Afterlives of the SNES/SFC

Michael Iantorno

A Dissertation

In the Department of

Communication Studies

Presented in Partial Fulfillment of the Requirements

For the Degree of

Doctor of Philosophy (Communication Studies)

At Concordia University

Montréal, Québec, Canada

April 2025

CONCORDIA UNIVERSITY
SCHOOL OF GRADUATE STUDIES

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By: Michael Iantorno
Entitled: Afterlives of the SNES/SFC

And submitted in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY (Communication Studies)

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Signed by the final examining committee:

Dr. Farah Atoui	Chair
Dr. Dominic Arsenault	External Examiner
Dr. Darren Wershler	Examiner
Dr. Fenwick McKelvey	Examiner
Dr. Jonathan Lessard	Examiner
Dr. Mia Consalvo	Thesis Supervisor

Approved by

Dr. Mia Consalvo, Graduate Program Director

August 28, 2025

Dr. Pascale Sicotte, Dean of the Faculty of Arts and Science

Abstract

Afterlives of the SNES/SFC
Michael Iantorno, Doctoral Candidate
Concordia University, 2025

This dissertation explores the informal practices, technologies, and industries that have proliferated alongside the Super NES/Super Famicom (SNES/SFC) videogame console since its initial release. The SNES/SFC was manufactured and distributed by Nintendo in the early nineties and remains an important cultural touchstone due to its prominent role in the so-called console wars, its status as Nintendo's last 2D television console, and its large and influential library of games. My research joins a growing number of academic projects that expand the platform studies archive by decentring corporate narratives and interrogating the central role of user-driven activities in negotiating a console's meaning and its multifarious media imaginaries.

In this dissertation, I adopt a post-humanist media archaeological methodology that combines hands-on tinkering, hybrid ethnography, and collaborations with material communities. My approach is inclusive of areas of study that are typically excluded from historical accounts due to their status as unauthorised, unofficial, or even illegal. I chronicle the emergence of informal SNES/SFC emulators in the nineties; collaborate with citizen archivists who restore the Satellaview's abandoned software ecosystems; create bespoke reproduction cartridges to uncover the origins of bootleg games; and leverage hacker-made tools to interrogate diverse fan localisation and ROM-hacking efforts. In addition to generating insights about the console itself, my research ties the SNES/SFC into broader debates concerning intellectual property law, creative labour, and media obsolescence. Throughout *Afterlives of the SNES/SFC*, I broaden, complicate, and accentuate existing media historical analyses of the residual videogame console.

Acknowledgements

The last six years have been some of the most challenging, yet most rewarding, of my entire life. I'm truly privileged to have had the opportunity to dedicate myself fully to a project of this breadth, and my work wouldn't have been possible without mentorship and care from countless friends, family members, and colleagues.

I'd like to thank my supervisor, Mia Consalvo, for welcoming me into the mLab and for providing guidance and support throughout my entire degree. It is incredibly rare to have such a stable working relationship in graduate school (or really, anywhere) and I deeply appreciate the insights and advice you provided as I endlessly tinkered with Super Nintendos. I'm also extremely lucky to have a supportive doctoral committee: Darren Wershler, Fenwick McKelvey, and my wonderful externals Dominic Arsenault and Jonathan Lessard. I appreciate all the feedback and discussion that you provided along the way, and it was so nice to see your faces as I tiredly lurched across the finish line.

There are entirely too many other people I would like to thank, but I'll try my best. Thank you to the mLab folks: Sarah, Ryan, Dan, Nic, Andrei, Marc, Sâmia, Annie, Courtney, Scott, Lyne, Meg, Jules, Francis, Hanine, Justin, Maize, Jessie, Ali, Josh, Tamyres, Katey, Beck, Taylan, Claire, and Jess. There are certainly a lot of you and I'm sorry if I missed anyone! I'm always delighted to stop by the lab and see your faces. Thank you to Gina, Jess, and Enric for first welcoming me into TAG in 2017 when I was but a lost soul wandering about the EV building, and to Richy, Shahrom, Brock, Leo, Owen, Elizabeth, and the rest of the current batch of TAGsters who have cultivated immaculate lab vibes. Thank you to my fellow depot dweller Alex—I'm so glad that, after we found out we basically study the same thing, we decided to collaborate instead of being weird and competitive. Thank you to Rob, Janna, Laura, Courtney (again) for being the chillest PhD cohort imaginable. And, finally, thanks to the entire Solar Media Collective for helping me imagine a better version of academia.

And most of all, thanks and love to Brooke, who has supported me in so many ways during my extended jaunt through graduate school. Especially near the end, when I was basically writing in a fugue state.

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1. Introduction

Stop me if you've heard this one before. It is Christmas morning 1992. My brothers and I are gathered around a stack of colourful presents delivered by Santa Claus, impatiently waiting as our parents sort them by size and recipient. A conspicuously large rectangular box catches our eyes, but we try not to get our hopes up. Mom and dad slowly hand out the presents: new pajamas, books, school supplies. We shake in anticipation as they reach for the *big box* and, once it is placed in front of us, we tear into it like a pack of feral dogs. Tossing the wrapping paper and tape to the wayside, we are overjoyed to uncover a Super Nintendo Emulation System, which we had been coveting for months. Once the dust settles on the morning's festivities, my dad connects our new console to the television for us to play. Sprawled out on a ragged brown couch in our basement rec room, we are quickly entranced by pixels and plastic and play *Super Mario World* and *Super Adventure Island* to our heart's content (or at least until my dad turns off the TV and forces us go play outside in the snow).

Perhaps that story is a bit too derivative? Let me try again. It is a quiet weekday evening in 1999. My mother, a project manager at a Canadian bank, has finally allowed me and my brothers to use the dial-up Internet connection that she was given to work-from-home. She explains the ground rules to us: we can connect to the Internet for a few hours a day, evenings and weekends, and only after we have finished all our homework. I dial-in for the first time, accustom myself to the cacophonous buzzes and whirrs of the modem, and then open Netscape Navigator. Like many, I am immediately astounded at the vastness of the early web. For the first few weeks, I sift through a deluge of fan websites and forums to look up information about *EarthBound*, *Final Fantasy VI*, and a few other of my favourite games. After a while, I stumble upon a strange website called Zophar's Domain that hosts a bevy of applications referred to as 'emulators' which, much to my bewilderment, make it possible to play Super NES games on our home computer. After downloading ZSNES and a few game ROMs, I am quickly entranced by pixels and piracy and play *Chrono Trigger* and *Final Fantasy V* to my heart's content (or at least until my older brother kicks me off to join an *EverQuest* raid).

I think I can still do better… maybe one more anecdote? It is a lazy Sunday afternoon in 2010. I am strolling through the Annex neighbourhood in Toronto and stumble upon an unassuming store called A&C Games, which beckons visitors to "rediscover rare and vintage videogames" in chunky cartoon text. Chiptunes blare from a stereo system aimed at the front door, amplifying a YouTube playlist of nineties videogame theme songs. The inside of the shop is a spartan affair consisting of one long hallway, obviously reconfigured from its days as a nondescript convenience store, with makeshift wooden shelves stacked high with retro videogame cartridges. As I sift through A&C's enormous collection of second-hand Super NES games and consoles, I uncover items that I have never seen before: bootleg 50-in-1 multicarts, imported European and Japanese games, and even a reproduction console that accomplishes the unthinkable by playing both Nintendo *and* Sega games. Walking up and down the length of the store, I am quickly entranced by pixels and price tags and shop for Super NES games to my heart's content (or at least until I hit the limits of my bank account).

These stories, of course, are half-truths. Memory is a funny thing, and I am certain that if I hashed out the details with my brothers, my parents, and the staff at A&C Games, we would disagree on some of the finer points. However, my intent with these cyclical vignettes is to establish that I did not discover the Super NES just one time. Like many people, I encountered and re-encountered the videogame console in diverse contexts and configurations since first finding it tucked under my family's Christmas tree. I have emulated the Super NES on platforms ranging from smartphones to Steam Decks, hacked apart game ROMs to create new localisations and other chimeric variations, and catalogued numerous reproductions and plug-and-play devices as part of my work at the Residual Media Depot. While I have been curious about the origins of the Super NES for as long as I can remember—from exchanging schoolyard rumours about *Zelda* secrets to diving into websites like The Cutting Room Floor to read about the console's hidden development history—this curiosity was initially rooted in learning about what I believed was a singular device. But after each of my encounters with the Super NES, I discovered more inconsistencies, variations, and seams to pick at. Emulators, ROM hacks, reproductions, and hardware mods all destabilise the console and expose it as a multifarious mangle of hardware, software, peripherals, and paratexts.

In *Afterlives of the SNES/SFC*, I explore the informal practices, technologies, and industries that have proliferated alongside the Super NES videogame console since its initial release in 1990. In this pursuit, and I am aligned with a growing number of academic projects that seek to expand the platform studies research paradigm by decentring corporate narratives and formal documentation, while further emphasising the role of user-driven activities in negotiating a console's meaning. Incorporating my experiences as a videogame hacker and modder, I cultivate a media archaeological research practice that combines hands-on tinkering, hybrid ethnography, and collaborations with material communities. My approach is inclusive of numerous areas of study that are typically excluded from historical accounts due to their status as unauthorised, unofficial, or even illegal. Through a series of case studies, I will chronicle the emergence of informal console emulators in the nineties; collaborate with citizen archivists who restore abandoned software ecosystems; create bespoke reproduction cartridges to uncover the origins of bootleg games; and leverage numerous ROM-hacking tools to study decades-old titles at the level of code. In addition to generating insights about the SNES/SFC itself, I will tie the console into broader debates concerning intellectual property law, user rights, and media obsolescence. My dissertation builds on the foundational work by Arsenault, who has adeptly framed the Super NES as "a technological enforcer of economic and cultural corporate wars in the video game industry" (2017, p. 1), and Apperley and Parikka, who question the epistemic threshold of platform studies (2018, p. 350). In the pages ahead, I broaden, complicate, and accentuate existing media historical analyses of the device.

What Is a Super Nintendo?

While I will be arguing against easy definitions of the Super NES throughout this dissertation, I still believe it is wise to provide a baseline description of the console before diving too deeply into analysis. For the moment, I will summarise it as a home videogame console that was released by Nintendo in the early nineties and is commonly imagined as a commercial and

critical success, particularly in popular videogame histories. While I have used the console's North American name so far, to reflect my own experiences, for the rest of this dissertation I will refer to it as the Super NES/Super Famicom (SNES/SFC). I chose this acronym on Darren Wershler's recommendation, to acknowledge the device's regional variations and the deterioration of jurisdictional distinctions that has occurred since the nineties.

Figure 1.1. The North American Super Nintendo Entertainment System.

Figure 1.2. The Japanese Super Famicom.

Figure 1.3. The European Super Nintendo Entertainment System.

Although Nintendo officially discontinued the console in all regions by 2003, the SNES/SFC and its software library have spawned numerous re-releases and re-creations. Perhaps the most notable official hardware revival was the Super NES Classic Edition in 2017, and SNES/SFC software has been consistently distributed across Nintendo's online storefronts since the establishment of the Nintendo Wii's Virtual Console in 2006. Despite the lasting cultural cachet of the SNES/SFC, Arsenault's platform study (2017) challenges some of the popular imaginaries associated with the platform. Framing the SNES/SFC as Nintendo's fall from grace, Arsenault takes the provocative position that the console was a failure, arguing that it led to the squandering of an advantageous business position that it took years for Nintendo to fully recover from (2017, p. 3). Although the true commercial success of the SNES/SFC is open to debate, it remains an influential cultural touchstone due to its prominent role in the so-called console wars (Harris, 2014), its status as Nintendo's last 2D television console, and its large and influential library of games.

Chapter Breakdown

I have kept this introductory chapter brief for two reasons. First, I have written dedicated chapters for both my *Literature Review* and my *Theory and Methods*, where I will flesh out the scholarly threads that underpin my research. Second, while this is certainly not a manuscript-style dissertation, Chapters 4 through 7 are case studies focused on different practices and technologies related to the SNES/SFC: emulation, software preservation, reproduction cartridges, and user-driven localisation. Each one of these chapters is relatively self-contained and I do not feel they require additional contextualisation here. However, I will begin by layout out a comprehensive road map for my dissertation.

In Chapter 2, *Literature Review*, I synthesise the varied ways that scholars analyse videogame consoles and their users. While these are broad areas of study, I divide my review

into three overarching categories: platform studies; fan studies, labour and legality; and nostalgia, authenticity, and digital cultural memory. I approach platform studies by summarising the field's canonical texts, before turning toward crucial epistemological provocations that urge scholars to interrogate and expand the platform studies archive. I next tie together numerous user-oriented research projects on fan studies, labour, and legality, with a strong focus on videogame modding practices. Finally, I discuss the temporality of videogames and how users negotiate their meaning long after their commercial lifespan has ended.

