me the ability to invent likenesses from my imagination without needing to copy photographs of real people directly.

Figure 76. A sample of Mass congregation drawn from imagination.

Designing the main characters

The central character in the first issue was initially drawn from my imagination. His likeness was inspired by images of the film actor Sean Patrick Flanery in *The Boondock Saints* (1999). His hairstyle, shape of the head and the forehead shared a similar resemblance to my character (see figure 77). The initial likeness evolved over time but became an imaginary depiction. My initial character was thus Caucasian. However, Coyle's critique was that the depiction of my character was unconvincing. He claimed my drawings conveyed little expression or recognisable persona. Despite iterating the drawings several times, the problem persisted. We concluded that an imaginary design for the central character was not going to work. A photographic reference was necessary to convey convincing emotions.

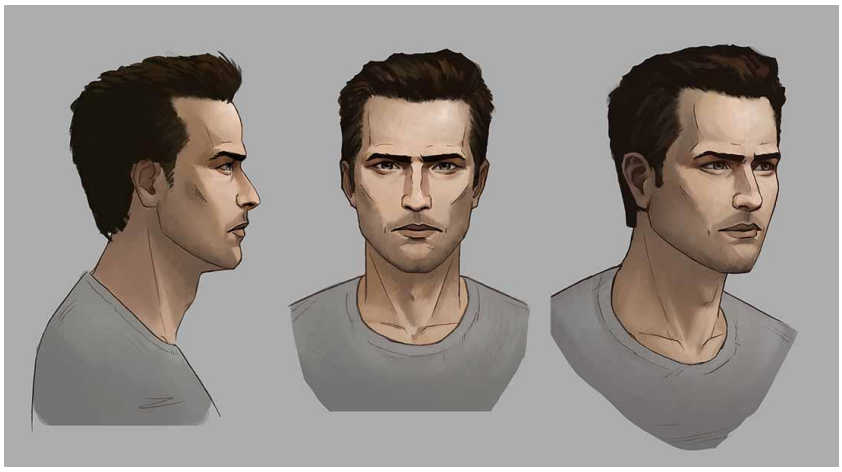


Figure 77. Initial design of the central character in the first issue of the graphic novel.

We decided a live actor was needed. Coyle performed the role. Of Asian ethnicity, Coyle insisted the new depiction of the character also needed to be of Asian likeness (see figure 78). It was initially challenging to draw a convincing Asian face – a significant portion of my human anatomy practice was centred around Caucasian likenesses. I had memorised methods of drawing Caucasian facial features. But the structure of the eyes, such as the tear ducts, are distinctly different for many Asian faces. I struggled to draw the eyes, which kept being drawn similar to Caucasian eyes. I studied photographs of Coyle's face and redrew it several times in an attempt to capture the eye structure convincingly.

a) b)

Figure 78. a) Reference photographs of actor David Coyle (Banasiak 2017). b) Final concept art of the character.

The remaining cast of characters were designed from imagination. My gained knowledge of human anatomy and costuming were used to create a unique cast of distinct characters with unique appearances and personas (see figure 79). Once the designs of locations and characters were established, refined sketches could be drawn.

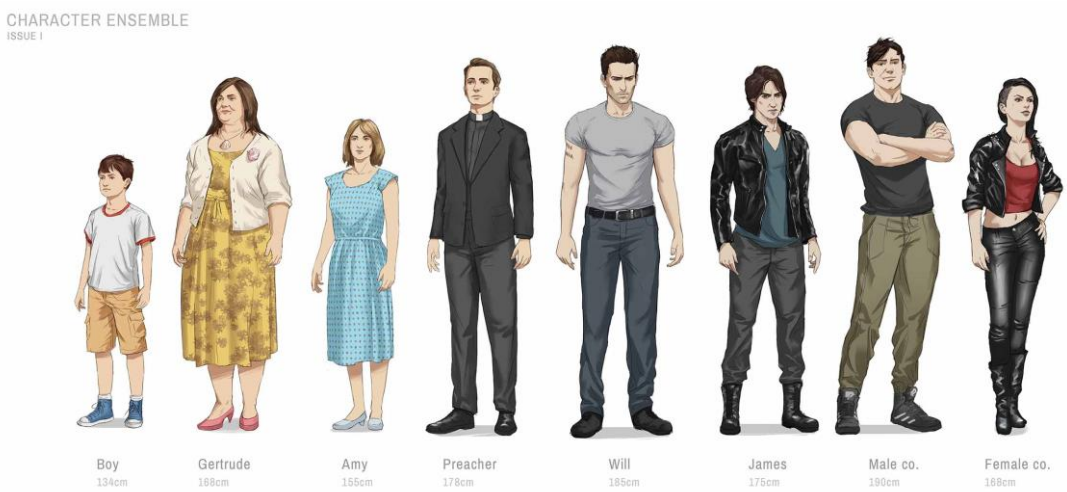


Figure 79. My initial designs of the full cast of characters in issue one. Note the variety in features, including body types, age, gender, heights, and costuming.

8.2.3. Producing the refined sketches

During the refined sketch stage, secondary and tertiary details are defined (see figure 80). Secondary details include character's features, such as the shape of the head and shape of clothes. Tertiary details include small features that define a character's likeness and facial expression, such as the creasing in the skin, the shape of the eyes, the shape of the lips and so on.

Figure 80. A refined sketch of page five, issue one. Note the addition of secondary and tertiary features, such as the head structure, facial features and design of clothing.

To allow the addition of these smaller details, the digital canvas was upscaled to a higher resolution of four hundred pixels per inch. The file's print size, which is eleven by seventeen inches, remained the same. This allowed me to zoom into the canvas to draw smaller details, such as the shapes of the eyes on characters, without pixelation. At this stage, I also needed to utilise perspective construction techniques to establish the 3D space more clearly in my drawings.

Perspective construction

Prior to sketching the scenes in perspective, I needed to learn perspective drawing. I used Robertson's *How to Draw: Drawing and Sketching Objects and Environments* (2012). It taught me how to position the horizon line in the drawing and how perspective lines converge

towards vanishing points. I used this information to draw objects and scenes in perspective in my refined sketches. I adjusted the position of the horizon line inside the picture to convey different camera angles in my sketches. For example, a horizon line placed low in the picture created a low camera angle. This creates the effect of a camera pointing upwards.

In the process of drawing the imagined spaces in perspective, it became apparent to me that the complexity of the interior church environment would be difficult to draw in a convincing three-dimensional manner. From my sketches, it was clear that many of the panels in the comic would need to be drawn from extremely low or high camera angles. Foreshortening in these views was going to be difficult for me to draw without a reference. These camera angles are unusual because I do not normally view the physical world from such extreme angles. For example, when a camera is positioned low to the ground looking up at a character, or extremely high up in the air, looking down at a character, such views were difficult to draw. Hence, it became apparent to me that a 3D construction program could be used to create these extreme perspective views more effectively.

Upon further analysis, I realised it was going to be difficult for me to maintain consistency across panels that used similar scenes shot from different angles. The large number of details needed in the church environment was going to be difficult to replicate from these different camera positions using traditional drawing techniques; the spatial consistency would be difficult to maintain. Also, my knowledge and experience in perspective drawing was limited and so creating the drawings would take me a long time. Constructing the space in a 3D program would assist in overcoming these problems. Hence, I needed to find a 3D modelling program that was accessible and provided me with the necessary tools to overcome the outlined challenged.

8.2.4. Producing the 3D construction

Choosing Blender for 3D modelling

Choosing the most suitable 3D modelling program took some time and evaluation of the many programs available. Initially I considered using Autodesk’s 3Ds Max, because I had used it previously to learn basic 3D modelling. Hence, it should be easy for me to operate. But, I found the program unsuitable for this project because it was too expensive.

Modo and Autodesk Maya were also explored but found to be unsuitable due to expensive licenses. Free 3D programs were then explored. Of the many available, I chose Blender[50]. I tested its modelling tools by modelling basic 3D objects and sets. Mesh editing operations, such as manipulation, extruding and subdividing were easy to perform. Blender is also well supported online, hence, any problems I had with it could mostly be solved by looking at how others had solved them online.

I found Blender to be a versatile program. It is not intended for comic book production, but it did provide customising options that allowed me to appropriate its functions on my graphic novel project. For example, additional tools necessary for the project were downloaded from online sources, such as *Github.com* and *Gumroad.com*. These tools can be installed in Blender as add-ons. I installed two add-ons in Blender during this project: 'Mhx2 – MakeHuman exchange' and 'Object Layer Manager'. I used them to help me execute several key operations during the 3D construction process. My utilisation of these add-ons is discussed in more detail later in this chapter.

3D modelling in Blender

I began to teach myself how to model in Blender by constructing the church structure. I did this by extruding a series of 3D planes into the approximate dimensions of the church. The surfaces were extruded to create the floor and outer walls of the church (see figure 81). My observational studies and photographic references were used to determine the measurements. The exterior and interior of the church model were constructed simultaneously so the designs matched. Using a 3D program made this process easier than designing the structure using traditional drawing methods.

[50] In this project, I used Blender version 2.79.

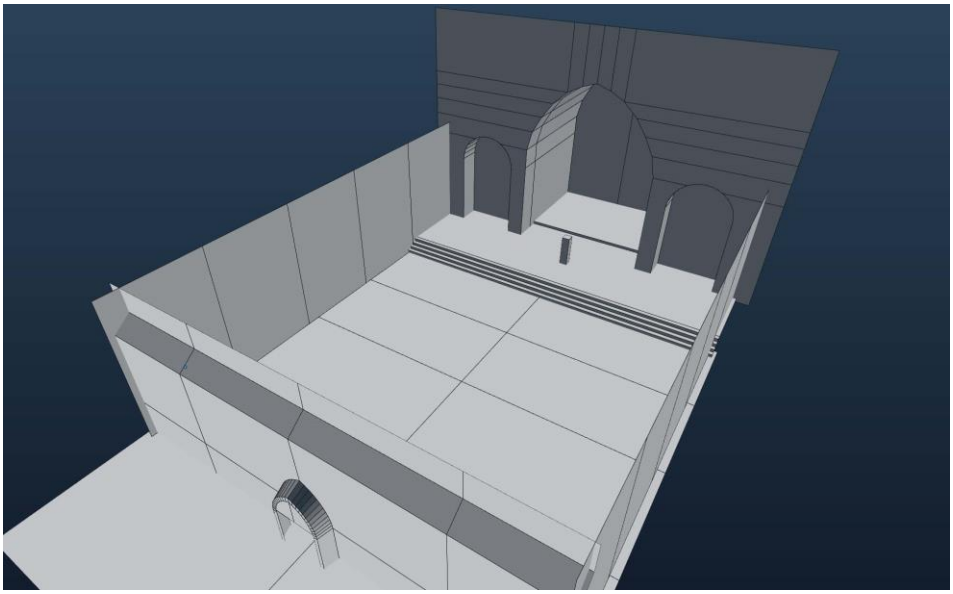


Figure 81. Initial 3D block-out model of the church interior environment in Blender.

I then inserted a box object in the scene, with width and height dimensions similar to an average male figure (seen in figure 81). It helped me grasp the scale of the space. I used the refined sketches drawn prior to my 3D constructions to determine whether the action sequences in the story would fit inside the modelled space.

Smaller architectural details like windows, doors and the shape of the roof were added later. For example, I modelled the arch-shaped roof by subdividing the top plane of the structure into several polygons. Then, I used a vertex falloff radius effector[51], called 'proportional editing' in Blender, to drag the centre edge of the plane upwards such that the surrounding subdivided edges followed at a decreasing rate, creating an arch shape.

The church environment was furnished with objects such as: an altar, crucifix, tables and pews. I modelled these using box modelling techniques[52] (see figure 82). For example, the pew was modelled by extruding and subdividing a cube mesh into a basic form resembling a pew. Photographic references taken inside a church were used as inspiration for the design of the pew. The pews in the photographic reference were not copied exactly – they were only

[51] A vertex falloff radius effector refers to an area of influence around a selection of vertices. It influences nearby vertices to transform with the selection but at a decreasing rate – vertices furthest from the centre of selection will be influenced the least, and those closest will be influenced the most. For example, on a subdivided flat plane, raising a single vertex selection upwards will move the surrounding vertices at a decreasing rate, resulting in a bump shape (Blender, n.d. c).

[52] Box modelling is a 3D modelling process where a primitive geometric form, such as a cube, sphere or cylinder, is used as the basis for modelling a more complex geometric form. The primitive form is edited by modifying its shape and topology using modelling tools (extrusion, loop cuts, scaling and so on) until the final object is created.

used as a guide for the shape and scale, such that the 3D model was identifiable as a pew. Only the large parts of the pews were modelled, such as the seat and the back rest. Smaller, decorative details were ignored to reduce construction time.

Figure 82. Furnishing the 3D church interior with 3D objects and architectural details.

I created a row of pews by applying an array[53] modifier to a single pew object. The modifier generated an array of pews along the length of the church. Changes could quickly be made by editing the original instance of the pew. The changes would automatically update the cloned pews. This allowed for the rapid editing of the pew model.

3D character avatar generation

A process was necessary for creating convincing 3D models of human figures for the 3D space in Blender. Modelling every aspect of a 3D avatar manually was going to be too time consuming. The collection of characters necessary for this project was significantly large, and each character had a distinct body shape and body types. For example, a particular age, gender, height, musculature, and so on.

An alternative to depicting each character separately was to download individual characters from online marketplaces, such as *Turbosquid.com* or *CGTrader.com*. However, the diversity in characters available from different authors introduced its own problems. Different authors often used different production techniques. For example, the characters may be modelled using different topologies, or be rigged with different skeletal configurations or controls. It was also difficult to evaluate the quality of an asset from the images provided on the website.

[53] A series of evenly spaced copies of an object.

An asset must be downloaded first to be evaluated. Moreover, different authors may use different file formats, some which are not compatible with Blender. I decided that it was not a reliable process, as it was time consuming and dependent on the availability and quality of models.

Generating characters using an avatar modelling program ensured that the quality between all my 3D character models would be consistent. The models were constructed using identical topologies and rigged identically with the same bone structure and control schemes. The models needed also to be customised to closely represent the sketch designs of my characters. To generate the characters, I used the program MakeHuman. It is a free program used to rapidly generate 3D virtual human avatars using a simple user interface (see figure 83). Its interface is made up of a series of interactive sliders to modify and blend individual 3D model attributes. I could use MakeHuman to generate a generic 3D avatar automatically. This seemed like a good solution.

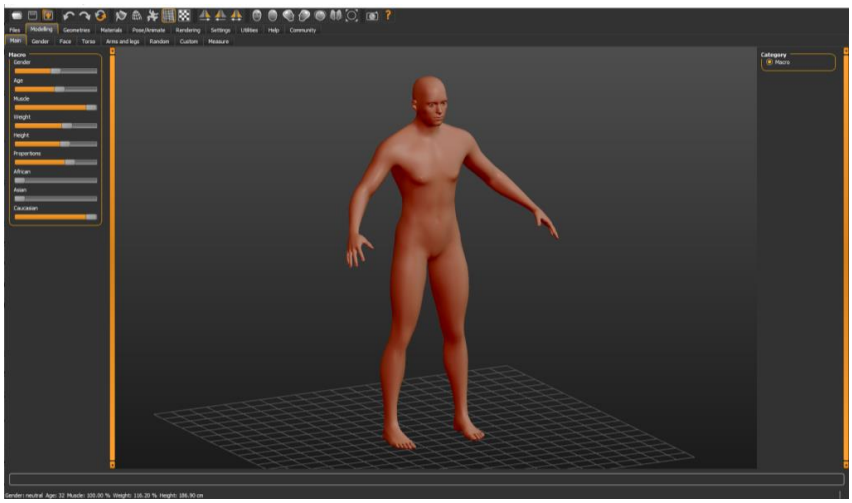
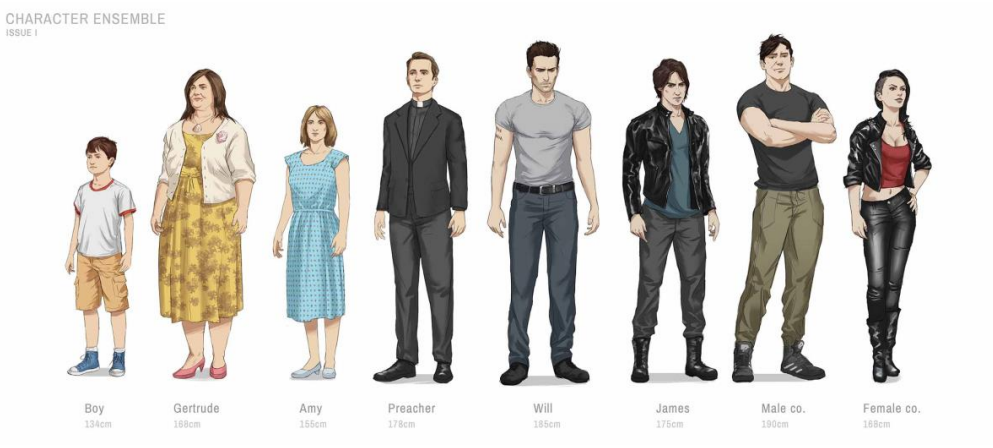


Figure 83. Screenshot showing me generating a 3D character avatar using MakeHuman software.