In Chapter 3, *Theory and Methods*, I lay out my media archaeological approach to studying the SNES/SFC platform and establish my central research questions. Building upon the epistemological provocations posed by Apperley and Parikka (2018), I identify four lenses for approaching the informal technologies, practices, and industries that have emerged during the SNES/SFC's afterlife: temporality, stability, formality, and material communities. With temporality, I deconstruct dominant videogame platform narratives such as official release windows, console generations, and a perceived descent into obsolescence. In studying stability, I question the status of videogame technologies as singular objects by seeking out their numerous, often subtle, variations. Concerning formality, I develop a framework for addressing distinctions between users and producers, firmly rooted in Lobato and Thomas's theories on (in)formal media economies (2018). Finally, I leverage the concept of material communities to approach user-driven practices and technologies that grow alongside media technologies and help produce their meaning. I close the chapter by detailing my post-humanist media archaeological methods, which I divide into two overlapping areas: a) hands-on technological experimentation; and b) hybrid ethnography of material communities. I also touch upon my personal stakes in this scholarship as a player, ROM hacker, and researcher.

In Chapter 4, *The Super Nintendo Emulation System*, I chronicle the development of SNES/SFC emulators from the late nineties to the present day. I first consider how emulators render videogame consoles into convivial software, enable new production and distribution in (in)formal contexts, and appeal to various nostalgic media imaginaries. I then summarise the challenges in tracking emulator history, most pointedly the lack of formal records, the ephemerality of the early Internet, and the challenges in securing developer interviews. I divide the remainder of the chapter into three distinct aspects of SNES/SFC emulator history. First, I track the challenges facing early emulation projects as developers attempted to render the SNES/SFC playable on home computers. Second, I scrutinise the blog posts and/as manifestos left by the celebrated developer Near, whose quest for hardware accuracy tested the limits of SNES/SFC emulation. Finally, I consider the turn from closed emulator development teams toward F/OSS projects hosted on GitHub.

In Chapter 5, *Satellite Archaeologies*, I analyse user efforts to reconstruct the Satellaview, a SNES/SFC add-on that allowed Japanese users to download content over satellite. I first summarise the device's corporate history and contextualise it with contemporary console add-ons and networked technologies, before outlining its day-to-day use. I then contemplate how the Satellaview's ephemerality requires scholars to embrace informal technologies, user-created techniques, and paratexts to construct its platform studies archive—identifying it as an abandoned ecosystem with a critical lack of formal stewardship. This leads me to the 'satellite

archaeologists' who fill in gaps left by existing institutions of memory. For the remainder of the chapter, I take an in depth look at the techniques and technologies cultivated by these informal archivists—paratextual analysis, emulator development, data recovery, and informal archives—to better understand what traces are left of the Satellaview. I close by reflecting on how the Satellaview fits alongside other preservation and media archaeological practices.

In Chapter 6, *Pixels and Plastic*, I use a bootleg version of my ROM hack *HyperBound* to study the broader phenomenon of SNES/SFC cartridge reproduction. I begin by reviewing theories of informal media distribution and authenticity (i.e. the desire for physical objects and ephemera) in the context of game cartridges. Next, I discuss the continued user desire to engage in SNES/SFC development practices and how this is both enabled and constrained by intellectual property law. Following this foundational work, I scrutinise four online storefronts that sell reproduction cartridges to establish patterns in their production and distribution. For the remainder of the chapter, I delve into three common methods for creating reproduction SNES/SFC cartridges—template boards, donor boards, and bootlegs—while documenting my own experiments in creating bespoke versions of *HyperBound*. I close by reflecting on the materiality of nostalgia, from mass-produced collector's editions to bespoke hobby projects.

In Chapter 7, *Final Fantasies*, I analyse how users disassemble, reassemble, and recirculate the popular SNES/SFC title *Final Fantasy VI* (1994) in pursuit of a definitive localisation. I begin by questioning the notion that games, particularly cartridge-based ones, are ever singular or static objects. I then turn my attention toward early informal re-localisation efforts of the game, which reveal fan motivations to create a 'better' or 'more authentic' version of *Final Fantasy VI*, and how all versions of the game have been shaped by technological (e.g. cartridge space restrictions) and regional (e.g. cultural norms) factors. Next, I jury-rig the hacker application Wanderbar to play five different localisations of the game simultaneously, allowing me to synthesise key themes that are contested between versions of the game. Finally, I reflect upon the cyclical nature of localisations, the centrality of technical affordances to the afterlives of SNES/SFC, and the impossibility of finding a truly "authentic" version of *Final Fantasy VI*.

Finally, in my conclusion, I offer some final connections and provocations about my dissertation. First, I consider two themes that run throughout this research project: a) the stewardship of the SNES/SFC; b) the console's fragmentation into endless variations. Next, I reflect on three research limitations—elusive users, regional bias, and research costs—and pose some broad ideas for addressing them. Finally, I consider what research paths I can pursue in the aftermath of *Afterlives of the SNES/SFC*.

2. Literature Review

Chapter Introduction

Before I discuss my media archaeological approach to studying the SNES/SFC, I first examine the various ways that scholars study videogame consoles and their users. I divide my literature review into three key areas: **platform studies**; **fan studies, labour and legality**; and **nostalgia, authenticity, and digital cultural memory**. Platform studies is an obvious place to start as it is the most prominent way that game studies scholars holistically study videogame consoles. I first dissect Montfort and Bogost's foundational work in establishing the field (2009) and the studies that built upon their initial template (Altice, 2015; Custodio, 2020; Jones & Thiruvathukal, 2012), before turning my attention to epistemological provocations that wish to expand the scope of platform studies research (Anable, 2018; T. Apperley & Parikka, 2018; Nicoll, 2019). In addressing fan studies, labour, and legality, I tie together arguments from Jenkins (2006, 2013), Certeau (1980), and Swalwell (2021) to situate the role of users in relation to popular media technologies. This naturally leads me toward game modification or "modding" practices—which highlight different aspects of creative labour—and the various legal and moral debates that arise when the barriers between user and producer become porous (Keogh, 2019; Lobato & Thomas, 2018). Finally, I unpack a number of messy concepts in addressing nostalgia, authenticity, and digital cultural memory, where I lean heavily into Guins' study of videogame afterlives (2014) and Boym's ruminations on nostalgia (2011). I close by discussing the contentious nature of user archives, using Derrida's *Archive Fever* (1996) as point of provocation to discuss how fans develop and maintain online repositories to establish memories and histories that may not align with those of corporations and institutions.

Platform Studies

Studying platforms, as laid out in Montfort and Bogost's analysis of the Atari 2600 (2009), is one of the most prominent lenses to discuss videogame consoles and their software libraries. While Montfort and Bogost's work is preceded by other hardware-centric studies, such as Kirschenbaum's investigation into computer storage systems (2007), the popularisation of the platform studies paradigm resulted in an explosion of research projects centred on videogame consoles, microcomputers, and related technologies. Despite this wealth of scholarship—or, perhaps more accurately, because of the diversity of theories and methods that constitute it—there is some ambiguity as to what "doing" platform studies entails. In this section, I briefly untangle a decade and a half of platform studies research in search of continuities and dissonances.

As a point of clarification, I first acknowledge that the version of platform studies I will be exploring is only one of many scholarly approaches that go by the same name. As summarised by Poell et al., platforms are popularly characterised in Internet and media studies as digital infrastructures that "facilitate and shape personalised interactions among end-users

and complementors, organised through the systematic collection, algorithmic processing, monetisation, and circulation of data" (2019, p. 3). Rather than the consoles and computers that are prominent within game studies, this conceptualisation of platform is generally assigned to entities such as Facebook, YouTube, and Twitter, although the size and heterogeneity of such services has resulted in scholars studying individual apps (Light et al., 2018) or platform instances within larger digital ecosystems (Nieborg & Helmond, 2019). I cannot fully ignore this venue of research, as Internet technologies are deeply entwined with game culture, but it remains secondary to my scholarship.

Constructing Platform Studies

In the series foreword to their popular MIT Press book series, Montfort and Bogost define platforms as the "foundations of digital media: the computing systems, both hardware and software, that developers and users depend upon for artistic, literary, gaming, and other creative development" (Montfort & Bogost, 2009, p. vii). Despite attempting to demarcate the field, this framework appears enormously inclusive. Computing systems are ubiquitous, and most are subject to some form of creative development by either their originators or users. Aware of the confusion (and critiques) that their initial description wrought, the authors released the cheekily-titled follow-up article *Frequently Questioned Answers* (2009) to clarify their stance. Referring to criteria first laid out by Mosaic browser co-creator Marc Andreesson, Bogost and Montfort posit that "**if you can program it, then it's a platform. If you can't, then it's not**" (Andreesson, 2007; Bogost & Montfort, 2009). Recognising the boldness of this statement, they quickly hedge their cut-and-dry approach with a pair of important caveats. First, technologies are programmed in diverse ways, from the hardware-reliant Atari 2600 to coding languages such as BASIC. Thus, programming can take place at various levels between hardware and software and transcends the popular imaginaries of readable lines of code written in an editor window. Second, they contend that it is less important to provide a definitive answer to what a platform *is* and more impactful to determine "whether a particular system is influential and important *as a platform*" (Bogost & Montfort, 2009, p. 5). This statement alludes to the cultural elements of platform studies: how technologies are imagined, used, and developed for. However, it also exposes epistemological wrinkles. What makes a platform important enough to study? Who counts as a platform's developer?

The answers to these questions are elusive but may be gleaned by reconciling what the platform studies book series espouses versus what has manifested in platform scholarship. In practice, platform studies has predominantly focused on commercial videogame consoles (e.g. the Nintendo Entertainment System) and early home computing technologies (e.g. the Minitel). Intentionally or not, Montfort and Bogost's foundational work set this trajectory due to the affordances of its initial research object and the methods they used to analyse it. As the Atari 2600 is "entirely hardware, consisting of a circuit that lacks even built-in ROM" (Bogost & Montfort, 2009), there is no space to study higher-level software layers such as operating systems or programming languages. By the authors' own admission, this has led to many presuming that platform studies is "all about hardware" (Bogost & Montfort, 2009), shifting the frame of what scholars believe they can study through its lens. Second, Montfort and Bogost

are primarily occupied with official development practices, only briefly alluding to discussions of homebrew, hacking, and other less formal activities (2009, p. 143). As a result, their investigation into how platforms "enable, constrain, shape, and support the creative work that is done on them" (2009, p. vii) is mostly relegated to corporate histories, despite the console's diverse user communities. Finally, with each chapter named after an entry in the Atari 2600's software library, the authors emphasise the importance of sustained commercial development practices—something that only popular, long-lived devices receive. While not totally prescriptive, their template enables and constrains ensuing scholarship due to its flag bearer status, skewing scholars toward technical analyses of commercially successful hardware through official development practices and documentation.

What qualifies as "technical analyses" merits some elaboration, as "technical rigor and in-depth investigation of how computing technologies work" (Montfort & Bogost, 2009, p. viii) is one of the methodological touchstones that differentiates platform studies from other types of games scholarship. Adopting a geological metaphor, the authors stratify digital media into five descending layers—*reception/operation*, *interface*, *form/function*, *code*, and *platform*—and suggest that scholars need to dig down to the platform layer to consider how it enables and constrains all the activities that sit above it. As demonstrated through their analysis of the Atari 2600, this "level below code" (Montfort & Bogost, 2009, p. 147) includes objects such as graphics and sound processors, but also encompasses a panoply of technologies that exist between users and hardware.

The authors aim to correct the perceived omission of technical specificity in game scholarship, where little has been written about "how the hardware and software of platforms influences, facilitates, or constrains particular forms of computational expression" (Montfort & Bogost, 2009, p. 3). This mindset is part of a broader material turn in game studies that rejects the "prima facie notion that games are virtual aesthetic experiences" (T. H. Apperley & Jayemane, 2012, p. 15) and demands that videogames be considered as situated objects. Critiques of "screen essentialism," for example, date back to Montfort's research on early computer interfaces (2004), in which he debunks popular assumptions about computer programs such as *Eliza/Doctor* and *Adventure*. While these programs were contemporaneous with paper interfaces such as teleprinters, they are now almost exclusively presented through modern screen technologies—unmooring them from their material assemblages and erasing valuable insights into their development histories. In a similar vein, Montfort and Bogost discuss the importance of cathode-ray tube televisions (CRTs) in the development and operation of the Atari 2600, with much of *Racing the Beam* dissecting the capabilities of a TV's electron gun in rendering game graphics (2009, p. 21). An ongoing outcome of this material turn is the recognition that games are not ephemeral digital artefacts but are entwined with other technologies and infrastructures, from printer paper to family television sets. While many of these technologies have faded in prominence outside of enthusiast communities, such as CRTs, or have been rendered obsolete, such as the teleprinter, they nonetheless occupied an important position in videogame development and reception. The material turn, thus, forges connections between videogames and other technologies (T. H. Apperley & Jayemane, 2012, p. 15) in ways that screen essentialist research cannot. As Kirschenbaum eloquently describes, "one does not

always need to look at screens to study new media, or to learn useful things about the textual practices that accumulate in and around computation" (2007, p. 31).

This material turn, however, is often critiqued for its omissions; particularly its proclivity to push human subjects to the periphery. Anable laments its tendency to narrowly fixate on the hardware and software levels of technology, reproducing "methodologies and epistemologies with no need for gender, race, sexuality, or other types of difference" (2018, p. 136). Nooney similarly questions the ability of current historical and archaeological techniques to account for gender in videogame history, noting that materialist media analysts often get "lost in their own love for the mechanism's indifference to the body" and end up "rearranging actor-network deck chairs, envisioning histories and theories without corporeal or discursive bodies" (2013). The risk of the material turn is that it may detach technology from those who use it, ignoring users entirely or presenting their actions as the surface layer of a platform rather than being entwined throughout. Furthermore, Anable argues that platform studies often tacitly abides by corporate rhetoric that frames technologies as stable and easily bounded. Rather than being discrete objects, Anable argues, "platforms, and the ways they connect us technologically and socially to others, are porous, penetrating, and penetrable" (2018, p. 137). Referring to Chun's notion of leaky media (2016), Anable questions the perceived boundaries between hardware, software, code, people, and objects, raising doubts that platforms ever truly stabilise into singular objects.

An unsteadiness emerges throughout these provocations. Despite the necessity to bound a platform, or a series of platforms, to study them, this boundary-drawing is at odds with the inherent instability of technology. Reflecting on a decade of platform studies work, Apperley and Parikka keenly theorise that "platforms are not recalled and rediscovered through platform studies, rather in the process of 'doing' platform studies, a uniform platform is produced" (T. Apperley & Parikka, 2018, p. 353). While a device may lay at the centre of a research project, it is neither self-contained nor does it passively await scrutiny. Rather, as a scholar chooses their methods and delineates what technologies, practices, and temporalities are worthy of inclusion, they construct a "platform studies archive" (T. Apperley & Parikka, 2018, p. 353) that produces a specific rendition of the platform. As part of their epistemological exercise, Apperley and Parikka interrogate the field's most referenced materials: officially produced hardware and software; journalistic and marketing materials; documentation from designers; and oft-cited interviews with notable figures in game history. As I touched on earlier, the standardisation of the platform studies archive has pushed the field toward commercially established and mass-marketed platforms—the only technologies capable of accruing a sufficiently large collection of these complementary research objects. To correct this trajectory, Apperley and Parikka suggest that platform studies could be enriched by incorporating oral histories, unofficial paratexts, and cultural activities that take place outside of the commercial lifespan of a platform. This could open the door for studies of "experimental, imaginary, and playful platforms" (T. Apperley & Parikka, 2018, p. 354) and a greater focus on failed, lost, or otherwise adrift platforms (2018, p. 359). All of these descriptors are rich with meaning and potential and point toward the heterogeneous pathways that platform studies is capable of traversing.

(Re)Constructing Platform Studies

In his book *Minor Platforms in Videogame History* (2019), Nicoll attempts to rethink the platform studies archive by centering technologies that have failed to accumulate a large collection of official software or paratexts (2019, p. 14). These *minor platforms*, consisting of "objects, subjects, and spaces that are, for various reasons, ancillary to conventional narratives of videogame history" (Nicoll, 2019, p. 13) are recalcitrant and resist dominant scholarly, historical, and popular lenses. Whereas research objects such as the Atari 2600 enjoy both an established place in videogame history and an enormous collection of official materials to constitute its platform archive, Nicoll's objects of study possess neither. In fact, he deliberately challenges the standardisation of videogame objects and the very notion that there can be a unified set of methods for studying them (Nicoll, 2019, p. 30).

This perspective is made most evident through his investigation of the Sega Saturn and its infamous vapourware title *Sonic X-Treme*, a game that is inherently unarchivable due to the simple fact that it never was completed or published. To construct his platform archive, Nicoll includes materials that typically fall outside the purview of games scholarship, namely unreleased game prototypes, reverse-engineered demos, and online archives. Nicoll explicates on the "residual mediation" (2019, p. 135) undertaken by fans as they reconcile the fragmentary nature of *Sonic X-Treme* by "collecting, curating, and resurrecting technical and discursive materials such as design documents, assets, prototypes, and source code" (2019, p. 152). This archive is, by necessity, much more opportunistic and improvisational than those formed around more stable technological configurations. The endless fan-revived versions of *Sonic X-Treme* unearth lost development processes, filling in technical and discursive gaps with imaginaries of what the game *could* have been if it had come to fruition. Official documentation and unofficial hacks blend in Nicoll's case study, expanding the scope of the platform studies archive by questioning the temporality and stability of the Sega Saturn and its impalpable flagship game.

While Nicoll is intent on reimagining the target of platform studies, not all efforts to revise the academic field take as drastic of an approach. Following *Racing the Beam*, scholars have challenged the dominant platform studies paradigm from within by expanding its breadth (widening what technologies and types of creative development fall under its umbrella), temporality (extending the study of platform beyond its officially supported lifecycle), and methodology (incorporating new methods and subject positions).

Custodio's (2020) platform study of the Game Boy Advance (GBA) is notable for addressing many of the perceived shortcomings of Montfort and Bogost's initial approach. Dispelling narratives of linear technical progression that frame the handheld as a bounded object or a technological stepping-stone, Custodio highlights that the GBA "contains multitudes that no single, stable configuration can capture" (2020, p. 5) while exposing the difficulties in demarcating a platform that features countless iterations. Furthermore, through discussions of the residual afterlives of the GBA, they re-center the importance of users in extending the life of the platform long beyond a developer's intended lifespan. Homebrew scenes, fan-made hardware modifications, and other hobbyist technologies play an integral role in Custodio's platform archive (2020, p. 176), despite their informal origins.

Similarly, Altice's (2015) platform study of the Nintendo Entertainment System (NES) prominently discusses the emergence of videogame emulators, a technology that Nintendo initially condemned (*Archived: Legal Information (Copyrights, Emulators, ROMs, Etc.)*, n.d.) but has played an important role in both corporate and hobbyist realms. As Altice aptly notes, the emergence of user-friendly emulators in the mid-to-late nineties helped "catalyze the cultural cross-fertilization between Asian, European, and American nations" (2015, p. 317) and contributed to the transition of physical goods to virtual ones, through both piracy and official re-releases. Emulation changes user perceptions of what software is part of a platform's library due to its indifference toward formal strategies of production, distribution, and localisation, while extending the prominence of hardware long after it disappears from store shelves. Jones and Thiruvathukal build upon this idea in *Codename Revolution* (2012), noting that the Wii was Nintendo's first console sophisticated enough to be backward compatible, capable of interfacing with GameCube peripherals and running emulators for the company's discontinued consoles (2012, p. 104). This interoperability was designed to be proprietary but, as the authors document, every platform is "in part defined by the possibilities that lie outside what it was designed to do, because every platform is a site of sometimes-unpredictable transactions with users"(Jones & Thiruvathukal, 2012, p. 118). Jones and Thiruvathukal claim that the Wii's platform archive includes contributions from both users and developers, who both lend meaning to the console, even when their activities are somewhat oppositional to one another.

Admittedly, these varied readings of what a platform can be, and what may constitute its archive, can be disorienting. In addition to his survey of the Sega Saturn and *Sonic X-Treme*, Nicoll includes Twine, a free and open-source tool for creating text adventures, and the Daewoo Zemmix, a series of videogame consoles known for their pirate uses, among his case studies. Boluk and LeMieux push platform boundaries even further by challenging the secondary role prescribed to game software, noting that popular titles such as *Super Metroid* have "become platforms for making new games" in their own right, identifying these derivative works as *metagames* that encompass the "unprecedented experiences and effects that emerge in, on, and around videogames" (2017, p. 32). Metagames proves to be a challengingly broad term that encompasses everything from speedruns to esports commentary but foregrounds the potential of platform studies to incorporate an increasingly diverse set of paratexts. In a fitting bit of cyclicality, the games-as-platforms argument recalls early musings by Aarseth (2001) and Montfort (2006), who speculate that games such as *Quake III* and *Combat* are platforms, of sorts, due to their ability to provide multiple game modes based on user preference. Aaarseth points out that *Quake III* possesses numerous customisable game modes, such as capture-the-flag and deathmatch, while Montfort notes that *Combat* was one of the earliest titles that allowed users to customise their play experience—by flicking on and off particular options, players gain access to variations such as "tank-pong, "bi-plane," and "invisible tank," all of which are derived from a single central tank game.

While Aarseth and Montfort are more concerned with official play variations, Boluk and LeMieux are intrigued by the unexpected, once again reminding us of the potential inclusion of official and unofficial works within the platform archive. This archive is shaped by the actions of corporations and users, as "a successful game or platform spawns its own 'wider culture,'

extrudes its own paratext as it makes its way through the world" (Jones & Thiruvathukal, 2012, p. 129), but also through the choices a scholars makes in encapsulating it. Although widening the scope of platform studies risks making the "platform" label applicable to almost any game-related object, these are epistemologically productive provocations. Platforms are neither self-contained nor self-evident but are produced over time through diverse processes.

Fan Studies, Labour, and Legality

Above, I have reviewed platform studies scholarship alongside critical arguments that the field should be more inclusive of user contributions rather than defaulting to technological and commercial histories. While users are largely secondary within platform studies, fan studies is highly concerned with the practices of those who receive, edit, and redistribute mass-produced media. Notably, it builds upon theories of audience reception and interpretation by framing users as active creators who repurpose the raw materials of popular media to craft new works. In the context of videogames, fans take on a variety of roles—writers, hackers, modders, archivists, collectors, artists, and more—and often affiliate themselves with games, franchises, or consoles. Here, I review the roots of fan studies scholarship before exploring how it has been applied to ludic technologies such as videogame consoles, micro-computers, and game software. I leverage Jenkins as a through-line for these discussions, as he was part of an influential wave of nineties fan studies scholarship that remains canonical yet contested, before shifting my focus toward game modification practices. Finally, I turn toward legality to review some of the intellectual property debates surrounding fan practices.

Fan Studies and Active Users

In his twentieth anniversary retrospective on *Textual Poachers* (Jenkins, 2013)—perhaps his most candid contemplation of the field—Jenkins identifies two epistemological issues that motivated early fan studies. First, he claims that prior media research typically looked down upon user activities and disregarded ethnography as a viable method, often relying predominantly on textual analysis. He critiques early television scholarship for framing fans as "inarticulate, incapable of explaining their motives and actions" and for an overarching "[scholarly] refusal to engage with the community (and thus a rejection of the value of ethnographic methods)" (Jenkins, 2013, p. ix). Of course, Jenkins was not the first scholar to recognise this omission. Radway's study of romance novel readers (1984), as a prominent example, criticised media scholars for their "lingering tendency to grant primacy and ultimate power to the text itself" (1984, p. 51) and their diminishment of audience interpretation. Both Jenkins and Radway grapple with the omission of audiences—television and literary, respectively—and adopt research frameworks to better take them in account.

Second, Jenkins highlights the reluctance of researchers to acknowledge their personal stakes with a given media franchise, claiming not to be "implicated in their own analysis" or "accountable to a fan community" (Jenkins, 2013, p. ix). This proposition eventually led to the formation of the term aca-fan, popularised by Matt Hills (2002), in which he recognises that while media researchers are entrenched within academic theory and literature, they are still

privy to the knowledge and traditions of fan communities they are part of (Jenkins, 2013, p. 5). Rooted in feminist critiques of objectivism—such as Haraway's (1988) crucial writing on situated knowledge that highlights the impossibility of observing the world from an external, unmediated viewpoint—the aca-fan viewpoint pushes back against common tropes of the impartial researcher and fosters a self-awareness that has since become central to the fan studies approach. As Jenkins summarises, aca-fans accept that tacit knowledge, community relationships, and personal accountability are embedded within the ethnographic process (2013, p. xiii). Fan studies, then, urges scholars to recognise the importance of user activities alongside their personal connections to the media (cultures) they study.

To revisit Jenkins' initial contestation—I will necessarily discuss the second in my methodology section—his call for user-focused research may seem quaint in the current media landscape. But fan studies coalesced in the early days of digital culture, before terms such as the "digital economy" (Terranova, 2000), "playbour" (Kücklich, 2005) and "produser" (Bruns, 2009) were commonplace, and well ahead of the widespread adoption of technologies that made the modification and circulation of popular media approachable and highly visible to the general public. Interest in user activities increased greatly as Web 2.0 became a buzzword, reaching a fever pitch in the mid-aughts with *Time*'s infamous declaration of "You" as person-of-the-year ("Person of the Year," 2006) and Lessig's contemplation of remix culture and its implications for intellectual property regimes (2008). Famously, Jenkins touted the ability of Internet-enabled knowledge sharing (i.e. collective intelligence) to empower fans and destabilise long-entrenched power dynamics in *Convergence Culture* (2006, p. 20), reacting to flourishing online communities and early manifestations of social media. However, fan studies predates the promises of the modern web, and I now recall an earlier era of scholarship to explore its underpinnings.