I could adjust the control sliders to customise the model's features, such as age, height, body proportions, body fat and musculature, to better reflect the features of my character concepts. I repeated the process to create a unique avatar model for every character in the story (see figure 84).

a)



b)

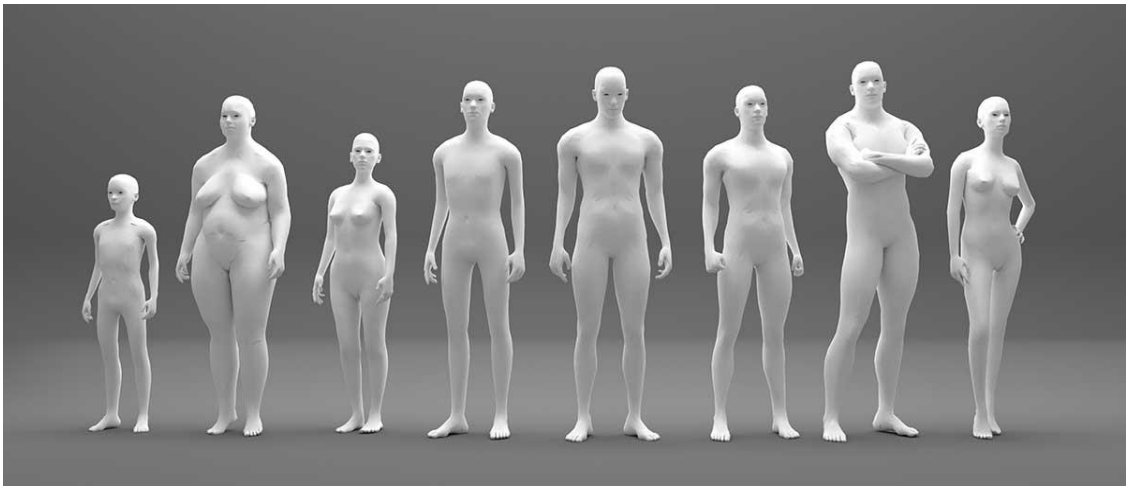


Figure 84**.** a) My designs for the main characters in issue one. b) 3D Character avatars generated in MakeHuman for each character.

Exporting MakeHuman characters to Blender

To export the avatar models from MakeHuman to Blender, I needed to install the add-on 'Mhx2 - MakeHuman exchange'. It uses a unique file format called MakeHuman Exchange (.mhx) to import MakeHuman avatar content into Blender. It was useful in my production because it simplified the import process by transferring the 3D human model into Blender from MakeHuman without complications. It imports the model in the correct scale, and automatically generates a human rig with correct vertex weights[54], which allows the model to be posed convincingly (see figure 85). The add-on also provided me with several options for controlling the rig, including the ability to alternate between forward kinematics and inverse kinematics to control each limb. The generated rig provided the necessary controls for

[54] Vertex weights refer to numeric values assigned to individual vertices of a model. The values range from 0.0 to 1.0. They can be used to determine the strength of influence of deformers, such as armature bones. The vertex weights are used to create convincing deformations of human 3D models by manipulating the influence of bones for each section of the body (Blender, 2020b).

individual parts of the avatars, including the limbs, spine, collar bones, mouth and eyes. The add-on created an efficient and reliable pipeline by automating several tasks that would otherwise have required additional time to set up or troubleshoot.

Figure 85**.** An automatically generated human rig inside the MakeHuman avatar model. The coloured bones are controllers used to pose the model.

The individual 3D avatar models were exported from MakeHuman as separate files. The avatars were imported directly into the 3D Blender church scene. In Blender, each avatar was labelled by its character name to distinguish between them. A problem with MakeHuman is that models could not be customised using control sliders inside of Blender. This is because the topology is converted into a static mesh[55]. Any adjustments to the model geometry can only be made by manipulating its vertices using Blender's transform tools, or editing the model inside MakeHuman and re-exporting it back into Blender[56].

Posing character avatars in Blender

[55] A polygonal mesh with fixed vertex locations. The mesh can no longer be dynamically modified with pre-defined parameters and presets.
[56] For future research I will investigate a method for creating custom python scripts to customise avatars similar to MakeHuman directly inside Blender.

Avatars are posed, using my refined sketches as a reference. I posed the individual body parts by manipulating the avatar's armature[57] bone components. I used inverse kinematics to pose the limbs. Compared to forward kinematics, I found inverse kinematics to be more efficient because they required fewer transform operations to position the arms and legs into place. For example, the hands and feet could be positioned in the required place first, and the bones of the arms and legs automatically followed, bending convincingly.

To convey characters' movement between panels in the comic book, the avatar for each character needed to be posed differently for each camera shot in the 3D scene. I did this by duplicating the avatar model several times and posing each duplicate differently according to my sketches. Each duplicate avatar represented the character at a particular time in the sequence (see figure 86).

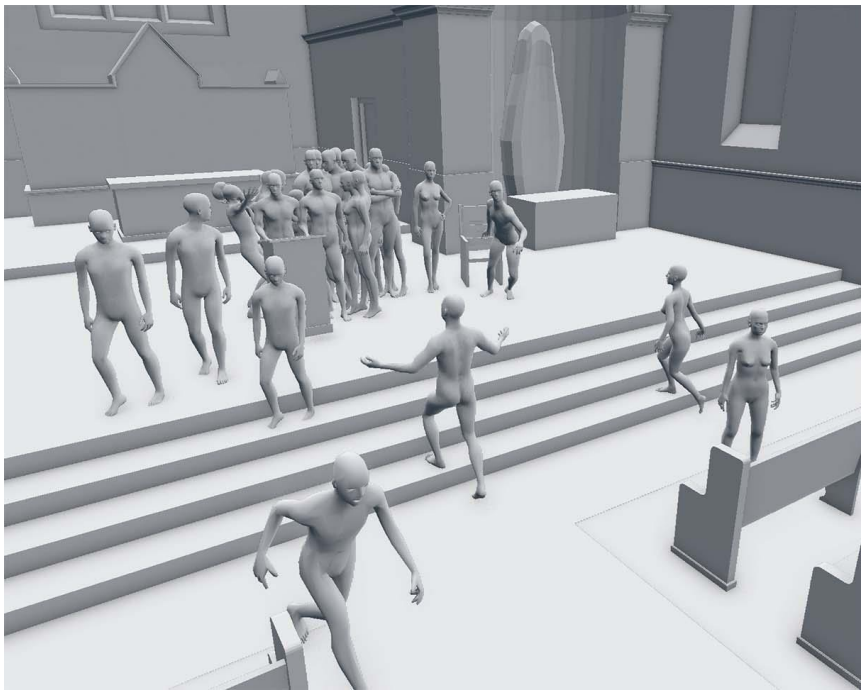


Figure 86. Screenshot showing how the character avatars are duplicated several times and then posed and positioned differently for each panel in the comic book.

The visibility of avatars was controlled using the 'Objects Layer Manager' add-on. This add-on extended Blender's layering functionality by unlocking its layer limit from twenty to an unlimited number. This was useful because I needed over fifty layers to cover every unique camera shot (or panel) in the comic book. Each layer contained a duplicate of every moving

[57] An armature is a skeletal structure in Blender that consists of several bones. The bone structure is similar to the bone structure in real skeletons (human or animal). The armature is used to pose and animate 3D models by manipulating its individual bone components. The 3D geometry will move the same way as the bone that it is being influenced by.

character in a unique pose and position. The visibility of character models was controlled by only revealing the layer that corresponded to a particular panel in the comic book. For example, a layer for panel seven of page eight was revealed to show all character models posed and positioned for panel seven of page eight (see figure 87).

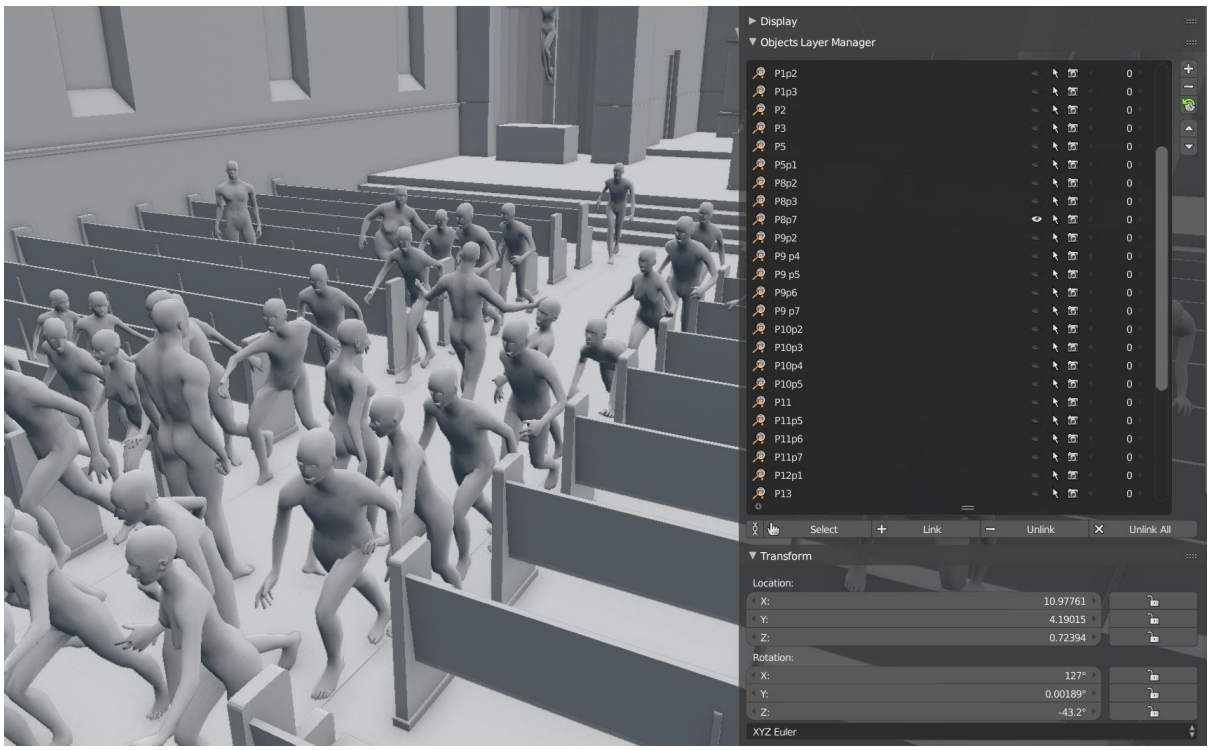


Figure 87. The ‘Objects Layer Manager’ add-on is shown on the right of the picture. Layer ‘P8p7’ is revealed to show all character for panel seven of page eight.

Optimising the 3D scene

To mitigate computer lag caused by high polygon counts in a 3D scene, I needed to optimise the geometry of the 3D avatar models. To do this, I applied a decimate modifier on the characters. The modifier reduces the polygon count by automatically merging vertices in a way that preserves the overall shape of the model. The amount of simplification is determined by a specific value setting, ranging from zero to one (Blender 2019b). For example, when the modifier is set to a ratio of 0.2, the polygon count on the model is reduced to twenty percent. It is a fast but crude operation because the modifier distorts the topology of the mesh, which introduces deformations to an avatar’s body and face (see figure 88). It also creates shading artefacts, such that the planes of the face were inaccurately defined. However, it was still sufficiently accurate for this project, as the overall form of the body remained mostly intact and the human features, such as the location of eyes and lips, were still recognisable. The

simplification process also increased performance of the scene, which in turn made production more efficient[58].

Once the character models were inserted into the scene, virtual cameras needed to be added to frame the scenes into compositions established in my sketches.

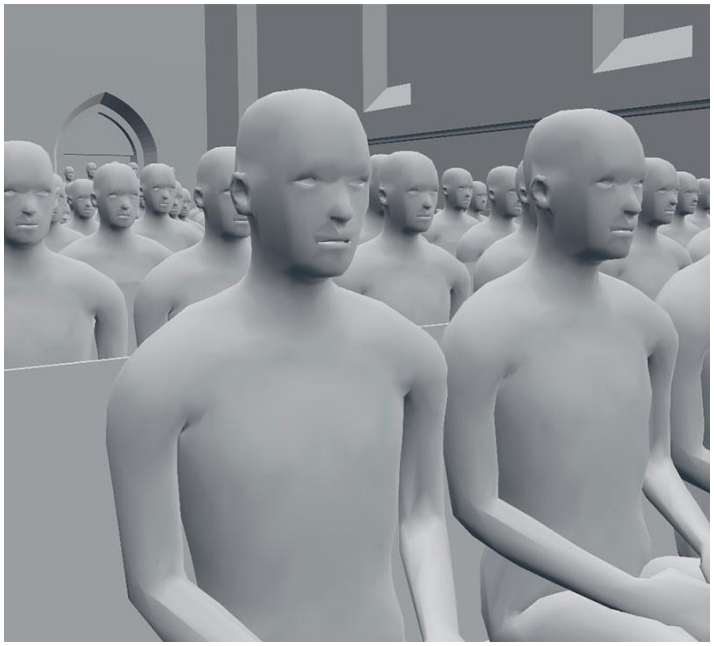


Figure 88. An example of an optimised character model using the decimate modifier.

Virtual cameras

Blender's virtual cameras were used to frame the 3D scene in two-dimensional compositions. The position of each camera was adjusted, such that its view matched the camera angles depicted in my refined sketches (see figure 89). The virtual cameras share similarities with a physical camera. For example, they utilise a focal length attribute to control perspective distortion, similar to how a camera lens operates. Hence, I could apply the knowledge I gathered from my photography studies to the virtual world to create the effects I wanted. This included: exaggerated perspective, and varying camera angles. These were used to improve the shot compositions established in my refined sketches. For example, I used a shorter focal length for large establishing shots to fit more of the surrounding space inside the picture

[58] In retrospect, I realised that duplicating character avatars many times to pose them for each panel was not an effective production process as it greatly increased computer lag problems. Instead, Blender's animations tools could have been used to animate the character avatars more effectively. The poses could be keyframed onto individual frames in the timeline for each panel in the comic book. For example, frame 1 could be used to keyframe poses of characters in panel 1, followed by keyframing poses in frame 2 for panel 2, etc. This would have greatly reduced the number of 3D avatars in the scene, thus reducing polygon count and likely reducing computer lag. I will investigate this method further in future productions.

frame. Doing so enhanced the perceived scale of the 3D space. The shorter focal length exaggerated the perspective by making things in the distance appear further away, and objects close to the camera appear closer.

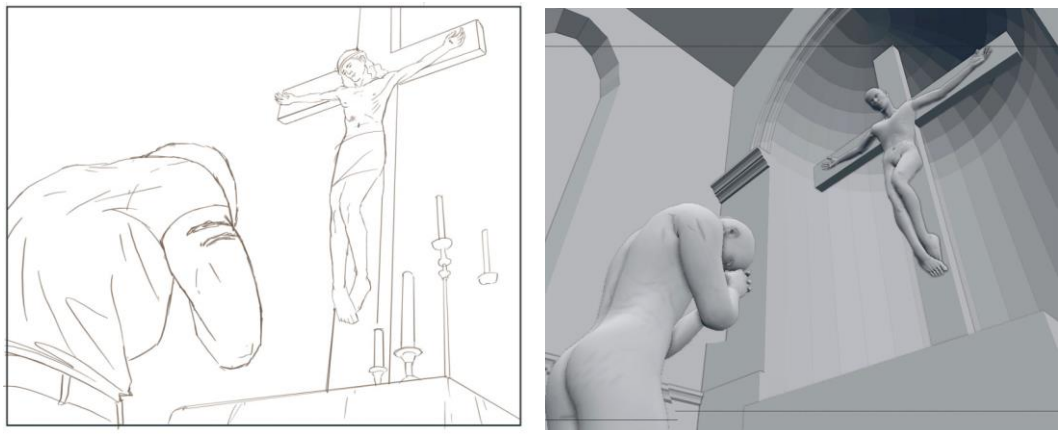


Figure 89. A virtual camera is positioned in the scene 3D scene to match the view drawn in the refined sketch.

Blender's virtual cameras simplified the process of capturing shots from extreme camera angles. Unlike a physical camera, their position is not restricted by gravity or physical limitations or obstructions in the physical space. Also, 3D geometry that obstructs the camera view, such as walls or floors, can be hidden to produce shots that would normally be difficult to capture in the physical world. This provided me with the creative freedom to experiment with camera angles. For example, a high camera angle was used to capture the church interior (see figure 90). I elevated the virtual camera high above ground and moved it back towards the exit until it framed a complete overview of the nave. In order to frame the shot closer to what I had imagined, I needed to move the camera back and past the front wall geometry to capture the necessary parts of the interior space. To do this, I had to disable the front wall's visibility to provide the camera with a clear view.

Figure 90. An extreme high camera angle captured inside the 3D scene using a virtual camera.

In another example, an extreme low camera angle was used to show a character laying on the ground trampled by the fleeing congregation (see figure 91). This camera angle could not have been shot in a physical space due to the floor surface blocking the camera. However, this was not an issue in the 3D environment. I positioned the camera below the floor, and disabled visibility of the floor geometry to get a clear view.

Figure 91 An extreme low camera angle showing the fleeing congregation of people. The camera is positioned below the floor plane. The floor plane is hidden.

Adjusting the camera positions in 3D allowed me to rapidly experiment with different camera angles (see figure 92). This process helped me invent new ideas about scenes not otherwise possible to imagine in a sketch alone. It also improved the compositions in my final drawings.

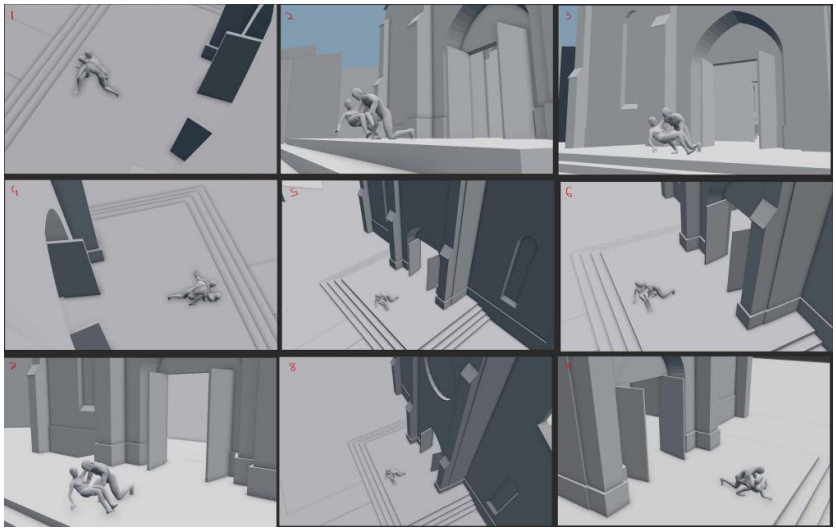


Figure 92. A series of camera angles I experimented with in 3D to frame an action in a panel. The experiments helped me brainstorm new ideas quickly.

Each panel in the graphic novel was framed with a unique camera object in a 3D scene. This was done to save the camera position and settings for each panel. Hence, dozens of camera objects were added in the scene to frame every panel in the graphic novel. I organised them by labelling each camera with the page and panel number they frame. For example, I used "P01p2" to label the camera that is framing the second panel of the first page. The naming convention ensured cameras were sequentially organised inside Blender's outliner[59]. The outliner was used to rapidly switch between camera objects. Once all the cameras were inserted in the 3D scene, I began experimenting with virtual lights.

Virtual lighting

Virtual lighting was explored during 3D construction. I inserted lights into the scene and rendered them using Blender's ray-tracing engine Cycles. The rendered image provided precise shading reference for illustrating convincing lights. But, the rendering process was time consuming. It also required too much processing power. In turn, this reduced performance of the user interface. Editing the position of lights or geometry in the scene during a live preview of the simulation was slow. This was especially so because any changes made, required a full recalculation of light rays. Due to this inefficiency, I decided that the

[59] Blender's outliner is a hierarchy tree listing all objects inside the 3D scene.

rendering of lighting for every panel was impractical. Instead, I rendered only some scenes that prominently displayed direct light and sharp shadows. An example of a ray-traced rendered scene is the morning scene where a sunlight appears to be backlighting a character walking through the doorway (see figure 93). To simulate the effect, I placed a Blender 'sun light'[60] in the 3D environment and angled it about twenty degrees from the ground plane. As shown in figure 93, the lamp cast sharp shadows of the doorway and the walking character. I saved the render as an image and had later used it as a reference when hand painting shadows in the illustration.

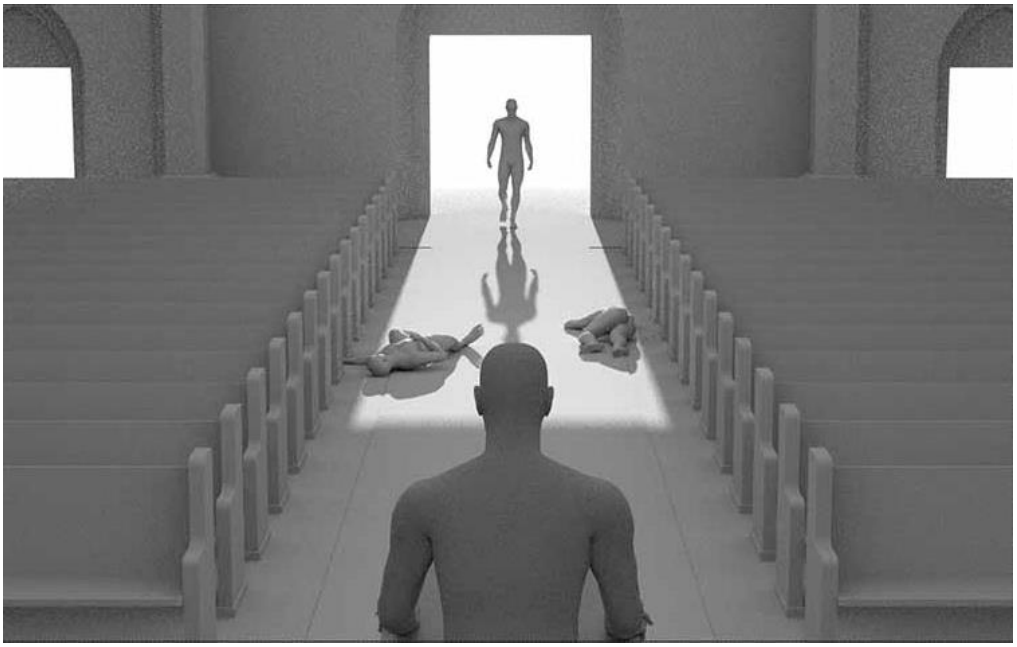


Figure 93. A rendered image of the lighting simulation in Blender. The image was rendered with Cycles.

Rendering with viewport shading mode

A faster solution to ray-traced rendering was to use Blender's viewport shading mode. Shading could be generated with Blender's matcap shading option. This shades the surfaces of an object using an image that is mapped onto the objects' surface normals[61] (Blender n.d. a). However, as the shading is relative to the camera view only, the effect does not produce accurate or consistent shading across different camera angles. Nonetheless, it did

[60] A sun light is a type of light emitting object in Blender. It emits light of constant intensity over infinite distance. The light rays also travel in the same direction from an infinite distance. The sun light object is used to simulate the physical behaviour of sun light on Earth (Blender, 2019c)
[61] In 3D computer graphics, a surface normal is a 3D vector that is perpendicular to the 3D geometric surface at any specific point. It is used to determine the direction at which the surface is facing to calculate the shading on the surface.

communicate the 3D form clearly enough for my purposes. Screen space ambient occlusion was also activated in the viewport. I found it useful because it outlined form changes and plane changes between surfaces, making the renders more legible. The combination of matcap shading and ambient occlusion was sufficient for my purposes because the perspective information could easily be extracted from the viewport renders, and the 3D objects were legible.

Exporting 3D renders to Photoshop

To convert the viewport renders into an image, I used Microsoft's Snipping Tool program to screenshot the viewport window. Doing so, I could bypass the rendering process completely and get renders faster. I repeated this process for every camera set up in the scene[62]. Captured images from the Snipping Tool could then be pasted into the comic book page files in Photoshop. But sometimes, the scale of the renders did not match the scale of the panels. Every panel in the graphic novel varies in size and ratio. Yet, the viewport window was displayed at a constant scale on the screen – approximately sixteen by nine ratio and 1400 pixels wide. Hence, it was difficult to determine whether the framed composition in 3D would fit inside my panel boundaries correctly. I needed to estimate the position of 3D objects in Blender in order to fit them inside my panel frame. Once I inserted the screenshot in Photoshop, I could position and scale the screenshots to match the compositions drawn in my refined sketches (see figure 94).

[62] The viewport rendering mode is not designed for rendering final images. It is optimised for quick and imprecise preview renders to aid the modelling process (Blender, n.d. a). The standard procedure involves rendering a high-quality image using Blender's 'Cycles' or 'Internal Render' engines (Blender, n.d. b). The render panel is used to modify and optimise render settings, and to initiate the rendering process. I discovered an unintended use by not following this rendering procedure, and prioritising efficiency and productivity. Doing so improved my production process.

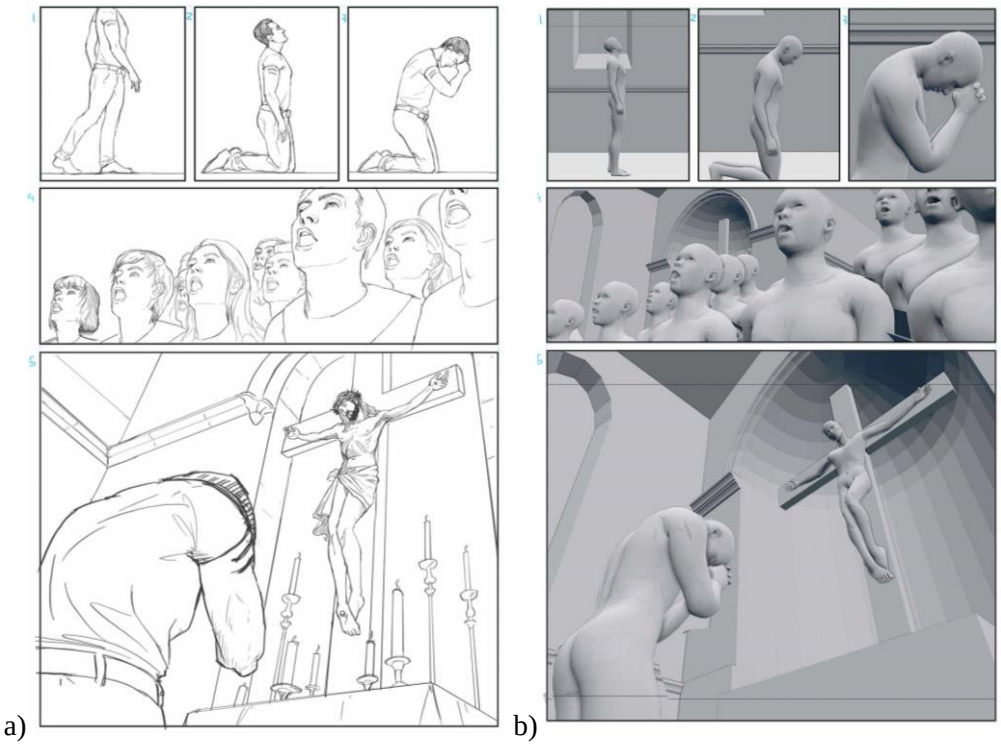


Figure 94. a) Refined sketch of page one issue one used as reference for placing the 3D screenshots. b) 3D screenshots pasted and positioned inside each panel in Photoshop.

The locations of characters and objects in the screenshots often did not align with the refined sketches. I needed to adjust the position of models or the camera angle in Blender, then screenshot the viewport again, and insert it into the panel. I repeated this process several times until all characters, props and the environment fit inside the panels as I had imagined them to. It was a necessary but time-consuming process of trial and error because there was no visual reference for panel boundaries inside Blender's viewport. It is worth noting that the 3D construction is only used as a reference for the final production – a guide for the placement of objects in perspective. Once imported into Photoshop, it is fully painted over with multiple layers. Once the 3D images were inserted into the panels, I needed to use photographic reference of actors, locations and props to help me create more realistic depictions of the 3D scenes.

8.2.5. Gathering photographic references

Photographic references of actors

Prior to this project, I was involved in photoshoots of actors for the graphic novel as part of a commercial venture. The images created were subsequently made available in the public domain. Any images I needed for this project have been accessed from this public website:

http://wocf.com.au/demons/reference-photos/. The photographs were used for referencing body poses, likenesses and facial expressions in the later stages of production.

Many of the actors in these photographic references were wearing specific costumes. Similar to Alex Ross' process, the actors in these photographic references were wearing costumes similar to those worn by characters drawn in my concept art. This enabled me to capture references of cloth deformations, such as folding and creasing of the materials. The details in the references helped create more realistic depictions of materials in my artwork.

Taking photographs

To gather photographic references, such as props and environments, I used a Canon 600D DSLR camera because it was affordable and could capture in the RAW image format[63]. This was important because it enabled me to adjust the photographs in post-production. For example, I was able to adjust the exposure to brighten underexposed photographs and retrieve information in the shadows. The camera also captured images in high resolution. This allowed me to zoom in and study the intricate surface details, such as the wood grain texture on wooden surfaces.

The camera's stock zoom lens provided me with control over the focal length. It has a range of eighteen to fifty-five millimetres. This allowed me to experiment with varying focal lengths to create perspective effects, such as flattening the perspective with a longer lens. For example, I used a longer lens to photograph my hands to reduce perspective distortions on their proportions.

Controlling the camera settings

I shot photographs in manual mode to have full control over every setting[64]. In some situations, I took multiple photographs of the same scene with different camera exposure settings to capture the extremes of light in a dynamic range. For example, in an exterior

[63] The RAW image format contains uncompressed, un-edited pixel data captured by the camera's sensor. By contrast, a jpg format compresses the pixel data and the texture information in shadows and highlights cannot be retrieved (Ringsmuth n.d.). As a result, raw file size is much bigger, but more useful for my needs.

[64] A camera's parameters include film speed, f-stop, focal length and shutter speed. F-stop is the size of the lens' aperture. The film speed (or ISO) is the sensitivity of the camera's sensor. The focal length, or field of view, is the camera's ability to capture a wider or narrower angle of view, which alters the perspective distortion of the picture being captured. For example, if both hands are held in front view, the arms would be outstretched to the sides if shot with a short focal length. But with a long focal length, such as seventy millimetres, the field of view is much narrow hence the arms would not be visible. Therefore, a shorter focal length is used to capture more of the scene.

environment with a cloudy sky and an environment in shadow, I exposed the sky to capture the details in the cloud formations, and then adjusted the settings to capture details in the shadowed areas on the ground. I then used the two photographs as a reference when painting an exterior scene in my artwork to capture a high dynamic range effect. I used this technique to get the information I needed for my illustrations. I later used this dynamic range effect to create overexposed effects in my illustrations. For example, I could blow out[65] the stained-glass windows in the church to remove the mosaic detail (see figure 95). This technique helped me save time by not having to paint the mosaic details in the windows in every panel.

Figure 95. Example showing overexposed windows. I used this technique to remove the mosaic detail of stained-glass windows.

Editing of photographs

Selected photographic images were edited with Adobe Lightroom. I brightened the shadows and darkened the highlights to reveal texture information in those areas. Exposing the details in a photograph provided me with more reference information to work with. The RAW image format enabled me to make this type of correction because it contains uncompressed pixel data, meaning it stores more information in the shadows and highlights of the photograph than in a lossy[66] image format, such as a jpg. I used Lightroom's batch processing feature to quickly apply my adjustments to a large number of photographs. The results were exported as

[65] An effect in photography where bright areas captured by the camera's sensor are registered as white pixels. This is because the intensity of the light is brighter than what the camera's dynamic range is set to. As a result, the white areas contain no texture information and cannot be recovered in post-production.

[66] In the context of images, lossy compression refers to a compression method that irreversibly removes pixel data from images to reduce file size.

high-resolution jpg files at a reduced quality of about 70% to reduce file size. The jpg files were used as reference during the later stages of production.

8.2.6. Producing the detailed line art

The detailed line art is the final iteration of design in the comic book. These drawings are drawn using a precise, thin, opaque round brush (see figure 96). They are later used to guide the painting process by specifying the position and shape of all other details. Hence, the design of subjects, such as a characters' likeness and position of facial features, must be drawn precisely and in correct perspective. I also finalised the layouts of compositions during this stage by tweaking the position and scale of subjects inside the panels.

Figure 96. Detailed line art drawing of page five of issue one. Note the crisp and precise edges outlining the final details in each panel.