Textual poaching is an enduring and deservedly contested concept in fan studies. Jenkins' development of the term is rooted in Certeau's initial postulation in *The Practice of Everyday Life* (1980), where he frames poaching as a tactical intervention undertaken by readers of literature. Instead of taking a reading position reified through institutions and designated interpreters, which he affiliates with a consumerist standpoint (Certeau, 1980, p. 171), the reader-as-poacher instead "invents in texts something different from what was 'intended'" (1980, p. 169). Certeau imagines this interplay as a series of encounters, "advances and retreats, tactics, and games played with the text" (1980, p. 175), in which readers deconstruct and reconstruct their meaning based on their own social milieu. At first blush, Certeau's viewpoint aligns with other scholars who have countered claims of transmission-based communication, with Hall's ubiquitous encoding/decoding model (1999) springing to mind. However, Jenkins argues that the poaching metaphor implies an instability that Hall's three-pronged approach lacks: "Hall's model, at least as it has been applied, suggests that popular meanings are fixed and classifiable, while de Certeau's 'poaching' model emphasizes the process of making meaning and the fluidity of popular interpretation" (Jenkins, 2013, p. 34). Poaching, as elaborated by Jenkins, is more akin to appropriation than interpretation, even when it leaves no residue. A reader acknowledges the power dynamics at play and makes their own

competing and contradictory readings, weaving between established categories but is never entrenched in the same manner as Hall's dominant, negotiated, and oppositional positions.

This ties into Certeau's commonly-cited characterisation of readers as travellers and nomads: folks who recognise the power dynamics that exist between themselves and the owners of a text but also realise that any intervention they can make is, by necessity, tactical and ephemeral (1980, p. 174). One of Jenkins' alleged departures from Certeau is his disagreement with his claim that textual poaching leaves no traces. Fans, he argues, reject regimes of ownership such as intellectual property law and authorial control, freely appropriate elements from mass-media texts, and leave numerous traces in the forms of derivative works, cultures, and communities (Jenkins, 2013, pp. 22–23). Through this lens, popular culture exists as a massive archive "whose treasures, though corrupt, hold wealth that can be mined and refined for alternative uses" (2013, p. 27). Certeau's most prominent case studies—reading in private and walking the streets of a city—certainly suggest that Jenkins' departure is novel. But did Certeau truly exclude tangible appropriation from the scope of his theorisation?

Swalwell (2021) argues that the omission is a scholarly one by Jenkins (and, consequently, fan studies at-large) rather than a theoretical one by Certeau, likely due to the former overlooking elements of the latter's oeuvre[1]. Her distinction complicates the relationship between two popular conceptions of textual poaching by bringing attention to the everyday hobbyist practices present in the second and third volumes Certeau's work, including technological activities such as coding and computer hacking (Certeau & Giard, 1997, pp. 108–113; Swalwell, 2021, p. 55). Certeau and Giard's conception of networks of labour, in fact, appears to directly counter Jenkins' claim of tracelessness while pre-empting some of his discussions regarding collective intelligence:

> Whether they belong to the sphere of public activity or that of satisfying domestic needs, the practices of production and transformation create strong networks of information… Here is invented a practiced way of refashioning the sociocultural environment, of appropriating its materials, and of making use of them for different goals. (Certeau & Giard, 1997, p. 114)

Swalwell also mobilises this aspect of Certeau and Giard's theorisation to push back against the fan studies tendency to frame user activities as solely reactive to commercial culture (2021, p. 75). While users certainly create their own interpretations and appropriations of popular media texts, "people are also literally makers, a point that has sometimes been obscured in cultural and media studies' appropriation of de Certeau" (Swalwell, 2021, p. 51). When discussing the activities of micro-computer programmers, for example, Swalwell emphasises that everyday cultures of coding, homebrew game development, and tinkering are often overlooked due to their vernacular nature and lack of public exposure (2021, p. 78). While Certeau's body of work is inarguably concerned with power dynamics, particularly tactical interventions, Swalwell argues that he also recognises that audiences productively use commercial goods in ways that

[1] In all fairness to Jenkins, the volumes in which Certeau and Giard make these arguments did not receive a widespread English translation until the mid-nineties.

are not appropriative, drawing a greater connection to oft-overlooked hobbyist, DIY, and maker practices.

I bring these conversations and debates to the forefront because they highlight two trajectories embedded in fan studies research. First, one of the field's overarching goals is to dissect power relationships between producers and consumers, which often manifest through the study of legal rights and moral obligations. Certeau theorised how this dynamic unfolds between readers and designated interpreters, and countless ensuing studies have applied a similar lens to scrutinise contestations between corporations and fans. Epistemologically, this starting point is vital to recognise, as it undergirds fan studies research. Second, I would like to reiterate Swalwell's insight that, while identifying power dynamics is vital, we cannot fully encompass fan/user activities as tactical engagements with mass media. She reminds us that people are inherently creators and that their practices are not necessarily motivated by established power dynamics or completed in reaction to widely circulated media texts. Over-relying on this perception poses a danger of projecting ideologies onto a group or, as Swalwell reminds us, excluding vernacular cultures from media scholarship.

Game Modification Practices

Game modification has long been a popular target for user-oriented game researchers due to its prominence and proliferation. Commonly referred to as *mods*, modding practices take multitudinous forms: authorised software mods facilitated through a shared marketplace, perhaps most evident in *Minecraft*'s robust modding community (N. Watson, 2019); game modification programs, called randomizers, which procedurally remix classic console titles to facilitate races and competitive tournaments (Iantorno, 2021b); hardware enhancements, such as 'mod-chips' that users physically install into game consoles to enable compatibility with illegally-copied games (Consalvo, 2007, p. 66); and lighting mods that improve screen visibility for handheld game consoles (Custodio, 2020, p. 70). While 'mod' is perhaps the most common term used to describe these technologies, 'hack' is used in some contexts, especially those that have illicit or unauthorised connotations (Wm. R. Bailey, 2008, p. 74; Iantorno, 2019a, p. 24), and 'cheat' is a common moniker for technologies that are considered deceptive or disruptive to other players (Consalvo, 2007, p. 8). In any case, numerous game alteration activities fall under the loose category of modding.

There is no strict linear trajectory to the history of videogame modding, as it consists of an uncountable number of public and private practices. I will call to attention *Dino Smurf* and *Castle Smurfenstein* for the Apple II for being some of the earliest documented game mods and for embodying themes of remix, technical experimentation, and satire that persist in the practice to this day. Created by Andrew Johnson and Preston Nevins on a lark, the two mods are off-beat parodies of *Dino Egg* (1983) and *Castle Wolfenstein* (1981) for the Apple II, which they created using a simple paint program and a sector editor (Johnson, n.d.). In the 40 years since these quirky forays, modding practices have become increasingly formalised within the game industry. Kücklich points toward id Software's release of *Doom*'s (1993) source code in 1997 as a watershed moment in this regard, as it signalled a growing desire for game studios to harness the productive activities of their users (2005). His discussion of *playbour*, a term meant to

address the evolving relationship between work and play across the entertainment industries, identifies the corporate motivations for embracing the practice. Mods, as Kücklich claims, are useful because they "close the loop" between corporation and customer by allowing developers to draw innovation, talent, promotion for a previously underleveraged fanbase (2005). This corporate-fostered modding is perhaps most evident in the establishment of official marketplaces like Steam Workshop, which allows users to upload and sell mods for a variety of games (albeit under a strict licence agreement).

Since its emergence, software modding has simultaneously been celebrated as an informal pipeline for the games industry and derided as precarious labour controlled by the whims of large media companies. Early mods, such as *Castle Smurfenstein*, exemplify the practice's vernacular origins—users undertaking small alterations to a game, leveraging whatever resources that are at-hand, and distributing them amongst their friends—and remind us that mods did not wholly emerge in reaction to economic demand. Rather, modding is one of many types of user labour that corporate stakeholders have attempted to foster and shape to their needs. As Terranova (2000) concisely lays out in her study of early online community building, this reconfiguration of user activities can dramatically shift the meaning of 'free' in free labour:

> Free labor, however, is not necessarily exploited labor. Within the early virtual communities, we are told, labor was really free: the labor of building a community was not compensated by great financial rewards (it was therefore "free," unpaid), but it was also willingly conceded in exchange for the pleasures of communication and exchange (it was therefore "free," pleasurable, not imposed). (Terranova, 2000, p. 48)

As Kücklich claims, game companies develop and release approachable level editors and maintain creator marketplaces to better capitalise on user labour. Keogh describes this as an integral aspect of the formalisation of the game industry, which resulted in game development becoming increasingly technically complex and requiring professionalised teams to complete (2019, p. 23). Early computer software development heavily featured games that were crafted in domestic spaces such as bedrooms and kitchens (Nooney, 2013) and even early Atari 2600 releases were often created by single developers or small teams (Montfort & Bogost, 2009, p. 99). The nineties, however, brought about larger development teams and intermediary game engines. In this context, modding became one of the few ways users could engage in videogame production—altering a commercial game allowed aspiring developers to be a part of the industry without necessarily being embedded within it. Terranova considers this to be a form of capture spurred on by the economic need of capital to extract value from existing knowledge, culture, and affect (2000, p. 38). Similarly, Kücklich notes that while modding may occasionally reward users with cultural and even economic capital, it may also foster an exploitative relationship in which hobbyist computing activities are enveloped by the demands of capital.

Game modding has not fully fallen into the hands of corporate interests, as revealed through various user-centric surveys (Jansz & Theodorsen, 2009; Sihvonen, 2009; Sotamaa, 2010). While this body of research reifies some common commercial presumptions about these activities—perhaps the most persistent argument is that modding serves as unofficial job

training for aspiring designers—it also pushes back against singular narratives. Videogame fans often use modding as a creative outlet, as it connects them with communities of like-minded fans and allows them to alter aspects of their favourite games in various ways (Jansz & Theodorsen, 2009, p. 12). While many of these activities add value to the original game title, users are often ambivalent, or outright subversive, toward developer desires. Postigo describes how *Battlefield 1942* modders—who had introduced vehicles and characters from the popular animated series *GI Joe* into the game—drew ire from Hasbro for their unauthorised use of intellectual property and eventually received a cease-and-desist order from the company (2008, p. 64). Welch contemplates queer modding practices, such as *Bubsy 3D: Bubsy visits the James Turrell Retrospective at the Los Angeles County Museum of Art*, which uses the scaffolding of a notorious flop to satirise the art world, hegemonic game design, and capitalism (2018). Burke contends that console owners have long altered their game consoles to circumvent corporate region-locking, recounting the violent user practice of shearing plastic barriers within the Sega Megadrive to allow for the insertion of Japanese-region cartridges (2016, p. 98). And, in her study of ROM hackers, Consalvo recounts the efforts of the *EarthBound* fan community to unofficially translate the Japanese-only game *Mother 3* into English, undermining Nintendo's localisation and distribution strategies (2016, p. 60). Through these examples we see that, while modding is commonly framed as an industry-centric practice, it constitutes a range of activities that fit no singular narrative and exist in a grey zone of legality and morality.

Legality and Authorisation

Postigo notes that, whether embraced or rejected by the original developer, modding practices expose how "the creative barrier between consumers and producers is historically porous" (2008, p. 60) and that approachable digital tools have accelerated this blending of cultural outputs. It is tempting to neatly divide stakeholders into users or companies, and their practices into authorised or unauthorised, but this is an exercise in futility. As Keogh notes, there is a clear impossibility in "categorising individual creators as either 'professional' or 'amateur' creators" and the videogame industry has often embraced and rejected near-identical activities based on its current interests (Keogh, 2019, p. 17). Keogh's viewpoint is heavily rooted in Lobato and Thomas' (2018) theorisation of the informal media economy, which I will explore in greater detail in my theoretical overview, but merits a quick summary here. The scholars describe formal economies as "industrially regulated" and informal economies as "[operating] without or in partial articulation with regulatory oversight" (Lobato & Thomas, 2018, p. 20), with theatrical movie releases (formal) and pirated DVDs (informal) being commonly-cited examples. However, while informal and formal practices appear to be diametrically opposed, Lobato and Thomas argue that media production and distribution practices exist on a spectrum and are "connected by exchanges of personnel, ideas, content and capital" (2018, p. 45). Thus, informal and formal economies are connected, codependent, and impossible to separate from one another—TV networks incorporate amateur footage without permission, fansubbers mimic corporate standards and distribution methods within their communities, and software engineers readily trade in both commercial and F/OSS code (Lobato & Thomas, 2018, p. 58). This

entanglement blurs distinctions of legality and morality and highlights the many stakeholders involved in media production and distribution.

While I argue that there is a haziness to game modification practices, there have been intense legal efforts to define what sorts of practices should be permitted. This aligns with Jenkins' acknowledgement that "the key debates of our times will be over who gets to define the terms of our participation" and that these debates will only intensify "as more groups assert control over the processes of cultural production and circulation" (2013, p. xxii). Court decisions are useful to refer to in these debates as they set legal precedents and, importantly, shape user activities by influencing popular ideas of what is allowed or disallowed. However, there are some major limitations in referring to legal precedents. First, while game modification practices occur across the globe, the most widely-cited lawsuits are from the United States court system (*Lewis Galoob Toys, Inc. v. Nintendo of America, Inc.*, 1992; *Sega Enterprises Ltd. v. Accolade, Inc.*, 1992; *Sony Computer Entertainment Inc v. Connectix Corporation*, 2000). America is commonly regarded as the trend-setter for intellectual property law, but relying too heavily on their legal lens risks the omission of jurisdictional specificities.