Utilising 3D reference

The line art is drawn on a new layer in Photoshop above the 3D reference images. Similar to placing tracing paper over a reference image, I added a semi-transparent white fill layer over the 3D layers to reduce their visibility. I then traced and transferred the information from the 3D images, such as the perspective of the environment and body shapes of characters, onto

the line art (see figure 97). By doing so, the 3D renders helped me focus less on the technicalities of drawing in perspective, and more on the creative component, which was more important for the project. However, I found that the 3D avatar poses in 3D reference images were often unnaturally distorted and stretched due to the human rig's limitations. Also, the rig did not simulate the flexing and contracting of muscles under the skin I was looking for. Hence, I often felt the human anatomy of my 3D avatars was not convincing. In this case, I used the reference photographs of actors to supplement the details.

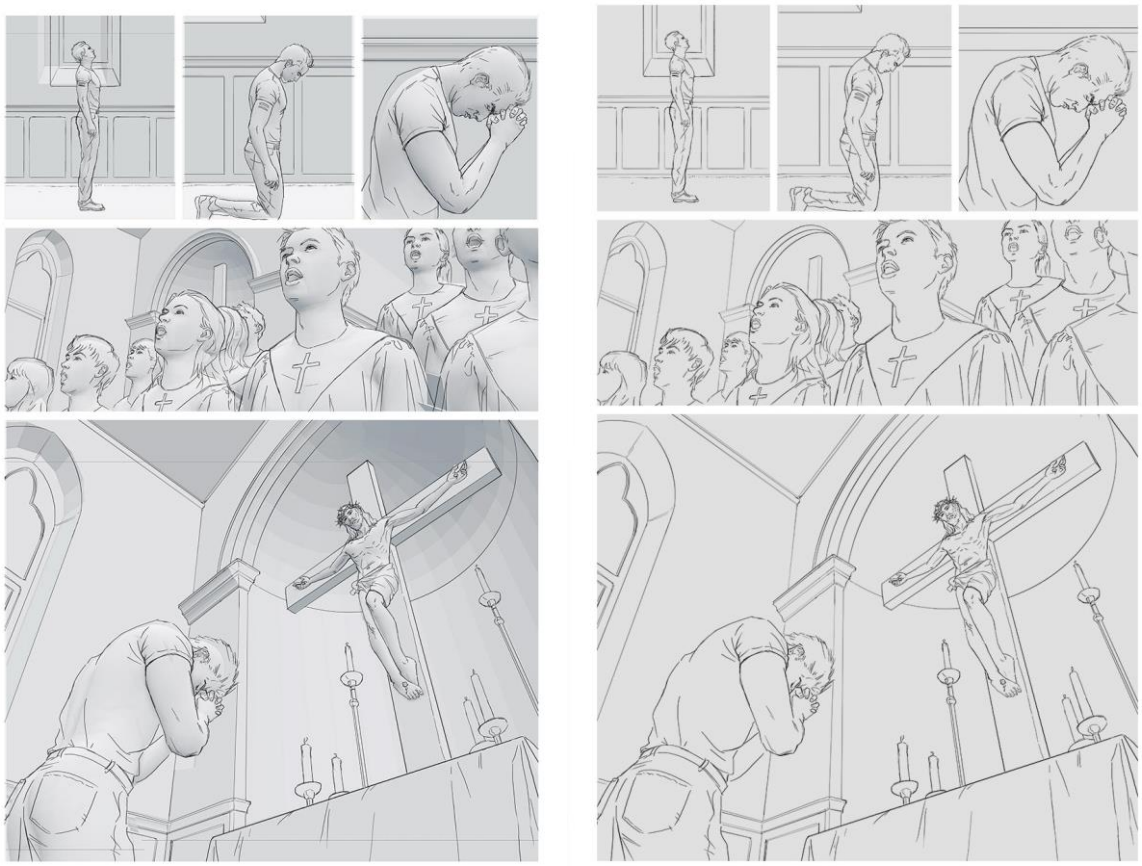


Figure 97. Example showing how the 3D renders were traced to extract character and perspective information onto the detailed line art drawings. The left image shows how the 3D reference is vaguely visible during the tracing process.

Utilising photographic references

When studying photographs of actors, I observed the forms of their bodies and copied them onto my drawings to more realistically convey the natural muscle behaviour, such as the stretching and contracting of triceps and biceps in flexed arms.

While working on each illustration, I used different photographs to reference different sections of the drawing. I overlayed the photographs over my artwork file by opening them as separate Photoshop windows. I placed them to the left side of the screen so as not obscure the drawing area in the centre (see figure 98). Similar to Alex Ross' small photograph size, I reduced the display size of photographs on my screen. This helped me focus on the whole image to study the actors' body proportions and pose more effectively. I was less distracted by smaller details like the actors' skin blemishes.

Having the photographs as separate files in Photoshop ensured that the photographs were not simply traced. Similar to Ross' process, doing so, provided me with full creative control over what I borrowed from the photographic reference. Also, this process forced me to study the references more critically, as opposed to mindlessly tracing the details. I was able to memorise the anatomical features, which later helped me improve my drawings from imagination.

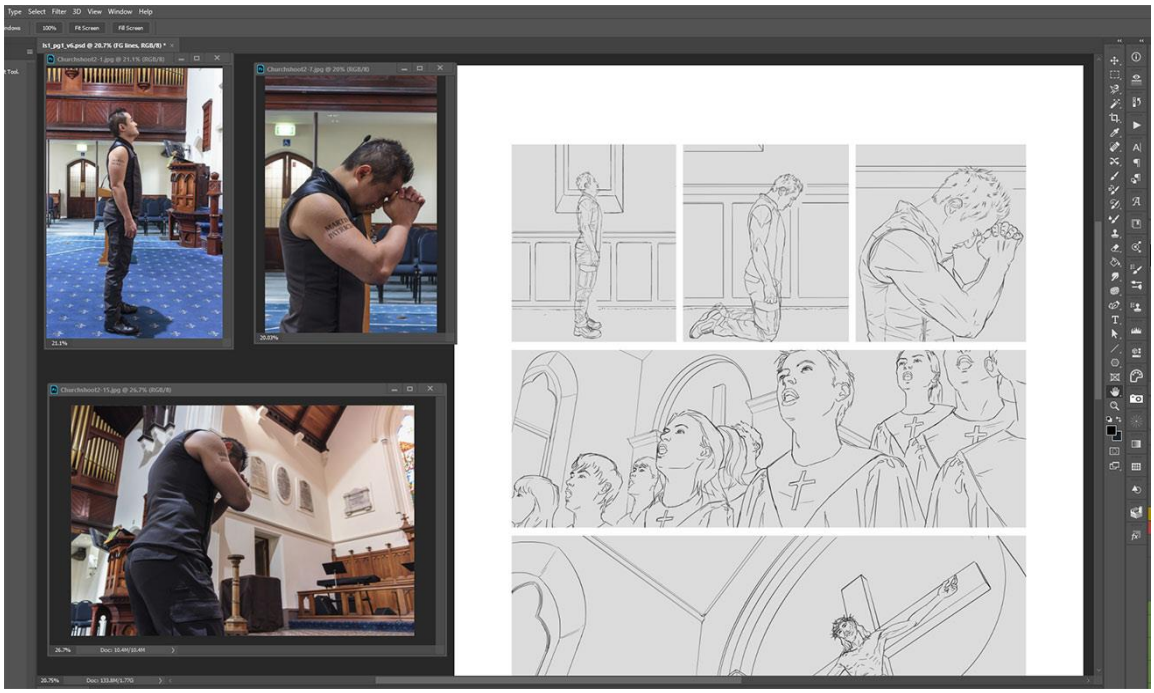


Figure 98. My arrangement of photographic references and drawing workspace on the screen in Photoshop.

8.2.7. Producing the digital painting

The final painting stage involved adding colour and shading to my drawings. I begin by applying flat colours on all objects in my illustrations. I used Photoshop's lasso tool to draw a selection around the outer contours of each object, such as a character, to outline its

silhouette. Then, I used the bucket tool to fill the selection with a flat colour on a new layer (see figure 99). The process is repeated for all objects in the artwork.

Figure 99. Character silhouettes are filled with a flat colour. In this example, I used different shades of grey to colour each character.

Fill layers are arranged in a particular order. Objects depicted in the foreground are on the top of the layer stack, and objects depicted in the background are at the bottom. This is done so that the silhouettes appear to overlap in perspective. Separating silhouettes into layers allowed me to select and transform each object independently. I could rapidly refine the placement of objects in the final illustration. Moreover, I could paint details in-between objects by adding a new layer in-between their layers.

Exploring visual styles

During the painting stage, several rendering techniques were explored so I could experiment with alternative visual styles. This is because I lacked confidence in my ability to paint the whole project with a realism style. Therefore, prior to committing to the realistically shaded style inspired by Ross, I explored variations of more simplistic styles. This was my attempt to complete my illustrations more rapidly. I explored methods of simplification, such as painting flat shades of colours inside black inked outlines to speed up the colouring process. An example of this style can be seen in Staples' *Saga: Volume One* (2012). Staples used a cell-

shaded aesthetic (see figure 100) to rapidly colour outlined characters in Photoshop (Society of Illustrators, 2014).

Figure 100. An example of the cell-shaded aesthetic used in the interior pages of *Saga* (2012). Art by Fiona Staples.

I discovered that flat colours could be utilised in the final artwork with the inked lines creating the legibility I sought. I used different colours to communicate different materials. For example, a flat, pale orange colour was used to define a character's skin surfaces, such as the face, arms and hands, while a grey colour was used to define a grey shirt. I painted the colours inside the silhouetted shapes by locking transparency[67] on each layer. This prevented me from painting outside the silhouette outline. Similar to the *Saga* (2012) graphic novel, I added a toon shading effect[68] to convey the three-dimensionality of objects (see figure 101a).

I painted the shadow patches using the lasso and paint bucket tools as described earlier. They were painted on a new layer, above the colour layer, and set to multiply blending mode[69] to darken the colour underneath. This method enabled me to communicate a 3D form more rapidly – the style circumvented the rendering of complex shading on human faces. However, I felt the effect created did not capture the appeal of Ross' painted work. Ross' artworks capture convincing lighting and colour that can be observed in the physical world. This effect appealed to me and I wanted to capture it in my own artwork.

[67] The 'lock transparent pixels' feature in Photoshop prevents drawing pixel information on transparent areas in the layer. Therefore, the layer's transparency is preserved.
[68] Toon shading uses flat patches of tone to describe form. It is a posterisation effect that reduces the colour scheme to three shades of colour: highlights, mid-tones and shadows. The tones do not transition gradually like a photorealistic image. Instead they are separated by sharp edges.
[69] The 'multiply' blending mode in Photoshop multiples the base colour by the blend colour painted over the top. As a result, the colour produced is always darker. The effect is similar to drawing over an image with a marker pen (Adobe, 2016a)

Utilising the full value range

It appears Ross captures convincing lighting in the physical world by utilising the full ‘value range’ in his paintings. A ‘value’ refers to a shade of lightness or darkness. In the context of digital painting, and an eight-bit colour scheme, there are 256 shades of value available in a greyscale colour ramp between white and black. Therefore, a full value range refers to utilising every value on a greyscale range from 0 to 255 (white to black) in RGB colour space. This value range can be used to create subtle gradations that can capture realistic details. For example, the creasing and bumpiness of a drawn character’s skin surface can be painted with values to match the creasing effects observed on a real person’s face. Moreover, Ross’ artwork does not require black outlines to be legible – the shading alone is used to add detail and contrast necessary for creating legibility. These effects appealed to me. Therefore, I chose to disable the visibility of my black outline layer and utilised instead the full value range to shade my forms going forward (see figure 101b). This process was more time-consuming, and photographic references were essential to rendering the details realistically, but, the final illustrations did capture the effect I sought.

a) b)

Figure 101. a) Inked line aesthetic experiment with toon shading on page five of issue one. b) Early rendition of page five of issue one using full value range to render details.

By utilising a full value range, I created a visual style that appealed to me. I felt, my skills and experience in painting this style of realism, including rendering natural colour and light, helped me increase the quality of my illustrations. By contrast, the earlier toon-shaded style actively removed these effects. Thus, I decided to apply a fully painted, realistic visual style for the rest of the project.

Colouring the artwork

When colouring the panels, I applied colour and shading onto the digital canvas simultaneously. The process differed to Ross' approach, which involves painting in greyscale first to define all the forms, followed by a separate, transparent colour wash[70] over a greyscale painting to add colour. Instead, I chose not to use Ross' method because it provided me with more control over the shade of colour being applied in my illustrations. Instead, I could select a specific colour from a colour wheel and apply it to the artwork, such that the colour's hue, shading and saturation remained unchanged.

To preview the legibility of my shading, Photoshop's soft-proofing feature was used. The tool can be used to isolate value from a colour to display a greyscale preview of the image. I found that the 'dot gain twenty percent' preset displayed the most accurate values. I set this feature to a keyboard shortcut so I could quickly activate it during the painting process. The technique helped me identify any legibility problems, such as a character's silhouette blending into the background. I could lighten or darken the shading using the dodge and burn[71] tools, or the 'levels' adjustment tool, to increase contrast between objects. Doing so increased the intensity of separation between objects in the image, thus increasing legibility.

Lighting the artwork

Shading was used to create convincing lighting effects in my artwork. When a light source, such as sunlight or candle flames was used, shading could be adjusted to paint highlights and shadows on surfaces to illuminate objects realistically. The location of most highlights and shadows needed to be estimated as I was often unable to gather accurate lighting reference for

[70] A colour wash refers to a transparent coating of colour on a surface such that the underlaying surface remains visible. The paint is thinned out with water or other media to reduce its opaqueness.
[71] The dodge and burn tools are used to lighten and darken images in Photoshop. They are based on traditional techniques utilised by photographers when editing photographs in a darkroom. The photographers would hide the surface from light to lighten it (dodge) and expose the surface to darken it (burn) (Adobe, 2017b).

my scenes. This was due to the project's time constraints and my inability to recreate the lighting of my imagined scenes in the physical world.

During the shading process, it was critical to think of the painting as a three-dimensional space rather than a two-dimensional flat surface. This is because the depth location of light sources in a three-dimensional space create different lighting effects on objects behind and in front of lights – different surfaces of the objects are being illuminated depending on the position of the light source relative to the object. For example, a light placed in front of the character will highlight their front features, such as their face, because they are in direct exposure to the light source. By comparison, a light placed behind the character should create a rim of light around the edges of the character's silhouette because their backside is illuminated by the light source. This backlighting effect is frequently used in Ross' work (see figure 102). The bright rim-light effect creates a white outline around his objects. Ross appears to have used this to separate foreground characters from the background environment. I utilised this effect frequently in my own painting process to increase the sense of depth (see figure 103).

Figure 102. Alex Ross' use of backlighting effects to separate foreground characters from the background in *Marvels* (1994).

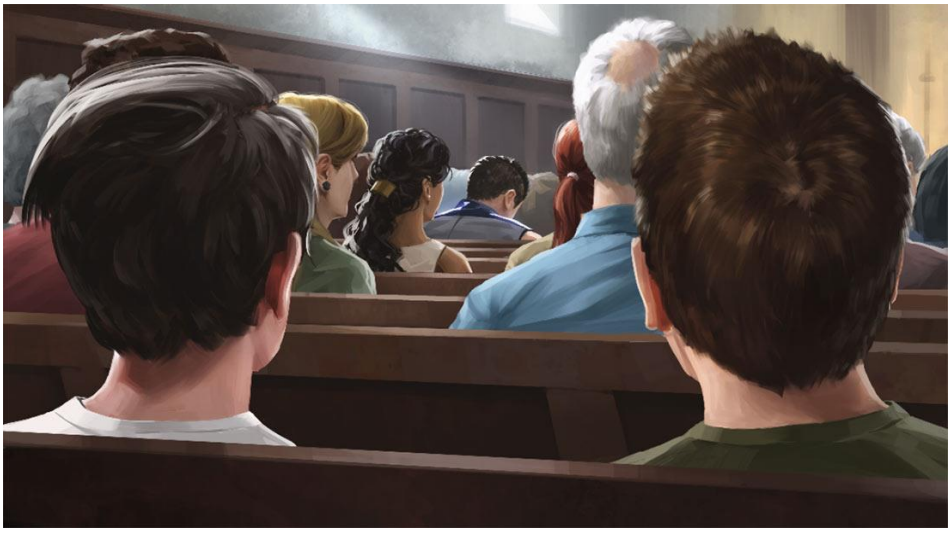


Figure 103. My use of backlighting effect to separate foreground characters from the background environment.

Utilising Photoshop tools for digital painting

When painting, I adjust the opacity and flow settings of Photoshop's brushes prior to applying brush strokes to my paintings. I do this because I have better control over the strength of colour I am applying. For example, I used a low opacity and flow setting to paint transparent washes of colour over a painting. This helped me gradually build up the intensity of a colour over a painted surface and blend colours more effectively. I also frequently used the mixer brush to create soft, painterly gradations between colour patches. This tool was most effective when I set its 'wetness' setting between ten to twenty percent.

To help direct the reader's attention to foreground subjects, such as a character's face, I added a blur effect on objects behind the character to *reduce* their legibility. The technique was inspired by the depth of field effect created in photography when shooting with a telephoto lens. Initially, a Gaussian blur filter was explored, but I found that the effect did not blend well with the other painterly textures of my illustrations. This is because it is applied uniformly across the artwork.

Instead, I used the smudge tool to smudge the background artwork (see figure 104). The tool softened the sharp transitions between patches of colour to reduce contrast. Unlike the blur filter, I was able to apply a custom texture to the smudge brush tip to add a painterly texture to the smudge effect. I felt that the texture blended more effectively with the painterly aesthetic.

Figure 104. Several examples showing how I smudge the background environment to reduce contrast between patches of colour.

Final Photoshop layer structure

To keep the Photoshop files organised, the layers for the line-art drawings, final paintings, 3D references and refined sketches were moved into separate layer groups[72], labelled accordingly (see figure 105). The layer groups were then inserted into another larger group called 'Panels'. The layer group was masked with a vector mask[73] that hid all its content outside the panel boundaries. I applied a stroke layer effect[74] on the 'Panels' layer group to automatically generate black borders around each panel.

[72] A layer group in Photoshop is a container which can be used to group a number of layers.
[73] A vector mask is a mask that is resolution independent. Similar to a raster mask, it hides the contents of the layer or layer group. It can be created using vector shapes or paths.
[74] A layer effect is an effect that can be applied to a layer non-destructively to alter the appearance of the layer contents. The stroke layer effect outlines the contents of a layer with a uniform stroke.

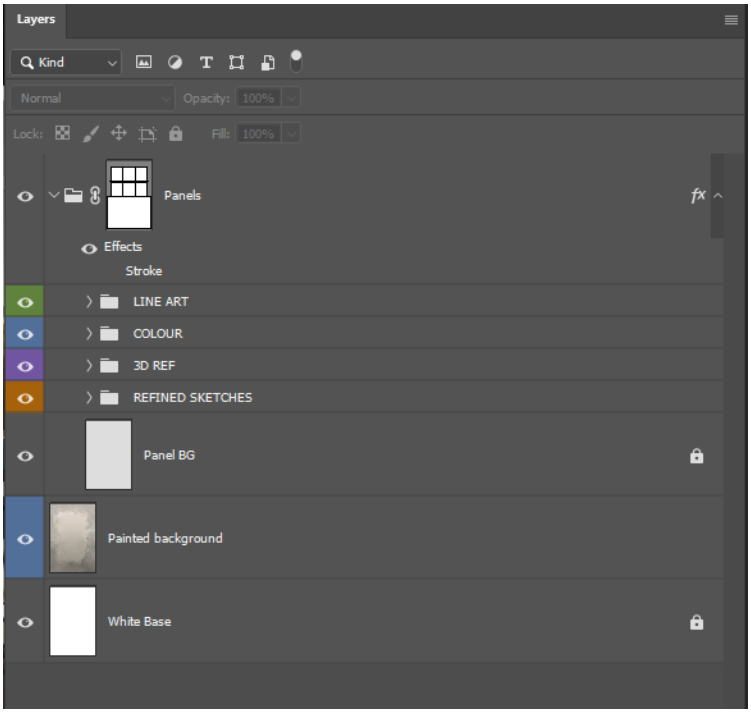
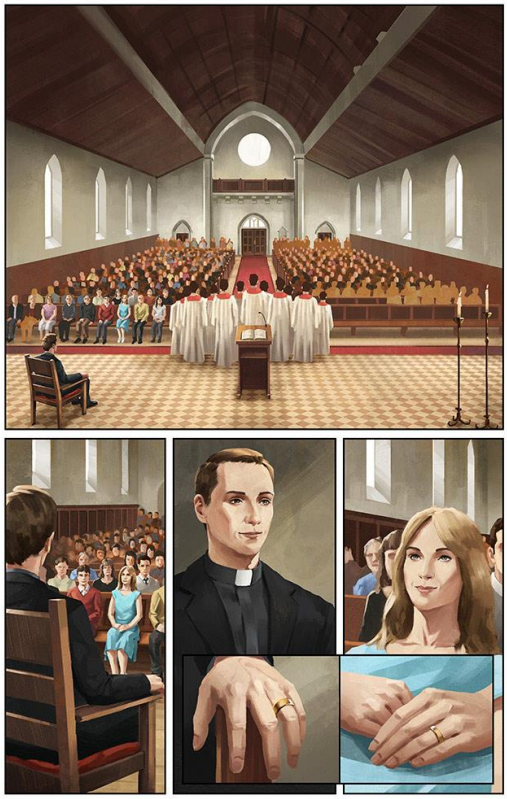


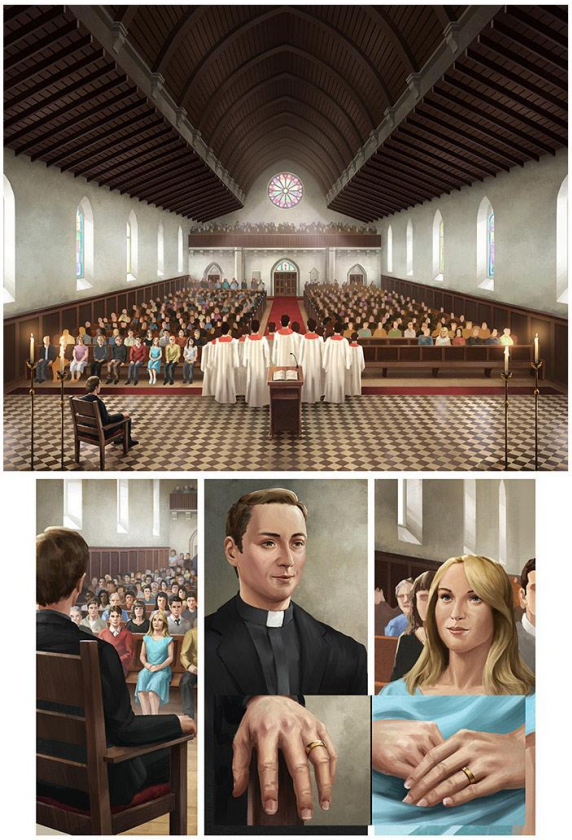
Figure 105. The layer structure inside one of my pages' Photoshop file.

Iterating the paintings

During the development of my painted style, all illustrations in the graphic novel were iterated numerous times over the course of production as my rendering skills developed in the process. As shown in figure 106, the rendering of environments and characters changed over time. In my view, the general colouring, the depiction of materials, and the depiction of human anatomy, including bodies, human faces and expressions, appeared more naturalistic as the artwork developed. Thus, I found the characters and locations to become more believable, which was important for me to achieve in my realistic visual style.



1



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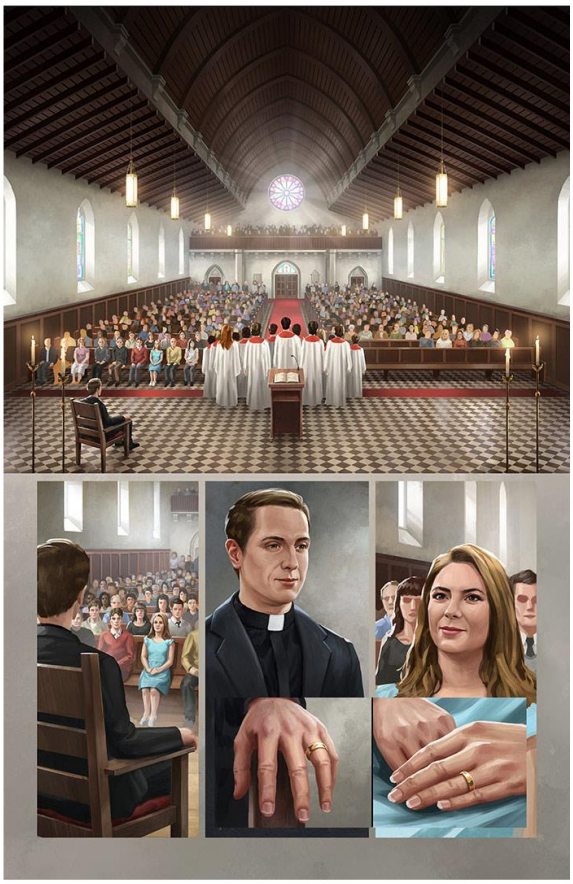

3

FINAL

Figure 106. A series of iterations of page of the graphic novel. The stages demonstrate the improvements made to the rendition of characters and environments over the course of production.

Summary

This chapter provided an in-depth overview of the artistic processes utilised to produce the artwork in the graphic novel DEMONS. The production consists of several stages: rough sketches, concept art, refined sketches, 3D construction, photographic referencing, detailed line drawing, and digital painting. The production is inspired by Alex Ross' by utilising the processes of sketching and photographic referencing of actors to produce a realism style. However, my project builds on these by integrating 3D construction techniques and digital painting to address some of the challenges involved in producing this style. As a result, I have created a personal style that captures the aspects of realism I sought, but is also unique and stands apart from the works of Ross.

Conclusion

Comic books and graphic novels are an art form that use images to communicate a narrative. Unlike other mediums, they are designed to communicate information or narratives by combining images and text and arranging them in a sequence. As part of a broader art form called sequential art, their history spans from prehistoric cave paintings, to Egyptian tomb paintings, invention of proto-comics, and finally, to the emergence of comic books and graphic novels. The visual styles employed by various artists have evolved over time as new technologies and processes became accessible. Advancements in the printing-press allowed mass production and distribution of this detailed visual style to a mass audience. The later adaptation of digital painting tools like Photoshop allowed the digitisation of traditional processes to speed up production. The utilisation of 3D digital tools like Zbrush, Poser and Blender, introduced a new variety of visual styles that have only recently begun appearing in comic books. 3D digital tools and techniques also provide comic book artists with new methods for producing realistic art in comic books and graphic novels. However, visual realism has yet to become a mainstream part of the comic book industry.

The aim of this project was to examine how my combination of photographic referencing and digital tools, including 3D computer graphics and digital painting, could develop the realism visual style I sought for my graphic novel project *DEMONS*. To pursue this, my research consisted of a creative component and an exegesis developed synchronously. For my creative component I produced a graphic novel painted in the realism style using photographic references and digital tools, including Blender, MakeHuman and Photoshop to achieve the visual effects I was looking for. The style and artistic process I used were inspired by the work of Alex Ross whose graphic novels *Marvels* (1994) and *Kingdom Come* (1996) were a major influence on the realistic visual style I adopted for this project. His artistic processes, including sketching, photographic referencing and painting, were the basis for my own creative processes, all documented in the exegesis.

The creative component helped me determine how the new digital tools could be integrated into my own processes similar to Ross', to create my own original realism style in a graphic novel. The exegesis is a documentation of the processes and creative explorations I used during the making of my graphic novel. I used it to investigate and evaluate which processes and combinations of tools were most useful in accomplishing the goals for my creative product.

Following the practice-based/practice-led and autoethnographic methodologies outlined in chapter two, I developed a process to build and assess strategies to increase visual realism within my graphic novel, *DEMONS.* The methodologies, as discussed in chapter two, were utilised to collect and evaluate my research data. I found that the mixed method approach was most effective in uncovering the necessary knowledge to answer my research question. I utilised the practice-based/practice-led approach by directly engaging in the production and completion of my creative artefact. In doing so, I was able to identify the benefits of digital tools and techniques, and photography, in the creation of realism style for my comic book. The autoethnographic approach helped me reflect on my processes by organising and storing my large network of ideas in a mind map. The mind map was effective at helping me identify and generate new ideas during the production to build new knowledge. The interview recordings were then used to re-acquaint myself with the body of data and evaluate my past work. The interviews helped me arrive at necessary conclusions about my project, such as my stylistic goals and the processes involved in achieving these goals.

In chapter three, I provided an overview of the history of the production processes and visual styles utilised in traditional sequential art media: from its earliest known inception in cave paintings in the prehistoric era, to Egyptian tomb paintings, to the emergence of proto-comics during the development of the printing press, and to the introduction of printed comic books in the 1930s for mass consumption, and finally, to the development of highly detailed realistically painted graphic novels using digital tools. This research demonstrates that, as new technologies become available to artists, and new production processes are employed, new visual styles begin to emerge. The origins of realistic art in comic books was also explored – how it evolved as new technologies and processes became available. Further, how comic book artists have already been experimenting with some combinations of modern digital tools to create unique realistic illustrations in graphic novels was explored.

A detailed overview of Alex Ross' artistic process was provided – how he creates a realistic art style in his graphic novels is discussed in chapter four. His process involves the utilisation of traditional media to produce his artwork, including pencils and gouache paints on bristol board, and his use of photographic referencing to examine the complexities of the physical world. Unlike my project, however, Ross does not utilise digital tools, such as digital painting or 3D computer graphics. I found his use of realism appealing and used this as a basis for developing my own style.

The historical information about past sequential art productions, including Ross' artistic processes, provided the context for my own project *DEMONS*. In chapter five, I introduced the background of the project. I discussed the stakeholders involved, and my early acquisition of artistic skills, which I found were necessary in producing a comic book. It also explored early artistic influences and experiments and discussed how the discovery of Alex Ross' visual style radically shifted my aesthetic goals to the realism style I developed for myself.

This background provided a useful aesthetic context for my own artistic goals as I sought to produce a unique realism style using a series of new digital tools. In chapter six I made an attempt to describe how I conveyed realism in my visual style. I did this by defining the seven features that I found to be key in conveying realism in my graphic novel. They included: the physical behaviour of light, perspective, architecture, characters, natural forces, colour, and visual continuity. I examined each feature in detail, including how each one was applied in my project.

In chapter seven, I evaluated improvements made from my use of photographic and the digital tools. I found that photographs improved my depiction of a convincing world and characters; the 3D computer graphics improved my depiction of a physical space, of characters in correct scale and perspective, shot compositions, and lighting; and finally, the digital painting in Photoshop improved compositing of references and drawings during the production, and its painting and editing tools facilitated the production of realistic illustrations that conveyed the painterly quality I was after.

Chapter eight provided a detailed critique of the artistic processes and tools I used to produce the artwork in my graphic novel. The processes are similar to Alex Ross'. I used sketching and photographic references, and built on these by integrating 3D construction and digital painting techniques to create a particular personal visual style. My attempts to capture realism in my images was based on Ross' illustrations.

Together these chapters provide a context for, and chart a process through, the development of a new visual style evident throughout the production of the first issue of *DEMONS*. This development process will be used in the development of further issues under the *DEMONS* title.

8.3. Future Research

A project such as this can only scratch the surface of the many significant directions happening in the space between new digital tools and the development of new styles in sequential art. Several research topics were identified during the production of the graphic novel that will be explored in future research in an attempt to improve the production efficiencies and quality of my project further, including Plein Air painting, the value grouping painting technique, and depicting movement in a realistically painted style.

8.3.1. Plein Air painting

I conducted preliminary research on human perception and what a camera captures, and how they are differentiated from one another. They both have distinct characteristics and perceive the effects of light differently. For example, according to Gurney, subtle shifts in hue and value of colours can be observed on surfaces with the naked eye that are not captured in the photographic image (2010).

This has since inspired me to practice plein air[75] painting for future studies of these effects in the physical world, and to recreate them in future illustrations. The plein air studies may improve my selection of colours during the painting process, and the realistic depiction of physical light.

8.3.2. Value grouping painting technique

Value grouping refers to the clustering of details in an artwork into larger shapes. According to James Gurney, this is achieved by blending surfaces on the painting with adjacent surfaces of similar value (2009). For example, in *Blessing of the Young Couple Before Marriage* (1881) characters dressed in dark clothes are grouped and blended into a single larger dark shape, which eliminates contrast and definition of form in the characters (see figure 107). Thus, the grouped shape reduces visual detail within a larger area of the painting. This process is used to remove unnecessary details that may distract the viewer from focusing on the focal point in the artwork.

[75] Plein air painting is the act of painting outdoors. It involves studying the environment through direct observation by being physically present on-location. The term originates from the French term ‘en plain air’, which translates to ‘open air’ (Gurney 2009, p.214).

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Figure 107. *Blessing of the Young Couple Before Marriage* (1881) by Pascal Dagnan-Bouveret. The people dressed in dark clothes are grouped to form larger shapes of flat colour.

I see the value grouping technique as a potential breakthrough for my project. It could be used to address a major artistic problem I discovered during the production of my realism style in the current project. Adding details to my illustrations was important to portray a convincing physical world. However, I felt it sometimes weakened the effectiveness of communicating the story. This is because the focal point was less visible due to the overwhelming amount of detail in the artwork, such as in the illustration shown in figure 108. The large amount of set dressing created high visual contrast. It reduced the legibility of the focal point: the central character sitting at his desk and writing a report. Hence, my interest in the value grouping technique to reduce the visual clutter.