Second, both corporations and hobbyists are guided by assumptions regarding intellectual property law that embody their own interests over established precedent. Nintendo of America, for example, has contended that game-copying devices (i.e. technologies that allow users to make a digital copy of a cartridge-based game) are illegal in all contexts (*Archived: Legal Information (Copyrights, Emulators, ROMs, Etc.)*, n.d.), despite the fact that prior court cases have established the legality of similar media-copying for both personal (*Sony Corporation of America v. Universal City Studios, Inc.*, 1984) and intermediate (*Sega Enterprises Ltd. v. Accolade, Inc.*, 1992) use. Conversely, as I previously documented in my MA thesis (2019a, p. 56), users often work under the assumption that prior legal action justifies their activities. For example, videogame hackers presume that web-based ROM-patching applications are not liable for copyright infringement due to precedents established in the famous Game Genie lawsuit (*Lewis Galoob Toys, Inc. v. Nintendo of America, Inc.*, 1992). This viewpoint overlooks the fact that the Game Genie operates as an enhancement device, which was determined *not* to create derivative versions of the games it affected, while ROM-patching applications are explicitly designed to output derivative versions of a game, positioning its function more within the realm of fair use/dealing rather than eliding intellectual property protections entirely.

Finally, these high-profile court decisions typically only manifest at the behest of large corporations, overlooking many of the subtler methods that legal power is leveraged against users. A striking example of a smaller legal intervention can be seen with *Pokémon Prism*, a fan-made hack of *Pokémon Crystal* created by Koolboyman that he developed as an unofficial entry in Nintendo's popular franchise. Shortly after featuring the game on a Twitch stream, Koolboyman received a cease-and-desist order (Nintendo of Australia, 2016) and, consequently, halted production on the project (although it was later picked up, surreptitiously, by another group of hackers). Nintendo put forth the cease-and-desist order even though Koolboyman never hosted a copy of *Pokémon Crystal* and, instead, provided access to a patching application capable of editing a user-provided ROM. While court cases are often heralded for clarifying

aspects of intellectual property law, contesting a cease-and-desist order is something that the average user cannot afford to do, which leads to two common outcomes. First is what Ribaudo (2017) and other scholars have referred to as the *chilling effect*, where projects and activities are abandoned based on prior precedent or presumed legality. Koolboyman did not necessarily believe his actions were illegal but, rather, he could not bear the legal costs of proving otherwise. While the legality question remains unresolved, users may be discouraged from pursuing game modification work for fear of hitting a similar roadblock. Second, returning to Jenkins for a moment, users often adopt tactics to circumvent practices that are presumed to be illegal (or, at least, easily targeted through legal action). ROMhacking.net, perhaps the most prominent archive of ROM hacks online, explicitly bans the distribution of ROMs on their website, well aware that this type of activity has historically led to disastrous outcomes, including a recent judicial decision for multi-million dollar damages and a full injunction (*Nintendo of America, Inc., Plaintiff, v. Matthew Storman, Defendant*, 2021). This dance between stakeholders manifests in various ways: YouTube content creators change their background music to avoid copyright strikes, peer-to-peer users activate VPNs to prevent ISPs from tracking their file sharing, and modders obscure themselves behind pseudonyms that make real-life identification next to impossible.

As a final note on legality: though many hacking and modding activities have political implications, researchers have warned against presuming that practitioners are politically motivated. Vanderhoef is quick to highlight, for example, that while the homebrew and reproduction work that has flourished around the Nintendo Entertainment System is political based on its premise—resisting planned obsolescence by reverse-engineering corporate technologies—its members tend not to approach the practice "from a place of social, political, or economic critique" (2017, p. 122). Instead, they view it more as a playful expression of preservation and nostalgia—points that I will elaborate on in the final section of my literature review. When looking at game modification practices, especially those with histories of legal controversies, it is tempting to align them with radical computer hacking activities that are similarly concerned with access, ownership, and legality. However, Coleman (2013; 2008) warns against such simplifications in her studies of hacking and F/OSS communities, highlighting the heterogeneity of online subcultures and the dangers in prescribing a single definition to a diverse set of practices. She dismisses the notion of a distinct "hacker ethic," for example, in favour of "multiple, overlapping genres that converge with broader prevailing political processes" (Coleman & Golub, 2008, p. 256). Oftentimes, what is construed as political or part of a larger movement, is a less coordinated user effort to continue their creative practices unimpeded. Thus, while fan studies literature is invaluable for its inclusion of legal and moral debates, it is important to recognize the specificity of each case study and to not be overly prescriptive regarding motivations and community values.

Nostalgia, Authenticity, and Digital Cultural Memory

In the final section of this chapter, I turn my attention to the temporality of videogame consoles and how they are remembered and archived after their commercial lifespan has ended. Guins aptly describes this period of time as a game's *afterlife*, "a curious state after

commodification and consumption, after intended utility and designed functionality, and possibly even obsolescence; where a standard life span is met with extended or repurposed and recontextualized uses" (2014, p. 7). I will elaborate on Guins' writing in my theoretical overview, tying his perspective in notions of residuality (Acland, 2007; Williams, 1977) and trajectory (Appadurai, 2013; Kopytoff, 2013; Sterne, 2007), but here I choose to limit my scope to two areas: nostalgia and digital cultural memory. For the former, I look toward videogame user interventions that reconcile the past with the present, rooted in frameworks of nostalgia. Regarding digital cultural memory, I briefly discuss the ability of digital archives to create shared troves of cultural memory that are untethered from commercial and institutional stakeholders, and how users leverage them to destabilise and personalise game histories.

Nostalgia, Reproductions, and Emulation

In their anthology *Playing the Past*, Whalen and Taylor argue that a critical nostalgic turn is necessary to reconcile game research with time and memory, posing that many insights can be gleaned by studying hobbyist projects that revive, maintain, and/or remediate so-called "classic" videogame technologies (2008, p. 3). There are numerous user activities that fall under this broad umbrella: the emergence of *reproductions*, newly manufactured versions of older videogame technologies (Vanderhoef, 2017); the development of *emulators*, programs that allow a computer system to mimic another computer system (Murphy, 2013); and countless *hacking* and *modding* practices that alter commercially-released games to meet preconceived notions of authenticity (Iantorno, 2019a), to name a few. While these practices are diverse, they are all driven by a nostalgic desire to refashion and repackage the past in different ways.

Boym's writing on nostalgia is foundational to these discussions due to her breadth—covering topics ranging from blockbuster films to state propaganda—and her critical deconstruction of how nostalgia manifests. Boym frames nostalgia as "a longing for a home that no longer exists or has never existed" (2011), distinguishing between two types: restorative and reflective. Restorative nostalgia "attempts a transhistorical reconstruction of the lost home" (Boym, 2007, p. 13) and often thinks of itself not as nostalgia, but rather, as a form of truth and tradition. Reflective nostalgia, on the other hand, "thrives on *algia* (the longing itself)" (Boym, 2007, p. 13), calling truth and tradition into doubt while dwelling upon the contradictions of modernity and the complex dynamics of human longing. I am particularly drawn toward Boym's *Jurassic Park* metaphor in these discussions, perhaps due to its contemporaneity with nineties videogames and its focus on technologically reproduced marvels from the past. The film's pivotal amber fossil, a perfectly preserved piece of history that many would have happily displayed as a relic in a museum collection, is instead transformed into a piece of a scientific puzzle that enables a mass revival of a lost era (Boym, 2001, p. 35). This relationship between preservation and reanimation, in addition to making for good cinema, is intriguing in the context of videogame collection, reproduction, and emulation projects that profess authenticity using a blend of old and new technologies. As Boym notes, "artifacts of civilisation are made both available and disposable through mass production" (Boym, 2001, p. 38), providing users with the opportunities to collect or reproduce them in new contexts.

Remediation is central to processes of videogame revival and reconstruction, which Bolter and Grusin define as "the representation of one medium in another" (1999, p. 45) and purport to be the defining characteristic of new media. Remediation can strive to be transparent, occluding the medium in pursuit of immediacy and immersion (Bolter & Grusin, 1999, p. 21). More commonly, however, remediation draws attention to the medium by embracing the hypermedia affordance of computers (Bolter & Grusin, 1999, p. 31). Whether striving to be subtle or self-referential, remediation is used by various stakeholders to revisit videogame technologies. Shifting older games to newer platforms creates opportunities for play and profit and leads to nostalgia-driven debates about authenticity and faithfulness to the original media text. As it often does, nostalgia plays a double role here. On one hand, remediation may be used to establish a canon of game history, with corporations and institutions elevating a select number of their titles they claim are popular, influential, or culturally significant. On the other hand, users may favour copying, redistributing, and altering game technologies in more improvisational ways, playfully deconstructing their vaunted status and presumed use contexts.

In a potent example of competing forms of remediation, Payne (2008) uses the nostalgic lens to contrast the efforts of plug-and-play (PNP) videogame developers with those of the MAME[2] design team in providing access to classic arcade games. PNP devices are commercially produced miniature game consoles that connect to a television and provide access to a small number of 'classic' games such as *Pong* or *Frogger.* Payne characterises the work of PNP manufacturers as a "revisionist history [that] replays only economic successes, ignores marginal texts, and frames classic gaming as cheap and kitschy, easy-to-use novelty" (2008, p. 62), providing a limited and unalterable experience of classic videogames. In contrast, he claims that the MAME development community fosters an "organically evolving game memory" (2008, p. 62) due to the flexible nature of the emulation software. With MAME, users are granted the ability to "preserve and curate their own collections" (Payne, 2008, p. 56) and may push back against delimited official game libraries.

Payne's dichotomy is, however, a bit simplistic. Many early videogames were produced as easy-to-use immutable novelties (Custodio & Iantorno, 2023) and emulator developers commonly prioritise compatibility with well-established titles over lesser-known ones. Still, he points toward the tendency of commercial entities to package "all of the advertised nostalgia with none of the obsolescent mess" (2008, p. 62) in an attempt to stabilise a specific idea of game history, while highlighting how MAME developers adopt a more reflective form of nostalgia that encourages users to cultivate their own archives and canons.

Murphy (2013) further complicates the preservationist aspects of MAME in two ways. First, he indirectly builds upon Payne's assertion that emulation disrupts commercial game histories by pointing out its uneasy relationship with intellectual property law. As I touched upon in my discussion of platforms, emulators rely on users to provide ROM images of commercially produced games that, outside of uncommon technical assemblages, are generally not acquirable through legal means. Access, then, becomes central to the historicization of games

[2] Although once standing for Multiple Arcade Machine Emulator (MAME), MAME is now an orphan acronym. Regardless, MAME is still an emulator focused on arcade technologies.

as companies do not just elevate certain titles over others through marketing efforts, but also restrict access to games that do not fit within their corporate desires. Murphy argues that MAME is a "ludic technology designed to ensure that digital rights management does not result in a situation where games are lost due to industry negligence" (2013, p. 49), creating space for games that companies have pushed to the wayside. However, he also acknowledges that emulation does not fully bring about an authentic revival. Despite its claims of authenticity through accurate audio-visual reproduction, MAME is bereft of the social context of play. Arcade games were located in public spaces, housed within elaborately decorated cabinets, featured much-coveted high score leaderboards, and were designed around an "economy of time where skilful players were rewarded with longer games" (Murphy, 2013, p. 45). Thus, while MAME provides access to games that may have otherwise disappeared, it also disfavours material-focused discourses by elevating the importance of code.

Similarly concerned with the absence of materiality, Vanderhoef asserts that digital-centric discourses generally fail to recognize the user desire to create and distribute physical objects (2017, p. 115). He argues that one of the main motivations for NES homebrew developers is the possibility of creating a physical game cartridge—complete with box art, instruction manual, and other ephemera—to "create continuity with older games and contribute to the canonical NES library" (Vanderhoef, 2017, p. 115). Game cartridges have become uncommon as the industry increasingly relies on digital storefronts, and they harken back to a time when physical objects played a larger role in games distribution. Both Payne's discussion of PNP devices and Vanderhoef's investigation into NES homebrew make evident that formal and informal industries are quick to capitalise on social and cultural memory through nostalgic facsimiles. Vanderhoef claims that the "co-optation of social and cultural memory becomes a marketing strategy for the retro-games industry... repackaging it, and re-selling it to consumers, many of whom wish to reconnect with earlier periods in their gaming lives" (2017, p. 113), but also marks a divide between ideologies. He argues that established industry stake-holders tend to exploit nostalgia for financial gain, but smaller retro-gaming communities use vintage games to explore their own histories and form communities with like-minded folks (Vanderhoef, 2017, p. 115). The line between financial gain and personal reflection is blurry, especially with the emergence of retro-gaming cottage industries and niche crowd-funding campaigns, but Vanderhoef's perspective is useful in discerning the motivations behind physical goods that mimic the form and function of older ludic technologies.

Reproductions, emulators, and modifications all conjure questions of authenticity that have no easy answer. Dissecting the conception of an authentic return, Swalwell notes that "early games seem to call forth a very strong desire in some for 'the way it really was', even as they simultaneously remind us of the impossibility of recapturing a past time" (Swalwell, 2013, p. 2). Deviations and concessions may be deemed inauthentic, such as with the sanitised history of PNP devices or the code-centric efforts of MAME developers, and user communities often form judgements based on shared expectations and idealisations.

In her study of *Silent Hill* fan communities, Whiteman (2008) discusses how fans devise idealised meta-texts to reconcile their love for videogame franchises that span across various sequels and remakes. A meta-text, as initially laid out by Jenkins (1991), is a fan-created

conceptualisation of a media franchise that is used to evaluate what should or should not be present within it. In the context of the television series *Beauty and the Beast,* Jenkins notes that fans went as far as to designate certain officially-released episodes as non-canon due to their departure from perceived notions of what should be possible within the program's universe (1991, p. 105). Whiteman notes that *Silent Hill* fans acted similarly after the release of *Silent Hill 4: The Room*, as its setting (a haunted apartment rather than the eponymous town) and gameplay (a first-person perspective rather than third-person one) were considered too much of a deviation from prior entries. Whiteman argues that fans had ascribed a set of narrative and ludic values to the series and applied them to the new entry as a part of a "negotiation of textual authenticity," with dissonance between the meta-text and the new sequel creating a longing for a "return to an idealized state" (Whiteman, 2008, p. 33).

Sometimes this dissatisfaction goes unresolved, with users simply lamenting changes within a franchise and moving on. Other times, fans may engage in modification activities to forcibly realign a game with their expectations. During my master's degree, I highlighted one such effort by *Super Smash Bros: Project M* modders. Critical of how the core fighting mechanics of the series changed between *Super Smash Bros. Melee* (2001) and *Super Smash Bros. Brawl* (2008), particularly the introduction of chance elements and slower-paced gameplay, fans altered the sequel to better abide by an idealised set of competitive values (Iantorno, 2019a, p. 68). The adoption, and occasional rejection, of *Project M* within the competitive *Smash Bros.* community highlights how these conflicts do not simply represent tensions between corporate entities and users, but also a negotiation between user groups. While the modified game's mechanics were designed to better adhere to an idealised conception of how the franchise should function, its origin is rooted in practices that many users considered illicit or unauthorised, showing how user corrections may be just as contested as official deviations from an idealised meta-text.

Archives and Digital Cultural Memory

So far, I have discussed game technologies as shared textual resources that have become increasingly reconfigurable due to digital technologies. While I have focused on ludic outcomes such as reproductions, emulators, and mods, archives also play an important role in videogame user communities. De Kosnik proposes two definitions of 'archive' in fan communities that I will reference here. First, echoing fan studies perspectives, she highlights how users challenge distribution strategies that present media texts as finished products (2016, p. 34), transforming each one into "an archive to be plundered, an original to be memorized, copied, and manipulated—a starting point or springboard for receivers' creativity, rather than an end unto itself" (2016, p. 4). Second, De Kosnik observes that archives beget further archives, with computing technologies enabling the creation of *rogue archives* by "nonprofessionals—by amateurs fans, hackers, pirates, and volunteers" (2016, p. 2) who strive for more democratic participation in the production of digital cultural memory (2016, p. 11). Many projects fall under De Kosnik's broad definition of rogue archives, from fan-fiction collections to community-driven software repositories, all of which enable amateurs to take on roles that previously only existed within traditional memory institutions.

In *Archive Fever* (1996), Derrida makes an early argument for the digital transformation of archives. While frustratingly limited in his discussion of new media—Derrida seems most interested in emails despite writing in a decade rich with databases and hypertext experiments—he identifies how digital affordances influence the process of archivization and the structure of the archive. The archive is not only a place for "stocking and for conserving an archivable content *of the past"* (Derrida, 1996, p. 16) but also a set of practices and technologies that determine the "structure of *archivable* content even in its very coming into existence and in its relationship to the future" (1996, p. 17). As an example, he contemplates whether an archive of Freud's work would have taken the same form if it had been contemporaneous with email, due to the technology's near-instantaneous communication, blurring of public and private spaces, and de-emphasis of the handwritten communications that currently lie at the heart of psychoanalytic discourse (Derrida, 1996, p. 17). Reflecting on Derrida's work, Manoff argues that this realisation is the French scholars' most important contribution to the field, as "the methods for transmitting information shape the nature of the knowledge that can be produced" and "library and archival technology determine what can be archived and therefore what can be studied" (2004, p. 12). In the context of flourishing Internet archives—many of which are no longer tied to established institutions such as museums, archives, and libraries—it is worth considering how new media affordances alter their access, structure, and contents.

Steedman and Taylor argue that Derrida, and others, have rendered the term archive "capacious enough to encompass the whole of modern information technology, its storage, retrieval, and communication" (Steedman, 2001, p. 52) while diminishing the physical realities of archival practice. Does an online database, for example, count as an archive if it divorces itself from established structures, organisational regimes, and maintenance standards? Taylor goes as far to claim that most digital-born archives are not truly archives at all:

> ...most of what people call online 'archives' are not archives though they may have some archival features… It's a commitment issue—the owners may or may not commit to preserving these materials long term. Further, there is no selection process for materials uploaded online. No one vouches as to its sources or veracity. Expertise is irrelevant. The materials seem free and available to anyone with Internet access—avoiding the rituals of participation governing traditional archives. Power and politics continue to underwrite access, though at first it's not clear how. (Taylor, 2010, p. 14)

Though Taylor's insights are valuable, she downplays the knowledge and commitment of amateur archivists. Community expertise and maintenance are important rebuttals to this viewpoint, as I will discuss in my theoretical overview through Marvin's (1988) and Jenkins' (2006) writing on textual communities. For now, I use Taylor's criticisms and De Kosnik's optimism as entry points to discuss what may be gained (or lost) through digital archival practices, particularly those centred around videogame technologies.

De Kosnik suggests that, by digitally archiving aspects of mass culture, users can establish their own memories and histories that may not align with institutional or corporate interests (2016, p. 2). Speaking of these archives in relation to videogames, Navarro-Remesal acknowledges that users may be "less reliable as historians" but, importantly, "engage with and record aspects of the history of the medium that are usually left behind by official institutions"

(2017, p. 128). He divides these leftover fragments of game history into three categories: bad games, which have either been ignored or celebrated ironically due to their poor quality; unreleased games, which have been abandoned by their developers but are sometimes revived through informal fan efforts; and flops, commercially unsuccessful games that may later be elevate to cult classics (Navarro-Remesal, 2017, pp. 137–140). Whereas popular games often hold currency in memory institutions and are continuously re-released across official platforms, misfit games are less heralded and occupy an unstable place in cultural memory. Navarro-Remesal claims that the fan archival of these technologies is a practice of resistance against corporate histories but, also, a way for user groups to give "cultural validity and relevance to their own emotional investments" (2017, p. 132). While gaming history is often presumed to be homogeneous, no doubt fostered by institutional and corporate canons, games with little perceived quality, historic value, or cultural relevance hold significance to a great many users.

Users are not solely interested in exploring less celebrated games, however, and the archival impulse often drives them to probe the innards of popular titles in search of secrets and fragments of the past. Newman notes that games are "routinely *ported* (transferred and translated) to different operating systems and platforms with differing hardware and software capabilities, and *patched* (updated to fix bugs or modify gameplay mechanics)" (2012b, p. 135), belying their perception as singular media texts. Even cartridge-based games, which many fans fondly recollect as singular objects unbeholden to updates, exist in quiet multiplicities. *Sonic 1*, in addition to being ported to several of Sega's platforms, was also patched between production runs without any differentiation formally communicated to consumers (Newman, 2012b, p. 139). While these changes may have been small, they throw into question the idea of a developer-intended version of a game and fragment what users imagine to be consistent ludic experiences. Instability and uncertainty are key here, and are both points Newman (2017) explores in his dissection of *Super Mario Bros*' infamous World -1. As an unintended side-effect of the game's programming, players may gain access to a series of glitchy hidden stages by successfully executing a specific, unusual, pattern of movement in level 1-2. Emerging first as an urban myth, its existence was later confirmed through video documentation and user tinkering, surprising not just the game's fans but also its developers (Newman, 2017, p. 152). Newman argues that codemining, the purposeful excavation of software code through reverse engineering, allows users to unearth lost development processes and reveal unintended assets and affordances within previously impenetrable games.

Would it make sense to associate the activities described by Navarro-Remesal and Newman with Derrida's titular *Archive Fever*, particularly the compulsion to seek out origins and moments of inception? Steedman interprets Derrida's purported illness as a two-pronged "precursor fever" (2001, p. 1164) afflicting those who work with archives. Archivists take great pleasure in deconstructing a text to find something new, yet they experience persistent anxiety that they "will not finish, that there will be something left unread, unnoted, untranscribed" (Steedman, 2001, p. 1165). Videogame history, as mediated by corporations, evades this self-reflection by assigning a false sense of finality to a select canon of works. But, as Heineman elaborates in his investigation into memory and gamer identity, these histories will always fail "to capture the richness and complexity found across the many sites devoted to an ongoing

process of chronicling the history of classic games" (Heineman, 2014, p. 14). Users hold affection for games that corporate histories wish to diminish and, by delving into popular titles, they may discover that ostensibly singular objects hold complex provenances and hidden affordances. As Taylor recounts, the spectre of loss may "explain our current obsession with archives and the nostalgia both for embodiment and for the object" (Taylor, 2010, p. 15), with digital technologies facilitating methods for users to pursue and preserve their own histories.

As a final note, it is important to remember that even though digital archives are viewed with trepidation by institutional actors, amateurs and hobbyists are frequently trailblazers for game preservation practices. Swalwell recognises that retro-game communities "grasped the threats to digital games' longevity before the fragility of digital media was widely appreciated" and that users decided to "start documenting and preserving games and related artifacts long before games were on the radar of most cultural institutions" (Swalwell, 2013, p. 1). Emulators and fan websites are some of the earliest and most persistent online game repositories, informally digitising large swaths of gaming history and culture while appending them with expressive elements—personal commentary, informal histories, and unauthorised activities—that institutions have been slow to recognise and reluctant to incorporate in their collections (Guay-Bélanger, 2022). Švelch (2017) reminds us that, while such practices are certainly hastened by the Internet, computing archives existed before digital technologies were ubiquitous. In his study of the Sinclair ZX Spectrum enthusiast community in the eighties, he traces how user shared their technical expertise and personal opinions in magazines and informal networks, historicising and iterating upon the 8-bit home computer even as its own manufacturer resigned it to obsolescence (2017, p. 57). Perhaps then, the best lesson learned through this user-driven archival work is that archives are not just spaces for documentation but also for social connection and provide opportunities for their contributors to reconcile personal memories with institutional practice.

3. Theory & Methods

Chapter Introduction

In this chapter, I provide an overview of the theories and methods that underpin my study of the SNES/SFC platform (**Error! Reference source not found.**). My research builds upon the epistemological provocations posed by Apperley and Parikka (2018), who urge scholars to interrogate and expand the platform studies archive. Using a media archaeological lens, I destabilise the SNES/SFC's platform archive by centering informal technologies, practices, and industries that have emerged following the console's commercial lifespan. I situate scholarship as a productive expansion of videogame platform studies, joining a growing number of academic projects that challenge the field's preoccupation with top-down corporate narratives and formal documentation.

In this pursuit, I immensely benefit from the groundwork laid by Arsenault's existing platform study (2017) and a vast trove of popular writing that documents early nineties console gaming in North America (Harris, 2014; Tulis & Harris, 2020). Arsenault's account of the SNES/SFC, which I will refer to throughout my dissertation, provides invaluable insights into the platform's business and marketing histories. He urges readers to "consider platforms not only as technological objects but also as the embodiments of marketing forces that shape the creative works performed on that platform" (Arsenault, 2017, p. 5), drawing upon corporate documentation to bolster his arguments. Arsenault's work holds similarities with popular media accounts of the SNES/SFC, which largely define the device through its competition with the Sega Genesis and frame it as a liminal technology that bridges the phenomenal success of the NES with the three-dimensional follies of the N64 (Harris, 2014). The aim of my media archaeological research is not to use these prior studies as a convenient strawman but, rather, to expand this scholarship to include unauthorised and unofficial industries and technologies that proliferate around commercial videogame consoles.

Media archaeology, however, is difficult to circumscribe as it exists less as a formalised field or methodology and more of a fluid collection of themes, approaches, and philosophies. Huhtamo and Parikka introduce the concept by readily admitting that there "is no general agreement about either the principles or the terminology of media archaeology" (2011, p. 2) and Custodio laments that the term's precise definition "depends largely on the media archaeologist" (2020, p. 26). Even scholars who are oft-celebrated for being the forebears of media archaeology—perhaps most famously Walter Benjamin and Michel Foucault—were tied into the field posthumously, leaving its theoretical lineage open to interpretation.