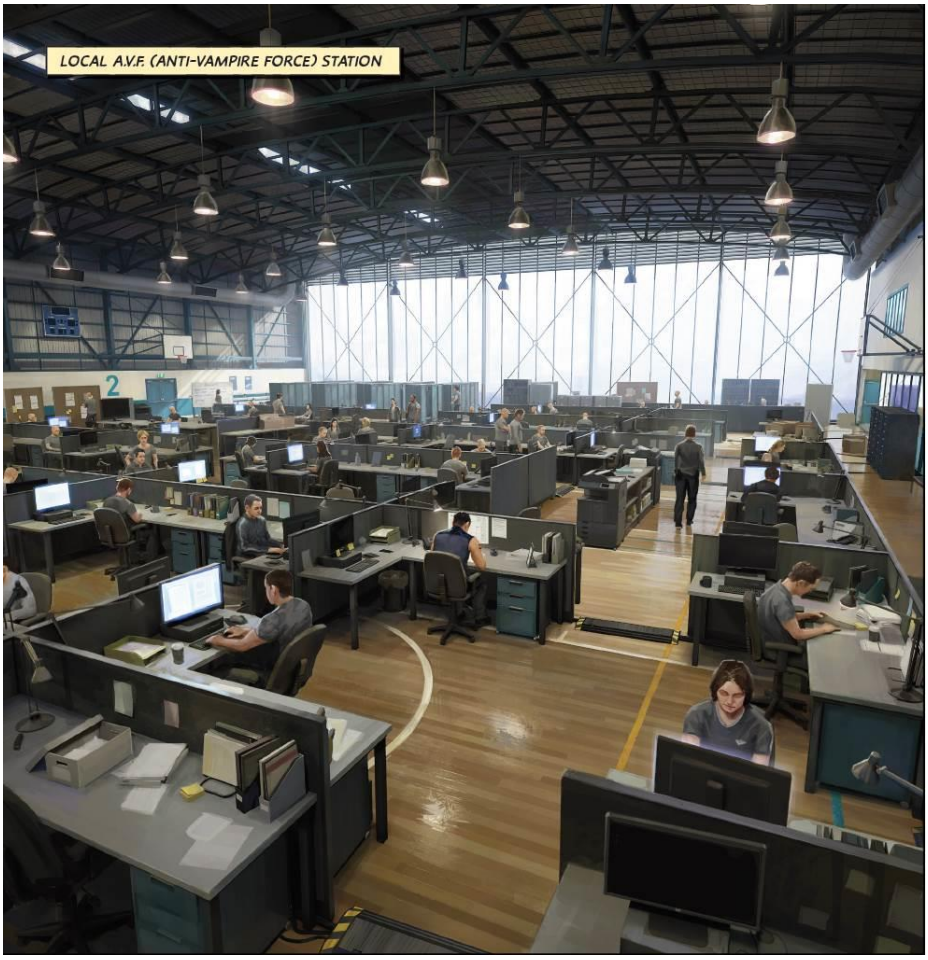

Figure 108. An illustration depicting a busy interior scene with many areas of high contrast. The central character is seen in the centre of the image.

The value grouping technique will be explored in future issues of the graphic novel in an attempt to simplify the complexity of illustrations. This will be done by reducing contrast within areas of high detail. This may help me focus the reader's attention to the important focal areas in the images, and thus, communicate the story more effectively. Value grouping does not eliminate the appearance of realism. In his YouTube video (2019), Gurney demonstrates the application of value grouping in a painting of a realistic outdoor scene. The artwork was simplified using the value grouping method, but its sense of realism was retained.

8.3.3. Depiction of movement in a painted realistic style

Depiction of movement in a painted realistic style has been previously criticised by realist comic book painter Scott Hampton (Talon 2007) in its inability to convey movement as effectively as traditionally drawn pen and ink comic books. He claims this is due to the high concentration of detail present in the image, which creates a static effect as opposed to the

dynamically drawn lines seen in the simplified drawings commonly seen in inked art. Furthermore, he claims that realistically painted characters can appear posed or frozen in time during moments of action, stating, “two guys shaking hands look like they’re holding hands, like they’ve been posed” (Talon 2007, p.101). Over time, Hampton discovered that line is a critical component in conveying convincing motion in an image.

I have conducted initial research into methods in which comic books convey motion in images. McCloud (1994) demonstrated how artists used streaks of speed lines, or “action lines” (McCloud 1994, p.112), in drawn images to convey a moving object in a single image (see figure 109). The action lines trace the motion path of the moving object to describe its movement across the panel at that moment in time. Other artists replicated the effects of motion blur seen in photography and film, where a fast-moving object is blurred when captured at a slow shutter speed.

Removed due to copyright restriction.

Figure 109. Pages 112 and 113 from *Understanding Comics* (1994) demonstrating several methods of conveying motion in an image.

A combination of action line and blur effects have been utilised by Ross in his painted illustrations in *Kingdom Come* (2008). They convey fast movements of superhero characters across the panels in a realistic art style (see figure 110). The effect is painted using elongated masses of flat colour instead of streaked lines, which integrate well with the surrounding painted illustrations. The effect works similarly to drawn action lines in conveying the dynamic motion in a still image.

Removed due to copyright restriction.

Figure 110. Page 152 from *Kingdom Come* (2008), showing action lines effects used to convey Superman's flight in the illustrations.

Using this research as inspiration, I have begun experimenting with methods of conveying motion in my own realistically painted illustrations. In figure 111, I used blurred streaks of colour to convey a sprinting character in a still image. In my future research endeavours, I will continue to investigate ways in which this effect could be improved, as well as ways in which more subtle motions could also be conveyed in a painted realistic style. I hope to use my findings to address Hampton's (Talon 2007) observation regarding the static and posed look found in realistically painted artwork.

Figure 111. An illustration I painted depicting a character running from left to right. Action lines are used to describe the direction and speed of motion.

8.4. Improving the production of realism in a graphic novel

In the execution of this research project, I found that some recent developments in digital tools for use in the production of realism in industries such as 3D animations, films and video

games have been revolutionary in developing a unique artistic process for producing realism in sequential art. In answering the question:

> *how does photographic reference imagery and digital tools, including 3D computer graphics and digital painting, improve the realism in my visual art style for a graphic novel,*

I have explored a number of avenues of creative practice and the affordances of new digital tools. I found that the combination of photographic reference and 3D digital tools provided an invaluable reference for executing highly detailed, convincing realism in my illustrations. The references helped to overcome the style's major challenges, including the depiction of a convincing physical world, depiction of convincing characters, and visual continuity across the sequence of panels.

It remains to be seen whether these tools will have a strong effect on the role of realism in graphic novels more generally – a form that has a long history of a specific, traditional, graphic style. The tools affect the capacity of the artist to convey realism on the page of a graphic novel. I believe, now it is a matter of whether potential audiences will respond to the use of realism in the pages of their favourite comics and graphic novels, such as *DEMONS*.

It is difficult to estimate how my approach to realism will affect my target audience at this stage as the graphic novel is yet to be disseminated to the masses. Once it is published and develops a larger following, I hope to investigate the effectiveness of my artwork in conveying a story in a comic book. I will do this by participating in online and in-person discussions with our readers, whose feedback will provide a better indicator as to which aspects of the graphic novel were successful, and which could be improved to communicate the narrative more effectively. The art form constitutes many individual design elements, such as story, pacing, panel layout, design of text and speech balloons, and so on, all of which contribute to its overall reception. I hope that by interacting with the readers, I will be able to identify whether the realistic illustrations detracted from their reading experience, and if so, inquire which aspects of realism they found distracting. The data collected from these discussions and surveys may provide enough evidence to suggest the effectiveness of realism in a comic book medium.

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Appendix

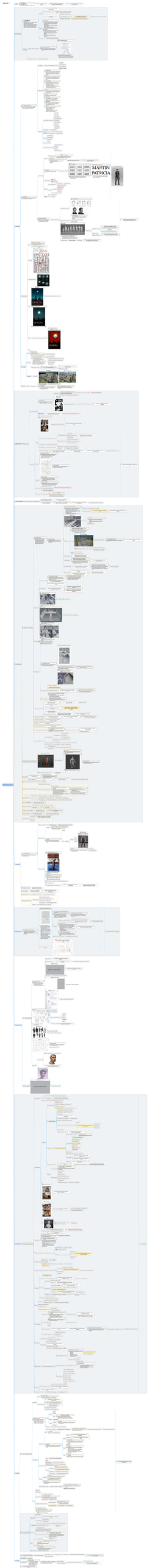
Appendix 1: Mind map

Appendix 2: *DEMONS: Issue 1 – The heart of all morality* (sample only).

Appendix 3: *A brief History of the Graphic Novel.* A published research paper by Rafal Banasiak and Theodor Wyeld

Appendix 4: *Using real-time 3D rendering to improve graphic novel production efficiencies.* A published research paper by Rafal Banasiak and Theodor Wyeld

Episode 8



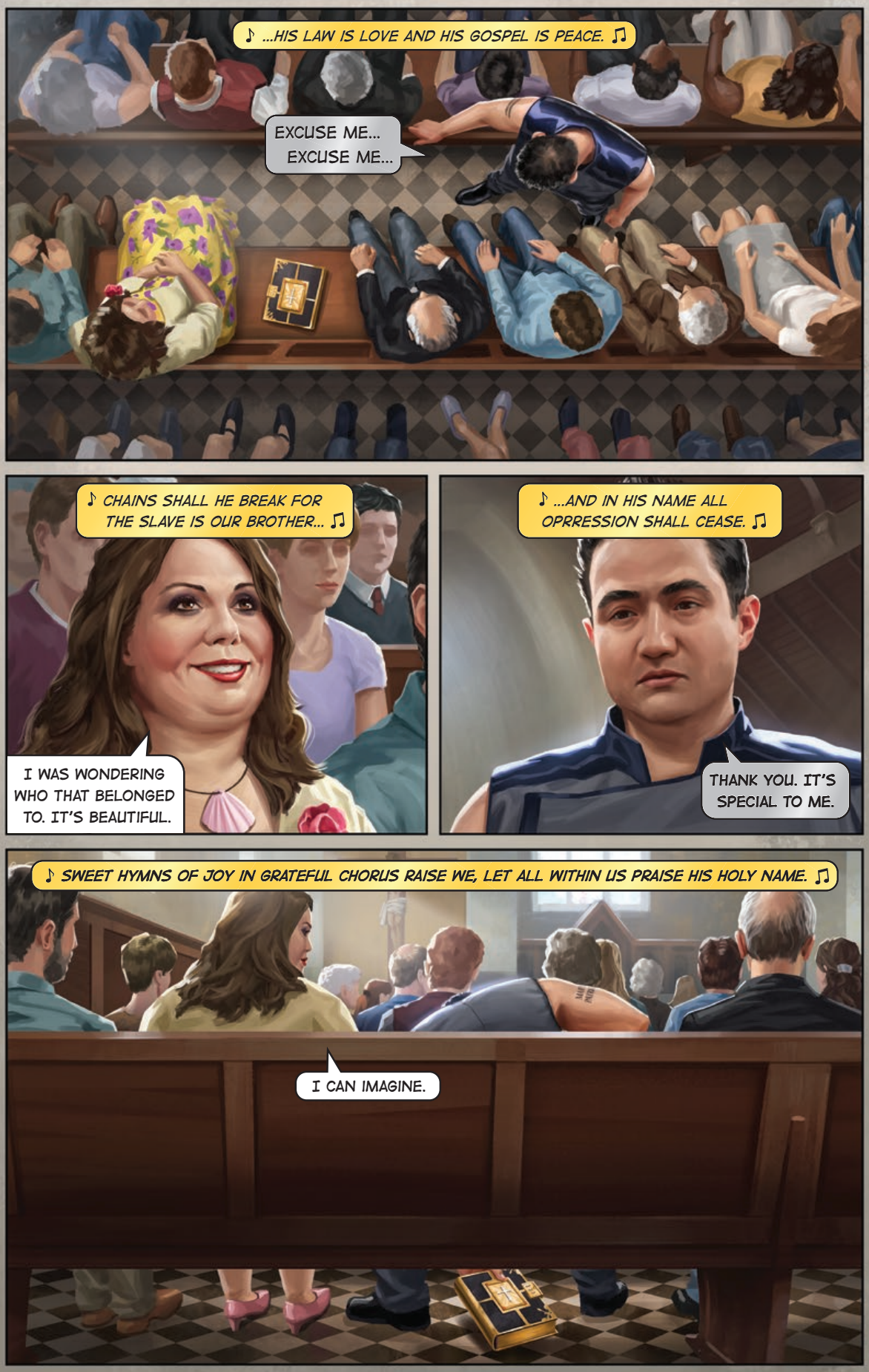
DAVID COYLE

RAFAL BANASIAK

Appendix 2

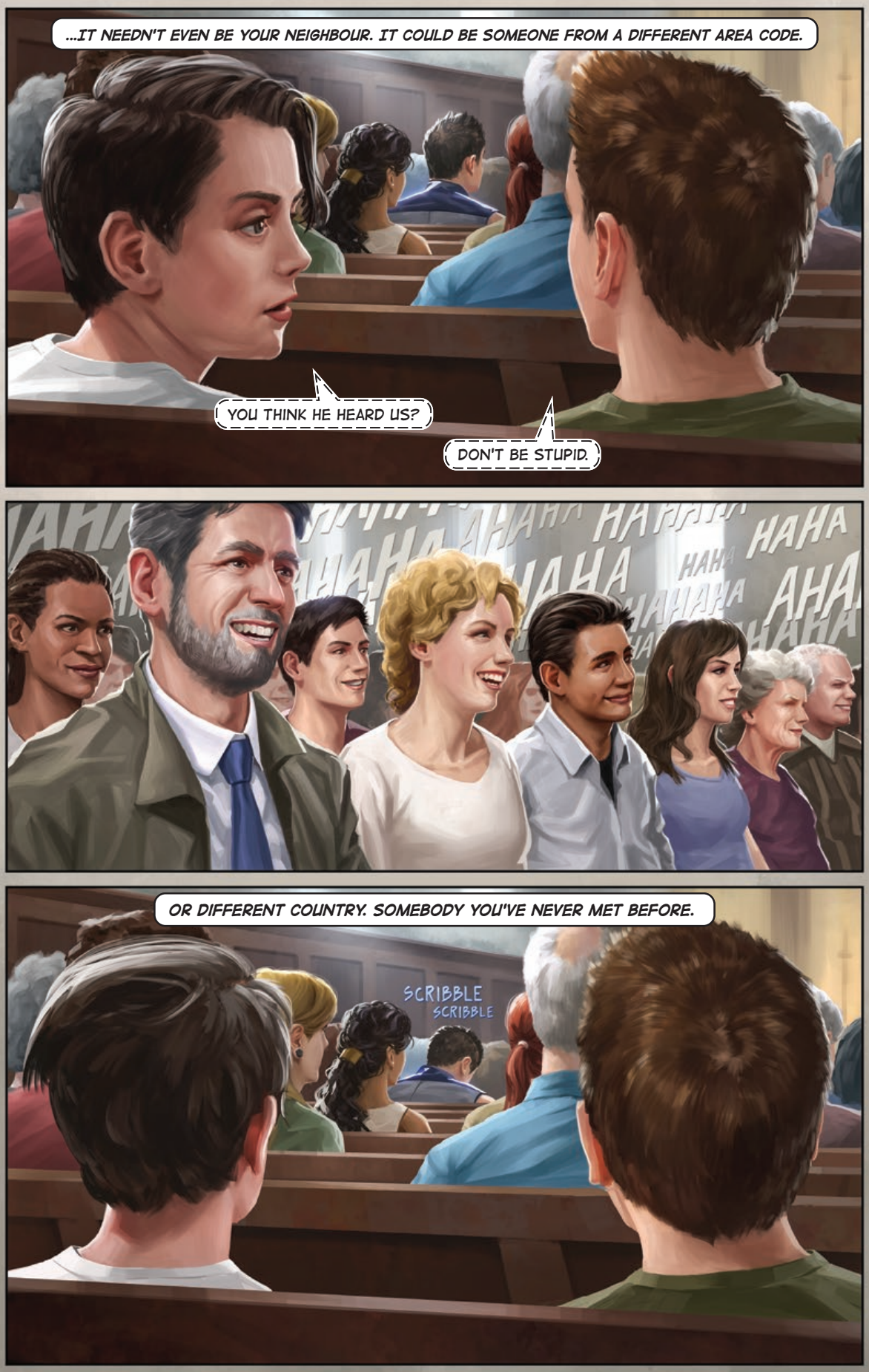
♪ FALL...
♫ ...ON YOUR KNEES!
♪ O HEAR...
MARTIN PATRICIA
♪ ...THE ANGEL VOICES! ♫
INRI
♪ O NIGHT DIVINE, O NIGHT WHEN CHRIST WAS BORN. ♫
INRI

♪ O NIGHT, DIVINE...
WHAT IS THAT GUY'S DEAL?
SHH... QUIET ADAM.
♫ ...O NIGHT...
♪ ...O NIGHT DIVINE.
♪ TRULY HE TAUGHT US TO LOVE ONE ANOTHER... ♫


♪ ...HIS LAW IS LOVE AND HIS GOSPEL IS PEACE. ♫
EXCUSE ME... EXCUSE ME...
♪ CHAINS SHALL HE BREAK FOR THE SLAVE IS OUR BROTHER... ♫
I WAS WONDERING WHO THAT BELONGED TO. IT'S BEAUTIFUL.
♪ ...AND IN HIS NAME ALL OPRRESSION SHALL CEASE. ♫
THANK YOU. IT'S SPECIAL TO ME.
♪ SWEET HYMNS OF JOY IN GRATEFUL CHORUS RAISE WE, LET ALL WITHIN US PRAISE HIS HOLY NAME. ♫
I CAN IMAGINE.