However, it is possible to ascertain trends in media archaeological research. Despite calling attention to the field's ambiguity, Huhtamo and Parikka provide a serviceable throughline by crystallising numerous scholarly perspectives:

> Discontent with "canonized" narratives of media culture and history may be the clearest common driving force. Media archaeologists have concluded that widely endorsed accounts of contemporary media culture and media histories alike often tell only

> selected parts of the story, and not necessarily correct and relevant parts. Much has been left by the roadside out of negligence or ideological bias. (Huhtamo & Parikka, 2011, p. 3)

This statement proves useful due to its incorporation of theories from the growing collection of media archaeological writing. Lovink's contribution is felt keenly, as he believes that media archaeology is a discipline that involves a "hermeneutic reading of the 'new' against the grain of the past, rather than telling the histories of technologies from past to present" (2003, p. 11). Ruptures, discontinuities, and dead ends are of utmost interest as they have the potential to dispel teleological and technologically deterministic historical accounts. I can also discern elements of Zielinski's variantology, a media archaeological critique of both mainstream media culture and the rigidity of contemporary media studies (Huhtamo & Parikka, 2011, p. 10), which seeks out the "non-normative, the alternative, the minor, and the differing practices" (Parikka, 2019) in media technologies. Through his related practice of anarchaeology, Zielinski privileges "a sense of the multifarious possibilities over their realities in the form of products" (2006, p. 27) and encourages the use of heterogeneous research materials and methods. Finally, I can tie this definition into Apperley and Parikka's description of media archaeology as "a broad field of analytical and creative interests that has been able to complicate and broaden media historical analysis" (2018, p. 364); one that provides an opportunity for scholars to question the implicit ways meaning is produced through media objects.

While not always conducted under the banner of media archaeology, there is a great deal of platform research that questions existing videogame histories and how they are constructed. Custodio has investigated the Game Boy Advance's "afterlives through homebrewing, hacking, and hardware modding" (2020, p. 174) undertaken by users; Altice has chronicled the development of emulation technologies that throw the stability of Nintendo Entertainment System (NES) hardware and software into question (2015, p. 289); and Jones and Thiruvathukal have highlighted how Wii hardware hackers develop complementary technologies that go "against the grain of the designers' and producers' intention" (2012, p. 129). As Apperley and Parikka urge, these research venues expose the cracks in dominant platforms studies paradigms, "testing the boundaries of what is counted as a platform" while contesting "narrowly defined user relations that platform studies often assumes" (2018, p. 363). Media archaeology, in this context, counters the idea of a singular platform with a contained lifespan, whose function and purpose are predominantly determined by a single group of stakeholders.

Though I draw inspiration from these research projects, my dissertation differs from them in two central ways. First, where these platform studies use officially released technologies and documentation as their starting point, my case studies all begin with less formalised practices and technologies. These typically exist on the fringes of platform research—often relegated to a single chapter in a book or a subheading in a journal article—and I wish to recentre their importance to the SNES/SFC platform. Second, my methodology takes a posthumanist bent that combines the hands-on technological experimentation demanded by media archaeological research alongside hybrid ethnography of material communities who actively work to reshape videogame platforms. Unlike some of the more stringent German

media archaeologists[3]—who pursue an anti-humanist practice with a "cold, hard materialist approach" (Emerson, 2022)—I believe that user communities and their outputs (hardware, software, texts, etc.) are integral to understanding a console's everyday use. Subsequently, these informal technologies cannot be fully understood without seeking out the expertise of those who have developed them. These theoretical arcs lead to my core research questions:

1. What new insights can a media archaeological approach glean from the SNES/SFC, a videogame platform that is already well-established in game histories?

2. What are the underlying discourses of material communities that have grown alongside the SNES/SFC and maintained themselves (and the platform) during its afterlife?

3. How can posthumanist ideals be integrated into media archaeological research to move beyond cold, hard material analysis?

As will become evident in my case studies, my research questions cast a broad net: there are countless technologies and practices that I could study to answer them. However, they all embody the media archaeological discontent that Huhtamo and Parikka describe toward canonised media narratives, as well as Apperley and Parikka's desire to pull apart platform studies at the seams. I will revisit these questions in my case studies and conclusion, but for now, I turn toward their theoretical underpinnings.

Theoretical Overview

I divide my theoretical overview into four subject areas: **temporality**, **stability**, **formality**, and **material communities**. In discussions of temporality, I question the dominant narratives associated with a videogame platform's lifespan such as official release windows, console generations, and a perceived descent into obsolescence. Guins' *Game After* proves central to this research purview, particularly his notion of videogame afterlives, but I also turn toward Appadurai (2013), Arsenault (2017), and Sterne (2007) to ponder the 'standard' trajectories of videogame consoles. Interrogating the stability of videogame technologies means seeking out their, often subtle, multiplicities to complicate their status as singular objects. I delve into forensic efforts by Newman (2012b, 2012a) and Wershler (2022) to dissect how seemingly monolithic hardware and software are constituted from numerous "changing, unstable object[s]" (2012b, p. 137). With formality, I seek out a more nuanced framework for addressing distinctions such as producer/user, authorised/unauthorised, and professional/amateur. I begin by combining Certeau's (1980) theorisation of power relations with Watson's (2019) mobilisation of strategy and tactics in *Minecraft* (2011) modding cultures, but I primarily draw upon Lobato and Thomas' (2018) conception of (in)formality to highlight the mutability of videogame production and distribution practices. Finally, the concept of material communities

[3] At the *Game Science* symposium in 2022, at which I was a presenter, Wolfgang Ernst made an unannounced appearance during question period. He proclaimed that he did not believe speaking to media practitioners was productive and that he designed his research practice to "get away from people."

provides a posthumanist lens for studying communities that grow alongside media technologies and produce their meaning. An adaptation of Marvin's textual communities (1988) initially posed by Wershler (2019) in his study of residual videogames, he advocates for the enmeshed study of people, protocols, technologies, and techniques. Material communities highlight the importance of maintenance in varied social-technical contexts.

Temporality

Life and death are fraught terms when discussing new media technologies, as they suggest that devices from computers to cell phones possess finite, somewhat predictable lifespans. While this sentiment may appear self-evident—nothing lasts forever, after all—consumer media products are notable for the sociotechnical processes that actively shape their duration. In *Out with the Trash*, Sterne claims that disposability (or the perception of disposability) is one of the distinctive features of new media technologies (2007, p. 18). This disposability manifests in two ways: stylistic obsolescence, where an object is viewed to have gone out of fashion, and technological obsolescence, where an object falls behind a perceived technological curve (Sterne, 2007, p. 20). The march toward obsolescence is both self-referential and intentional. With videogame platforms, developers establish obsolescence through wholesale generational shifts (each of which promises a newer, better, or *Super-er* Nintendo) or incremental technological updates (why buy a Nintendo DS when you can get a DS Lite, DSi, or DSi XL?). Echoing Sterne's sentiments, Newman observes how obsolescence is actively produced in the service of commercial interest: "a yearning for the future not only outstrips an interest in the past but is at least partly contingent on eradicating its memory" (2012a, p. 10). In order to sell the new, consumers must be convinced to bury the old.

Even uncritical accounts of media history recognise that death is neither absolute nor instantaneous. Media undergo numerous taxonomic transformations across their lives: from new, to useful, to obsolete, to unused, to garbage (Sterne, 2007, p. 24). While these changes are not inevitable and may even be reversible—Sterne highlights the cyclical re-emergence of vinyl records through nostalgic revivals—they represent a dominant pattern. Both Appadurai and Sterne suggest that there are standard flows for consumer goods; customary circuits they follow throughout their lifespans influenced by sociotechnical factors. For Appadurai, studying these flows involves scrutinising the social life of a "thing", a practice that he feels is important for two reasons. First, it allows for a recognition that objects in our society take on numerous values which are never inherent but, rather, are a "judgment made about them by subjects" (Appadurai, 2013, p. 3). Notably, he outlines how the term 'commodity' represents less a specific type of object but rather one stage in its social life—"the situation in which its exchangeability for some other thing is its socially relevant future" (Appadurai, 2013, p. 13). Second, by attempting to flesh out the total trajectory of an object, we can observe a "shifting compromise between socially regulated pathos and competitively inspired diversions" (Appadurai, 2013, p. 17). Appadurai's examples of diversions range from the dramatic (the sale of a beloved family heirloom in hard times, returning it to commodity form) to the artistic (the transformation of found objects into art spectacles, granting them a singular value). Whatever the diversion, he notes that the challenge is to "define relevant/customary pathos so the logic of

diversions can be understood" (Appadurai, 2013, p. 29). These diversionary logics are intriguing in relation to videogame technologies, but to interpret them I must first identify a customary circuit.

Game companies design a standard life cycle for a videogame console—beginning as a highly sought-after commodity, transforming into a hub of everyday use and complementary purchases, and eventually descending into perceived obsolescence. The beginning of this cycle is heralded with intense advertising campaigns announcing a console's arrival into the world, where developers persuade consumers to purchase their device over those of their competitors. While some of the advertising rhetoric is focused on selling a superior piece of technology, Arsenault questions purely technical perspectives by noting that "platform owners do not sell technology to gamers as a base good; they present technology as a promise of new games to come" (2017, p. 52). That is, a game platform does not stand alone but is part of an ecosystem strengthened by its software, peripherals, and intellectual property. Regardless, after its initial purchase, the console's adoption into the home marks the beginning of a phase characterised by everyday use and consumptive engagement (Arsenault, 2017, p. 52; Guins, 2014, p. 7). The availability of complementary goods "creates lasting value for the consumer that can quickly exceed the value of the primary good (the console)" (Arsenault, 2017, p. 50) and provides the user with more reasons to engage with the console. Depending on the success of a platform, this active period may last months (such as with the ill-fated Virtual Boy) or years (as seen with Sony's typical 5–7-year PlayStation release cycle), with its end gradually brought about by a suspension of customer support, the ceasing of software development and hardware manufacturing, and the release of a successor console.

While this customary circuit proves useful, some qualifiers are needed. First, this life cycle is only adopted by a small number of large companies whose devices "lean heavily into generational logics that differentiate one console release from another through supported lifespans and standardised software formats" (Arsenault, 2017, p. 12; Custodio & Iantorno, 2023). Many game consoles—ranging from early *Pong* machines to modern day plug-and-play devices such as the Super NES Classic Edition—more closely follow the standalone release strategies of toys or boardgames. Second, this perspective glosses over the heterogeneity of videogame hardware. As I will elaborate on in my discussions of singularity, platforms exist as families of devices with highly touted branded editions and almost imperceptible technical iterations, both which complicate straightforward hardware progressions.

Seeking out diversions from this customary circuit ties into the media archaeological desire to find ruptures and discontinuities. Guins' notion of "afterlife" proves useful here, as he attends to the "phases in the game's total life beyond its intended design and commercial circulation" (2014, p. 4). Games are ascribed countless meanings and uses over time, from falling into disrepair to becoming highly sought-after collector's items. In a sense, Guins presents afterlife as an antithesis to death, as death implies a level of stasis that few media objects achieve (and is perhaps only accomplished through outright destruction). While both a historical and archaeological endeavour, Guins critiques both perspectives for implying that technologies can achieve a definitive end state. Popular histories often position videogame consoles as bounded objects that are inevitably replaced by their generational successors or

resigned to the trash heap. And, despite ostensibly working against such teleological histories, media archaeologists occasionally make claim to unearthing lost media; uncritically bringing the past into the present by viewing it "hermetically sealed, time-capsuled for our rediscovery and reliving" (Guins, 2014, p. 3). Such scholarly endeavours can become fixated on either circumscribing or rediscovering aspects of videogame history, even though these technologies are not so easily bounded and have remained in continuous use. After all, as Hertz and Parikka note, "a medium never dies, but instead "decays, rots, reforms, remixes, and gets historicized, reinterpreted and collected" (2012, p. 430).

To pull an excerpt from the Residual Media Depot's mission statement—a playful inversion of William Gibson's famous amorphism—"the past is still here; it's just unevenly distributed" (Wershler, 2016). Games do not simply *poof* out of existence once their successors hit the market nor do they stabilise into static objects for future study. Instead, they enter a "curious state after commodification and consumption, after intended utility and designed functionality, and possibly even obsolescence; where a standard life span is met with extended or repurposed and recontextualized uses" (Guins, 2014, p. 7). This perspective ties into William's notions of residuality (1977) and Acland's mobilisation of the term to discuss media technologies (2007). For Williams, residuality is the influence of "old" cultural practices in contemporary societies as a residue, and points toward practices that are "effectively formed in the past, but [still] active in the cultural process, not only and often not at all as an element of the past, but as an effective element of the present" (1977, p. 122). Acland explicitly brings media technologies into this theoretical paradigm through studies of "living dead culture," offering a corrective to media histories that either do not account for continuity or overly fetishize the new—"the residual can be artifacts that occupy space in storage houses, are shipped to other parts of the world, are converted for other uses, accumulate in landfills, and relate to increasingly arcane skills" (2007, p. xix). This multifaceted approach is attentive to how media technologies and practices fade away or persist over time, while also questioning how new cultural phenomena build upon existing forms and practices. Afterlife does not begin at a set point in the life of a game but, rather, represents an oblique moment when its product phase recedes and it may be disassembled, repurposed, or revalued (Guins, 2014, p. 11). Identifying the nuances of this threshold and the diversions videogames undergo, then, is essential.