♪ FALL ON YOUR KNEES!
O HEAR THE ANGEL VOICES! ♫

THANK YOU CHOIR, THAT WAS WONDERFUL AS ALWAYS.
'THOU SHALT LOVE THY NEIGHBOUR AS THYSELF', MATTHEW 22 VERSE 39.
THIS SIMPLE VERSE LIES AT THE HEART OF ALL MORALITY...
Love neighbour as self
♡ of morality
SCRIBBLE SCRIBBLE
...SUCH AN OBVIOUS INSTRUCTION, YET ONE WE FIND SO DIFFICULT.
SCRIBBLE SCRIBBLE
IF ONLY MAN CONSIDERED HIS NEIGHBOUR AS HE CONSIDERS HIMSELF...
SCRIBBLE SCRIBBLE
NOW HE'S TAKING NOTES.
WHAT A FREAK.


...IT NEEDN'T EVEN BE YOUR NEIGHBOUR. IT COULD BE SOMEONE FROM A DIFFERENT AREA CODE.
YOU THINK HE HEARD US?
DON'T BE STUPID.
HAHA
OR DIFFERENT COUNTRY. SOMEBODY YOU'VE NEVER MET BEFORE.
SCRIBBLE
SCRIBBLE

OR HOW ABOUT SOMEBODY YOU'LL NEVER MEET? COULD YOU FIND LOVE IN YOUR HEART FOR SOMEONE YOU'LL NEVER EVEN COME IN CONTACT WITH DURING YOUR TIME ON THIS EARTH?
HOW MUCH OF MANKIND'S SUFFERING CAN BE ATTRIBUTED TO THE ACTIONS OF FELLOW MAN?
AND HOW MUCH IS ATTRIBUTABLE TO GOD, PREACHER?
THIS IS A SERMON SIR, NOT A FORUM FOR DEBATE.

Appendix 3

A brief History of the Graphic Novel

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***Abstract*—The main visual device used in a comic book or graphic novel is a sequential array of images. As a visual communicative device, the sequential array of images has a long history. We see it in prehistoric cave art, the wall art of ancient Egyptian tombs, comic strips in newspapers, and most recently the digitally promulgated graphic novel, among other instances. As a visual narrative it is both impactful and highly recognisable. This is because it reduces the amount of information needed to communicate a succinct message using abstract iconography. This iconography evolved over the millennia until it formed its own lexicon and lingua franca within its media genre. Most recently, its conventions can now be relied on to communicate complex stories using digital media and the internet. This paper reviews the literature on the origins of the comic book art form, its current state and possible future directions. It provides an argument for the efficiency and enjoyment of this art form as a method for communicating information visually.**

Keywords—comic, graphic novel, sequential art, cognitive load, iconography, conventions, visual narrative

I. Introduction (*Heading 1*)

The graphical book, comic book or sequential art, is an art form designed to communicate stories and ideas by means of presenting a series of images in an organised sequence [1]. As a visual narrative it is included in media that focuses on visual storytelling, such as in films, animations, photography, illustrations, fresco painting and so on [2]. Comic books are distinguished by their use of sequential graphics to communicate complex ideas. The use of graphics supplemented with text in a comic book reduces the cognitive load associated with each type of media [3,4,5]. Hence, they tend to be more efficient at communicating information than text alone. This is why the medium is often use outside the context of comic books such as in aeroplane emergency instructions, assembly instructions (such as for IKEA furniture, see figure 1).

II. Historical Background

Many other types of sequential images pre-date the comic book. But, it was not until the eighteenth century, after the advent of the printing press, that the first *printed* comic strips began to appear. A defining feature of a comic book is its mobility and its ability to be read in many situations, including intermittently.

The earliest type of pictorial communication methods can be traced to prehistoric cave paintings which predate textual communication. The primitive style and emphasis on symbolism were used to transmit information graphically. Wall paintings in ancient tombs of Egypt fit the definition of image sequences used as a narratological device. Similar to cave paintings, Egyptian wall art was mostly symbolic, painted onto a single flat plane without the use of perspective or light and shade [6]. Human figures and creatures were intentionally drawn unrealistically from mixed viewpoints in order to convey as much information as possible in the space available. But, unlike the modern comic book, the paintings in Egyptian tombs were never intended for public viewing [7].

Fig. 1. *Brimnes day bed frame with drawers* assembly instruction manual (2017), IKEA

It could be argued that Egyptian hieroglyphics fit a definition of characters in a language rather than their primitive pictograms [8]. In this sense, they are signs rather than pictures and should be investigated under the rubric of semiology – the science of signs [9]. However, their sequential nature, and pictorial depiction of life, serves the dual purpose of recording a historical event with some artistic flare. As such, they tend still to fit the definition for the pictorial unfolding of a narrative without the strict use of text alone.

By contrast, Greco-Roman sequential art narratives in the form of friezes, such as *Trajan's Column* (113AD) is read in a spiral pattern, from the base to the top for which the caricatures cannot be mistaken for the glyphs of an alphabet (such as Egyptian Hieroglyphs) as the Greco-Roman Latin language was already well formed. This is similar to many other examples from different cultures, such as the *Bayeux Tapestry* (1080) of the Celts, or the *Mixtec codec* (1500s) of the Mayan's.

A significant innovator of the fifteenth century printing press was the English painter, engraver and printmaker William Hogarth (1697-1764). His illustrated sequential prints from the eighteenth century, such as *A Harlot's Progress* (1732), and *Marriage A-La-Mode* (1743-1745), details in pictures the

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contemporary social concerns of the time (McCloud, 1994). Unlike the modern comic book, Hogarth's work demanded that readers dwell on aspects of his illustrations.

Fig. 2. *A Harlot's Progress* (1732), prints by William Hogarth

By the mid-nineteenth century Rodolphe Töpffer introduced many of the common features of the modern comic book: panel borders, cartooning (simplified caricatures), and the interdependent combination of words and pictures to tell a story [8].

By the late nineteenth century, the comic book was mass-produced in the Sunday newspaper. Printed on low-grade newsprint, comic strips were cheap to reproduce [10]. *Hogan's Alley*, created by Richard Outlcault in 1895, was a popular and commonly known early comic strip published in America. It featured a distinctly yellow character referred to as the *Yellow Kid*. Only a few colours could be used in the early offset printing processes and this was a feature of his comic strip.

Fig. 3. *The Yellow Kid Takes a Hand at Golf* (1897), Richard Outlcault (Images from The Comics Journal, www.tcj.com)

III. Mass production of the printed comic book

By the 1930s, the modern comic book was produced from reprints of popular newspaper comic strips. The *Funnies of the Parade* (1933) was a popular production. Originally distributed as promotional 'give-aways' to advertise other products, comic books eventually began selling independently as a consumable product by publishers that began to realise their potential revenue. The new comic book style adopted genres and commercial practices from other popular forms of fiction at the time, such as the pulp magazine. Comic books became a regular addition to newsstands by the 1930s. Popular literary genres at the time – including adventure, detective, science fiction, fantasy, and romance [11].

By the late 1940s and early 1950s a new genre appeared, 'Horror comics'. Pioneered by EC comics publishing, it led to some controversy, censorship, and the *Comics Code* of 1954. Parental and political concerns raised had a negative impact on the public perception of the comic art-form, resulting in a readership decline after the 50's leading to alternative genres. In the 1960s 'underground comics' such as Robert Crumb's *Fritz the Cat* (1965-72) did not comply with the Comic Code and thus appealed to a very different audience to those of the 1920-1950 era.

IV. Superhero comics

The superhero genre emerged in 1930s with the appearance of the first issue of *Action Comics* (1938). The superhero series was published by *National Comics Publications* NCP (later rebranded as *DC Comics*). The superhero series increased capitalisation in the comic book market. It included, *Batman* (1939), the *Flash* (1940), and *Wonder Woman* (1941). Marvel comics, following NCP, introduced superheroes such as the *Human Torch* and *Sub-mariner*, and Captain Marvel, a popular superhero of the 1940's. The Superheroes comic genre quickly became the most popular in the comic book market, appealing to a younger demographic. In 1944, 95% of boys and 91% of girls aged between six and eleven were reading comic books, slightly less for adolescents [11].

In the 1960's, the superhero genre was revived by *Marvel Studios*. A central motif was muscle-bound anatomy and exaggerated depths of field [12]. The figures had to be larger, broader, heavier, more impressive, dramatic and imposing than an average human. The Marvel style of drawing focused on exaggerating the human figure in ways to capture the drama and intensity of character movement. Action poses, stances and camera angles were dynamic and expressive. They were also fully panelled storyboards with dialogue, such as in *Fantastic Four #1* (1961). Marvel's superheroes displayed more human qualities than in previous comic storybooks . This appealed to the teenage and young adult demographic and made superheroes such as *Spider-man* and the *Incredible Hulk* popular icons [11].

V. The emergence of the graphic novel

In the 1970s, the term 'Graphic novel' was introduced in the industry to "…distinguish serious works from the run-of-the-mill newsstand comic book" [13, p70]. As such, from 1976, longer comic book works labelled as graphic novels were produced which were aimed at a mature, adult audience. For example, Eisner's (1978) *A contract with God* was followed in the 80s by *Maus* (1980-1991), *Watchmen* (1986-1987) and *Batman: The Dark Knight Returns* (1986).

Art Spiegelman's comic book series which won the Pulitzer Prize Special Award, began with *Maus: A Survivor's Tale* (1980), was of particular significance during the graphic novel's development [13]. It was recognised by critics, and accepted as a genuine literary form, with professional librarians adding graphic novels to their archival collections.

VI. The transition to digital comics

The earliest digital comic productions included those of *Shatter* (1985-1988) by Peter Gillis and Mike Saenz (see figure 18). Illustrated directly on a Macintosh computer, the pages were later photographed and coloured for print reproduction, such as *Batman: Digital Justice* (DC Comics, 1990) was produced entirely using CAD [12].

Since the early days of digital production, every aspect of the graphic novel and comic book is now increasingly computationally altered. This includes typesetting and layout to replicating many of the processes traditionally performed manually. Whilst artists attempt to maintain its 'inked style' appeal, the computer offers a greater palette of options with almost limitless opportunities for revision and expansion [12]. But the computer has also opened up possibilities and styles not possible with manual processes alone. With increasing productivity and a more extensive tool palette, the comic book style is constantly evolving. The ease to which the digital tools can produce apparently professional results with limited skill also promotes others to create productions which may not have been possible without the digital resources [10].

A. Webcomics

From the earliest days of the Internet in the 80s and 90s, comic book creators began exploring it as a way to distribute their work. As bandwidth increased fully digitalised comics could be published online. Called 'webcomics', many of the early examples were simply scanned versions of printed books. In time, fully digitised versions became available. Creators experimented with various multimedia including hyper-text interactivity, allowing readers to choose alternate paths, or adding sounds effects and motion graphics into the panels [12].

The internet has promoted comic books to a wider audience, and provided a more direct communication channel between creator and their audience. Artists can use blogs and forums to exchange ideas and share works in progress with their community, as well as engage in online discussions to receive valuable feedback for future comic releases [14]. The first fully 3D graphic novel, *Sinkha* (1995), was produced in 1995 by the Italian illustrator Marco Patrito (see http://www.sinkha.com/novels_e.htm).

B. Cartoon art or photorealism?

Cartoon art has been the dominant art style in comic books since the medium's inception in the early twentieth century. McCloud [8] claims its popularity is due to its effectiveness at succinctly communicating a story visually, with minimum detail but high recognition. Specific areas can be the focus while less important details are removed. This amplifies the meaning of the art in a way that realistic or photorealistic art does not. This process of simplification of images to signs or symbols can be traced to early Hansi (Chinese & Japanese pictograms) and Egyptian pictographs. The letters of the written language were derived from pictographic symbols, which originated from abstract images of objects in the world. In time, these pictograms transitioned from images to the characters we know today. Once understood, abstraction facilitates more rapid recognition. The same principle can be applied to the abstract images in comics. Relying on the reader's familiarity with the various iconography and style conventions used in comics their meaning can be quickly recognised. These elements have become a visual language that helps the artist narrativise their images. Characters need to be established more quickly in a comic book as the format means there is less time for character development than other media, such as film. The symbolism of the characters, scenes and objects means they can be exaggerated and have depth of meaning contextualised in a way that is highly recognisable by the reader [10]. This further reduces the cognitive load required to comprehend the visual narrative. In turn, this makes the reading of comic books a pleasurable, rather than a laborious, task.

In response to the abstract expressionist, and minimalist art movements of the 1950s and 60s, the realistic art movement evolved from Pop Art and began appearing as photorealistic backgrounds in comic books after the 1970s [10, 15]. Using photographic essays to guide their work, these comic book artists were attempting to appeal to the reader's emotions directly. By the mid-1970s it was possible to incorporate photographic imagery in a comic book production directly. However, this was often criticised for distracting the reader from the main story by including too much background detail. A counter movement removed any realistic background material from their productions all together. For example, in Gabrielle Bell's (2006) *Lucky*, only black and white line-work is used – a return to the earliest days of engraving comic art [1].

In contrast to Bell's line-work, photorealistic comic illustrators such as Alex Ross used photographic material to produce highly detailed re-imaginings of the iconic superhero characters first popularised by Marvel and DC Comics. These sorts of visual style decisions have been used by comic art illustrators to promote a particular form of content. For example, Art Spiegelman's (1980) *Maus* was deliberately drawn in a crude style to appear as if it was produced in and smuggled out of a Nazi concentration camp [1]. Alternatively, a visual style can be associated with a particular artist – heavy brush strokes, strong colours, photorealistic characters and so on. And finally, those illustrators that use a photorealistic style may want to focus on the beauty and complexity of the physical world, while those who draw in the cartoon style may be more interested in conveying conceptual ideas [8].

C. Using reconstructed scenes and characters in 3D

The logical conclusion to the use of photographic reference material in the production of a comic image is its fully reconstructed three-dimensional scene. With the increasing use of visual effects in the movie industry and 3D video game production, it is perhaps not surprising to find these technologies also used in digital comic book production. The ability to rapidly construct scenes in 3D also means the time taken between concept, proposal, draft, production and dissemination can be shortened. This allows for more and more varied content to be produced in shorter timeframes than what traditional printing processes have allowed for in the past.

Fig. 4. *Marvels* (1994), Art by Alex Ross, written by Kurt Busiek, published by Marvel Comics.

D. Iconography a visual narrative

From the sequential art on the walls of ancient Egyptian tombs to today's digital comics, the abstraction of figures, objects and scenes to their minimal representations is a narratological device used to communicate visually a story's intent with the least amount of conflicting information and hence the greatest possible comprehension. Over time, the depiction of these components of a story as abstract iconographical elements leads to a visual lexicon that can be deciphered by those familiar with its conventions. The iconographic nature of the various elements in these graphic novels facilitates the development of a language of graphic storytelling more generally. The comic book creator can rely on the familiarity of their reader with the icons used and thus can produce repeatable events, scenes, characters objects and so on which communicate different stories framed by a highly recognisable universal format. Just as the iconic depiction of people are highly recognisable, iconographic objects can have their own vocabulary in the visual language of comics with instant significance. They can be employed as modifying adjectives or adverbs as economical narratological devices. Even the apparel that the comic artist clothes their characters in can have symbolic effect. It can be used to instantly signal a character's strength, emotion, occupation and intent, heightening and reinforcing the reader's emotional reaction to the underlying narrative [1].

VII. Conclusion

The comic book or graphic novel communicates information visually. As such it leverages the reduced cognitive load of all graphic information as pictures rather than signs (text) – it reduces the extraneous information that might otherwise need to be cognitively processed. This is at the core of its popularity as an information medium. The reader's facility to 'pick-up' the intended story is almost immediate. The tools used to generate this have been refined over the millennia. The most recent introduction of the digital graphic novel makes the art form even more accessible. From the early days of newsprint matter it is now archive-worthy and accommodates many styles. In a world where we are increasingly bombarded by the burgeoning mass of visual stimulation, the graphic novel offers both comic relief and a new form of rapid communication. There are many examples of this, such as the 3D animation of news stories, among others (see https://www.nextanimationstudio.com). The future of the graphic novel is largely explored or uncritiqued. But, with its most recent developments and its long history, it is an information visualisation medium that clearly has great potential.

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Appendix 4

Using real-time 3D rendering to improve graphic novel production efficiencies

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Abstract—The main visual device used in a comic book or graphic novel is a sequential array of images. As a visual communicative device, sequential art has a long history; we see it in ancient Egyptian pictographs, comic strips in newspapers, and most recently the digitally produced graphic novel. The evolution of technologies and methods employed by the comic artist has had a substantial effect on artistic possibilities and style in the medium. This paper presents a new method of producing a graphic novel and a new style. It describes how modern 3D tools and assets, real-time rendering technologies, photo referencing, and digital painting techniques, are used to produce a photorealistic art style. It outlines the key benefits of this method, including its ability to overcome current creative limitations, and proposes solutions to challenges introduced in this form of comic production. Finally, it provides an argument for how this workflow may be more efficient than previous methods in conveying a visual narrative.

Keywords—comic, graphic novel, sequential art, 3D modelling, computer graphics, real-time rendering, visual narrative

I. Introduction

The cartoon style of art has been a dominant form of pictorial storytelling since the early twentieth century. It has its origins in situational art dating back to ancient Egyptian pictographs and Hansi characters [5]. The abstraction of detail to caricature, leverages humans' innate face, and object recognition. As an art form, the humble comic strip has gone through numerous transformations, from black and white offset printing to a few colours, to full colour and digital production. This paper outlines a new method that extends the digital media production of the comic strip using 3D modelling to produce a graphic novel (the long-form of the comic strip).

II. Background

Cartoon art has been the dominant art style in comic books since the medium's inception in the early twentieth century. McCloud [10] claims its popularity is due to it succinctly communicating a story visually, with minimum detail whilst highlighting specific areas of focus making it highly legible. This amplifies the meaning of the art in a way that realistic or photorealistic art does not. This process of simplification of images to signs or symbols can be traced to early Hansi and Egyptian pictographs [7]. The letters of the written language were derived from pictographic symbols, which originated from abstract images of objects in the world. In time, these pictograms transitioned from images to the characters we know today. Once understood, abstraction facilitates more rapid recognition. The same principle can be applied to the abstract images in comics. Relying on the reader's familiarity with the various iconography and style conventions used in comics their meaning can be easily recognised. These elements have become a visual language that helps the artist narrativise their images. Eisner [6] claims the 'actors' or characters in a comic book need to be established more quickly when compared to a textual book, as the format means there is less time for character development than other media, including film. The symbolic abstraction of the characters, scenes and objects through illustration means they can be exaggerated and have depth of meaning contextualised in a way that makes them highly recognisable by the reader, according to Eisner [6].

While the comic strip can be traced back to the late nineteenth century printing press, its long-form, known as the 'graphic novel', is a product of the late twentieth century. The longer format of the graphic novel has allowed for a different emphasis and style of story-telling to evolve. For example, Harris-Fain [8] suggests that the graphic novel format allows the artist to spend more time developing the characters when compared to film. Indeed, it is also possible to tell a story with subtleties similar to film – using visual cues from realistic facial expressions and body language.

III. The graphic novel project

The key challenge in producing a graphic novel is how to promote a personal style – not one that is seen as derivative of other styles. Although nearly all art work is derivative in one from or another, personal style emerges where innovative and novel techniques are employed. The following outlines the processes involved in this project's production of a graphic novel which uses distinctly different techniques that differentiates it from other contemporary graphic novel art work.

In order to maintain authenticity and accuracy, three-dimensionally accurate, modelled, virtual worlds were used as a vessel for the unfolding story and the character's portrayed in it. The virtual worlds needed to resemble their real-world counterparts. In order to distinguish between characters, they needed distinct identities. They need to appear to differ in age, body type, proportion, height, facial structure, ethnicity, facial expression, movement and costume.

Another challenge was time management. With any comic book production, the nature of its sequential art requires many unique 2D illustrations. Moreover, each illustration needs to visually relate to the others to help the reader understand a character's position relative to others and their surroundings. A typical printed comic book page consists of only 6 panels of varying or equal size. Each panel is used to display a unique illustration, and one or more text balloons overlayed on top to provide a character's dialogue. The small panel size and restricted space on the page can make it difficult for artist to provide enough detail for the

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reader to notice important intricacies of the world or background story elements that the artists wants them to see.

IV. Developing a Stylised Photorealism

In order to address the challenges and difficulties outlined in the previous section, it was necessary to employ a form of stylised photorealism. It attempted to depict photorealism in a way that resembles our perception of reality in pictures, but removed visual clutter that could distract the reader's attention from the focal point.

V. The Challenges of World Building using 3D Computer Graphics for a Graphic Novel

The style of photorealistic art using a 3D modelling package – with the ability to incorporate personalised over-painting – significantly changed the normal approach to scene construction in a graphic novel. The Blender 3D modelling package was employed to provide the main scenes normally manually painted as individual cells. This meant the task of drawing intricate scenes and characters from multiple views was significantly quicker to execute and more accurate.

A. Overview of the workflow using 3D modelling of scenes

The interior of a church is depicted in the first issue of the novel. It was constructed in Blender. All the architectural details, walls, doors, windows, and furnishings, were modelled correct-to-scale to match the existing church interior. The layout of furnishings was structured and arranged to ensure compatibility with actions in the storyboard. The 3D model made it possible to generate multiple views from the same location. A series of preliminary storyboard sketches were used to set up the scenes in the 3D model. Being able to manipulate the model made it possible to test various scenarios and identify potential problems before they arose. This process saved time over the manual production of scenes, and allowed incongruities between scenes to be identified – such as spatial limitations or obstructions. As a 3D vector model, it could be scaled without degradation of its detail for many possible views – something that would traditionally require a complete manual redraw.

The 3D scenes were populated with 3D humanoid mannequins. In the beginning of the first issue, the story is described as an over-crowded environment with an ecclesiastical gathering – important for setting the initial 'world-state' scene. From the program *MakeHuman* [9], their generic, genderless, default humanoid avatar was generated and imported into the 3D church scene in Blender. The modelled character was automatically rigged. The rig was manipulated to mimic a natural sitting posture on a church pew. The same character was then arrayed to fill all the pews in the church scene. This helped fill the space of the church interior with humans as references which could then be hand-painted over later.

More detailed humanoids were generated by the *MakeHuman* [9] program for other actors in the scene – the protagonist, secondary characters and villains. For these it was important to highlight the unique physical attributes of each character's avatar, including gender, height, musculature and body weight, to reflect their individuality. A new 3D model was generated for each of these characters rather than using the generic models. Concept sketches were used as a reference for customising the anatomical features (see fig 1).

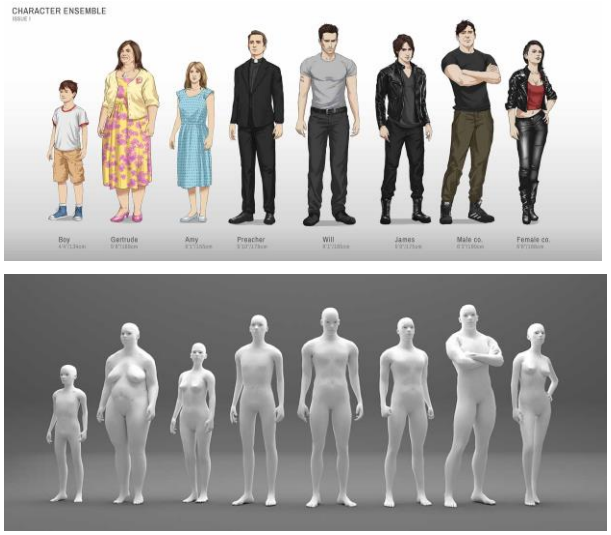

Fig. 1. 3D character models created in MakeHuman (bottom) based on 2D concept sketches (top)

Each character was individually posed for each of the panels in the comic – with storyboard sketches used as a reference. Details such as curling of the fingers, bending of limbs, orientation of hips and chest, and positions of the feet on ground, was possible due to the rigging and manipulated to provide subtle changes in body language and stance. The ability to pose characters assisted in the story pacing issues. Character placement in the environment informed traversal time and location in relation to other characters. In some cases, this meant panels had to be added to extend the timing – something difficult to anticipate or judge when manually produced. Similarly, more realistic character locations could be adjusted to fit within the real-time constraints of the scene. Character models could be duplicated for each unique pose and position in the scene.

VI. Improving Static 3D Model Rendering with Real-Time Rendering

The use of 3D tools in the first issue of the graphic novel improved the design, planning and referencing processes used for the photorealistic art style. However, the process also revealed several problems:

- repeated painting of identical details and textures in multiple panels;
- inconsistency in the design of props and environments between panels; and,
- inconsistency in shading between panels.

Thus, time was spent fixing continuity errors between panels – it is important the environments and props were consistently represented throughout the comic to retain reader engagement with the story. Whilst an improvement on traditional methods, clearly, further efficiencies could be gained.

VII. An improved 3D workflow used in the second issue

In the second issue a real-time rendering pipeline was used. Texturing and lighting in 3D was tested using Blender's ray-trace render engine Cycles. However, the quality was not sufficient for production purposes. In the 2019 release of Blender 2.8 Beta, the Cycles rendering engine was replaced by the real-time rendering engine EEVEE. This new render engine resolved many of the incompatibility issues with Cycles. It offered sufficient approximation of realism for the project's needs, and faster render times. The realtime viewport could be operated at sufficiently high framerate during normally heavy memory usage circumstances, such as high-poly scenes populated with hundreds of light sources, high resolution materials, and complex character models. Unlike Cycles, it provided more artistic freedom to alter and stylise the images to better suit the project's needs without slowing the production process.

In the second issue, using the EEVEE render engine, the 3D environments could be modelled at a higher fidelity to the real world. Hence, more time was dedicated to researching location and prop references – objects such as doors, tables, chairs, computer monitors were more accurately measured and modelled in Blender. Ruled measurements ensured all objects were built to their correct scale relative to each other. Google Earth photogrammetry data was used to measure building heights and road lengths. They informed the larger outdoor 3D scenes such as cityscapes and suburbia . Scale consistency thus ensured all assets could be shared between scenes.

It was important to model tertiary details on objects, such as panel cuts, computer buttons and lights, door handles, screws, and so on. The addition of these sorts of details improved consistency between panels – object details were defined prior to illustration process, and could be translated correctly in perspective, thus making it easier to keep track of continuity between panels showing the same objects from multiples angles. This increased set dressing in environments improved visual storytelling – more information could be delivered to the reader about character personalities through the environmental detail.

Where environments needed to be populated with a range of real-world materials, such as brick, wood, concrete, plaster, metal, glass, water and vegetation, the materials had to be physically-based to suit the photorealistic art style. A large collection of materials was gathered from the *Substance Source* [3] material library provided by subscription from *Allegorithmic* [2]. Online 3D market places such as *Poliigon.com* [11] and *Textures.com* [12] also offer free samples of high quality, common architectural materials, such as wooden floors, bricks and painted surfaces.

Materials were imported into Blender and combined using the Disney Principled Model (PBR) shader [4], – a shader designed to realistically simulate light reflections. Objects were UV unwrapped to prevent distortions on the 3D surfaces. The cubic projection mapping method was used as it rapidly provided good results.

Every 3D scene was illuminated with several light objects to simulate real world shading. A sun lamp was placed in the scene and sky colour was adjusted to create a daytime setting. Then, area lamps were arrayed to illuminate interior rooms and halls – reference images were used to align their placement. Bounce lighting was calculated using irradiance volume objects; box boundaries were scaled to fully enclose the scene so calculations took into account all objects in the scene. Hence, once 'baked in', surface colours were influenced by their surroundings, similar to real-world lighting effects – where colour objects 'splash' coloured light onto adjacent surfaces. Objects with sharp reflections however – such as glass and mirrors – were calculated using reflection planes – a mirror reflection method for obtaining accurate reflections.

Lighting in real-time 3D improved efficacies. The shading on surfaces could be made to appear realistic – a goal of the graphic novel's artistic style. The flexibility of the lighting system meant that changes could be made to light strength, colour and direction with results visible in real-time.

VIII. Integrating 3D renders into the 2D illustration

Rendering the 3D scenes out to a flat 2D image was a necessary conversion process. This process was necessary to transfer the information from the 3D model to the image editor for overpainting. However, it introduced several limitations:

- objects could no longer be 'moved' in 3D space, either to adjust their position or reveal overlapped detail;
- importing updated renders to match scale and alignment in Photoshop [1] was time-consuming; and,
- object silhouettes and individual surfaces could not be selected for masking purposes.

To overcome these limitations, several layered renders were extracted from Blender and imported into Photoshop.

The ability to reposition objects and reveal background information in Photoshop was achieved with render layers. The render was broken down into separate plates: foreground, midground and background. Doing so enabled basic manipulation of objects in Photoshop. Objects on the various layers could be moved, scaled or rotated independent of the background information. However, this movement of objects on layers was limited by the resultant perspective distortion. Hence, the technique was only used for minor alterations to the overall composition. More significant changes were made in Blender and re-rendered (see fig 2).

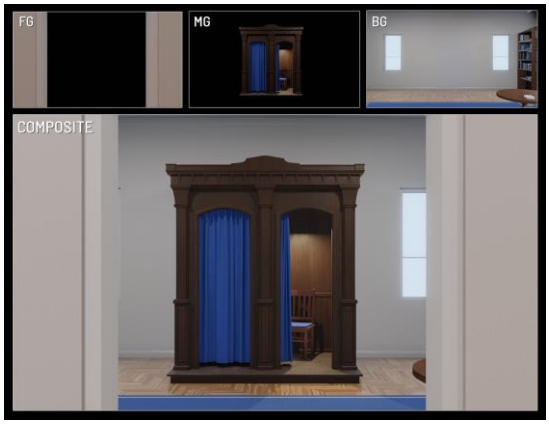

Fig. 2. 3D plates rendered separately and then composited in Photoshop to enable layer manipulation in 2D.

Photoshop's smart object layer tool was utilised to import updated renders. Smart object content could be replaced with updated renders while retaining earlier transformations inside Photoshop. This ensured all the unchanged 3D elements would remain in the same locations. Therefore, the over-painting layers continued to align correctly. Selecting object silhouettes and surfaces for masking in Photoshop was also possible with rendered layers or passes.

IX. Photo Referencing and Research

Collecting photographic references during the project ensured accurate depictions of real-world features used in the graphic novel. These included architecture, props, lighting, materials, fashion, human anatomy and nature. Most photos were collected online from image search engines such as Google Images, Pinterest, Flickr and Pixabay. They were used to guide design options and ideas only as the final designs needed to be original. Essential elements needed to be captured in the designs so that readers could easily understand the artwork and relate it to their own settings. The reference images were pasted onto a reference board inside the Pure Ref software program.

The most challenging aspect of photorealistic painting over these images was the accurate depiction of the humanoid characters. The humanoid 3D models generated by MakeHuman were insufficient for the more naturalistic characteristics of a real human desired by the artist. MakeHuman's bodies were generic, often inaccurately distorted from rig transformations, and incapable of showing emotion. They were only used as basic references for shading, perspective, position and scale in the 3D environments. Details like facial expressions, muscle deformations and general defining characteristics, were guided by photographic imagery and hand-painted to capture the necessary detail and convey the story and characters effectively and convincingly.

X. Conclusion

This paper outlines the processes underlying the production of a graphic novel that uses 3D modelling as its primary platform. However, with manual over-painting in Photoshop, the sterility of the 3D scenes was removed and the artist's expression foreground. As an extension to an ancient form of abstract sequential art, the graphic novel described in this paper innovates and challenges accepted traditional practices whilst still respecting them. The richness of imagery possible using digital art was used to communicate a storyline whilst achieving rapid production cycling. Moreover, the flexibility, authenticity and accuracy of the scenes depicted would not have been possible without the digital innovation.

The stylised photorealism produced in this graphic novel project required considerable expertise in world building using 3D Computer Graphics. This presented its own challenges. The necessity to completely construct 3D scenes facilitated flexible narratives, but it also meant a lot of time was spent setting them up. Yet, possible errors could be detected early on and adjustments made that saved considerable overall production time. The use of fully rigged avatars and digital virtual cameras was a significant improvement on traditional scene-by-scene hand-painting of characters from different angles. Nonetheless, the manual overpainting of these same characters added to the artist's unique style.

XI. References

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