Stability

Even before a videogame technology enters its afterlife phase—when it is subject to a myriad of alterations from hackers, modders, and tinkerers—it exists in quiet multiplicities; a fact that is not well-documented in videogame histories. For example, nowhere within the pages of *Console Wars* (Harris, 2014)—perhaps the most prominent popular press chronicling of the console—does the author mention that the Super NES was not a single device but, rather, a complex series of hardware iterations. Two major versions of the console were produced in North America alone: the original SNS-001, a boxy industrial unit that dominates public memory of the device; and the SNS-101, dubbed the "New-Style Super NES," which features a sleeker design. However, major model revisions are only the most perceptible aspect of the SNES/SFC's iterative development. Throughout its release window, Nintendo implemented numerous

unadvertised hardware changes ranging from motherboard revisions to video chipset reconfigurations (Neal, 2013). Given that *Console Wars* is a dramatised marketing history that leans heavily into generational logic, it makes sense for Harris to gloss over these details. After all, most users would neither know nor care about the subtle hardware variations within a console. Nonetheless, this type of chronicling retroactively applies a uniformity to consumer goods that they do not possess.

As made evident by the stacks of SNES/SFC housed within the Residual Media Depot, I share my preoccupation with the device's innards with lab director Darren Wershler. When discussing the signal modding practices that have developed around the device, Wershler looks toward Zielinksi's variantology to contemplate formal console iterations alongside modifications created by installing RGB bypass chips (2022). While he rightly credits game scholars such as Arsenault (2017) for their work in documenting major console releases and the sociotechnical discourses that determine how they were produced, marketed, and distributed, Wershler claims that existing accounts are quick to homogenise console hardware configurations:

> From the outside, multiple examples of objects like our consoles may look identical in every respect, but inside the casing, the mainboard design, onboard components, and firmware may be radically different. In a successful device that is on the market for several years, there will frequently be multiple revisions, which will all have their own specific characteristics. (Wershler, 2022, p. 93)

As mentioned before, media archaeologists claim that established histories tell "only selected parts of the story" and much of their work involves investigating what has been left behind during the process of establishing canons (Huhtamo & Parikka, 2011, p. 3). In the case of the SNES/SFC—whose status as an influential game technology is generally undisputed—this involves fragmenting the console's hardware imaginary by recognising its fluid configuration. Dispelling the console's stability, Wershler demands that we consider "the circuits of individual examples of consumer devices in their particularity rather than collectively, as a class" (2022, p. 104). Approaching these objects, then, becomes a variantological puzzle involving "textual research, a forensic examination of the circuitry, consultation with a community expert, and the operation of the device with several different configurations of equipment" (Wershler, 2022, p. 108). Even straight out-of-the-box, the promise of a 'standard device' is an empty one.

Newman (2012a, 2012b, 2017) wields a similar theorisation, albeit with a focus on software. In his detailed study of *Sonic the Hedgehog* (1991), he discusses how the game has been patched, ported, and remastered countless times. While many releases of the game are explicit diversions, such as the heavily reworked 8-bit edition released for the Game Gear, there are subtler variations on Sonic's first adventure. In fact, shortly following the game's initial release (identified by ROM hackers as REV00), Sega quietly reissued an updated version (REV01) with changes ranging from bug-fixes to new visual effects (*Sonic the Hedgehog (16-Bit)*, n.d.). By attending to the existence of multiple versions of the same game, Newman can pose a provocative question: which one should be regarded as the original? While REV00 can make the straightforward claim to originality by being the first version to be released to the public, Newman notes that the changes made for REV01 arguably bring *Sonic the Hedgehog* closer to

the developer's original vision (2012a, p. 130). The latter point is further reinforced by REV01's prevalence in digital marketplaces, such as the Wii's Virtual Console and the Switch's Online Store (*Sonic the Hedgehog (Genesis)/Revisional Differences*, n.d.), suggesting that it is Sega's preferred version of the title. I will talk about authenticity more later, but, for now, it is worth recognising that Newman is not concerned with claims of firstness or ascertaining a definitive game version. Rather, he argues that for almost any videogame there are numerous versions that may hold a "reasonable claim to being 'the original', if not by virtue of the time of their release, then as a product of their implementation of the original developers' intent" (Newman, 2012a, p. 130). Just as dominant discourses reduce the multitudinous SNES/SFC into a single console, so have they turned varied instances of *Sonic the Hedgehog* into a single game.

Building upon these points, I further argue that the media archaeological drive to seek out variations does not simply encompass the explicit affordances of videogame technologies but also their dormant capabilities. For example, in addition to exploring the default capabilities of SNES/SFC consoles, Wershler examines and modifies latent circuitry to reactivate quiescent video outputs. To simplify a complex technological timeline: later releases of the SNES/SFC omit video components that allow the console to output RGB and S-Video signals, which are arguably superior in quality to the default composite signal, but were rarely utilised by contemporary consumers (2022, p. 105). The expert discourse of console video outputs is messy and replete with pixels, scanlines, and CRTs, but for now I wish to align the hobbyist drive to interrogate console circuitry as part of the media archaeological search for ruptures, discontinuities, and dead ends. Videogames and consoles, especially those from the era of physical releases, hold traces of abandoned development histories (despite the best efforts of developers to occlude them). The search for these traces is something that Reinhard associates with the longstanding myth-hunting tradition of game enthusiasts, which ranges from "excavating the Atari landfill, to quests to find prototypes or lost games, to glitch-hunting in established titles" (2018, p. 27). These myths have not been generated by natural historical processes or simple neglect but are rather the result of efforts to simplify production timelines and erase unwanted development pathways.

The media archaeological drive to find developer-made traces recalls Foucault's musings on authorial oeuvres. I find myself drawn to *What Is An Author?* in these discussions—despite the fact that SNES/SFC games reject single authorship almost as strongly as Foucault rejects acknowledging digital technologies—as the article directly questions how works are ascribed to a corpus. Foucault claims that an author's name is not just an element of speech but a means of classification: a name can "group together a number of texts and thus differentiate them from others" and establish "different forms of relationships among texts" (1969, p. 304). This author-function not only clearly identifies who is responsible for an individual work but, importantly, determines which of an author's verbal or literary outputs should be counted amongst their oeuvre. While some determinations may be self-evident—commercially published works are almost always ascribed to an author—what of the scraps, scribblings, and drafts that are naturally produced throughout the creative process (Foucault, 1969, p. 302)? With videogame technologies, branding and black boxing serve as an author-

function, of sorts, discursively constructing what elements are part of a console's complete works, while blocking access to creative residue that has been deemed non-canonical.

The parallels between Foucault's writing and modern videogame technologies are not perfect by any means, but two of his points help tie together Newman's and Wershler's theorisations. First, Foucault claims that the author-function partially rose to relevance due to the growing need to assign rights and responsibilities (copyright, for example) to a distinct entity (1969, p. 306). By including certain hardware and software in their oeuvre, a game publisher is effectively drawing a circle around what they wish to associate with their brand. Second, the author-function is "not defined by the spontaneous attribution of a text to its creator, but through a series of precise and complex procedures" (Foucault, 1969, p. 309) that change over time. As seen with the production of subtle hardware and software iterations, videogame technologies are strategic artifices. Consoles and games are both multifarious and unstable, but developers endeavour to present them as the opposite. Bringing this instability to the forefront is a key aspect of the media archaeological approach.

Formality

By highlighting the idea of stability, I have indicated that videogame technologies are considerably less uniform than they appear. However, I have still rooted these discussions in the corporate lens by focusing on industry-devised iterations; simplifying the complex dynamic between developers and users. While it is tempting to delineate media users, practices, and technologies into a tidy 'authorised' vs 'unauthorised' dichotomy based on corporate intent, such attempts quickly prove untenable. The videogame industry has inconsistently applied the labels of 'professional' and 'amateur' to numerous, seemingly identical roles as technological, legal, and social contexts shift (Keogh, 2019, p. 17); homebrew game designers co-opt the affordances and aesthetics of game platforms without official acknowledgement (Vanderhoef, 2017, p. 122); and companies regularly condemn the use of technologies such as emulators (*Archived: Legal Information (Copyrights, Emulators, ROMs, Etc.)*, n.d.; *Nintendo Game Content Guidelines for Online Video & Image Sharing Platforms*, 2023) while simultaneously leveraging them to resell their game libraries on different platforms. Recognising the fluidity of these distinctions, it becomes necessary to find a more nuanced way to talk about the porous developer-user boundary and the acts of production and distribution they undertake.

It is worth returning to Certeau's notion of strategy versus tactics for a moment—despite my previous dissection of how many of its prevalent interpretations are misconstrued or oversimplified (Jenkins, 2006; Swalwell, 2021)—as recent research projects have productively fragmented Certeau's strategy/tactics dichotomy into a multifaceted set of power relations. Watson's *Re-Crafting Games* (2019) proves particularly useful, as he refashions Certeau's theorisations into a 'settling' metaphor to articulate how modders of the immensely popular computer game *Minecraft* (2009) leverage both strategic and tactical approaches to co-regulate its dynamic game space. For him, *Minecraft* simply "cannot be understood as a cultural product separate from its fan-contributed mods as they are an intrinsic part of what the concept of '*Minecraft*' means" (N. Watson, 2019, p. 36). While Microsoft is ostensibly the current owner of the game, *Minecraft*'s development has always been predicated on user feedback and hobbyist

contributions, leading to a shared creative arena where legal issues, moral concerns, and power dynamics elude easy definitions. Modding has long been an aspect of digital games, but early research framed it either as a value-add for developers (Kücklich, 2005) or a subversive practice subject to litigation (Postigo, 2008), reinforcing a binary between developers and users. With his settling metaphor, Watson instead argues that assorted stakeholders make claims to authority and ownership that are not purely strategic nor tactical as the game's power relations never fully coalesce. The cyclical negotiation of what is included in the *Minecraft* space, while certainly influenced by developer intent and intellectual property regimes, is not entirely determined by any single actor and does not result in straightforward circumscription: "the boundaries of this space are established by the strategically-designed affordances of the platform, but the edges are fuzzy" (N. Watson, 2019, p. 108). Various stakeholders are constantly changing the idea of what *Minecraft* is and what it may become and, while Microsoft certainly works to adopt and invalidate activities, they do not unilaterally control its dynamic game space.

Watson's research on *Minecraft* modding is an excellent bridge between Certeau's strategy/tactics and Lobato and Thomas' (2018) discussions of the informal media economy. Shirking dichotomies, Lobato and Thomas contend that production and distribution practices that are often imagined to be oppositional have entwined pasts, presents, and futures.

> Formal economies are industrially regulated. Informal economies operate without or in partial articulation with regulatory oversight. Neither zone can be fully understood without considering the other. Media history is a story of interactions between and across the formal and informal zones. (Lobato & Thomas, 2018, p. 20)

Informality and formality are not mutually exclusive but rather represent two ends of the same spectrum, and Lobato and Thomas argue that mobility along this spectrum has always been central to the production and distribution of media. To recall an infamous example, the highly publicised legal dispute between Napster and the Recording Industry Association of America (RIAA) in the late nineties demonstrates how elements of music distribution continuously oscillate between formal and informal. MP3s first rose to popularity due to the emergence of P2P file sharing over Napster, at-home CD burning technology, and other informal actions developed alongside the widespread adoption of the Internet. Despite initial condemnation and eventual litigation by established media corporations and institutions, these so-called pirate practices were soon co-opted and iterated upon in a highly formalised fashion. Apple capitalised on Napster's demise by establishing the iTunes digital music storefront in 2001, which heavily relied upon protocols and "consumer habits formed through informal media production and exchange" (Lobato & Thomas, 2018, p. 16). Addressing ideas of morality that dominate many media discourses, Lobato and Thomas argue that formal and informal activities can not be divided into legal-illegal, good-bad, or professional-amateur, but, rather, they resist reductionist classifications (2012, p. 43). As demonstrated with both *Minecraft* and the iTunes store, production and distribution practices are extremely context-dependent and formalised business models are often constructed piecemeal from elements that arose in informal structures. Formal and informal economies "are connected by exchanges of personnel, ideas, content and capital" (Lobato & Thomas, 2018, p. 45) and cannot be easily separated.

While it is important to complicate reductive terms, it is equally vital to establish criteria to help identify where users, technologies, and practices are situated on the formality spectrum. In his earlier work on shadow economies, Lobato notes that informal activities can be loosely identified through a set of common tendencies: a *disruption of standard media flows* based on stringent release timings and regional boundaries; a *high level of textual variation* that disrupts commonly held assumptions of what constitutes a media text; and a *tendency to be consumed in non-standard ways* (2012, p. 45). Lobato presents bootleg DVDs as an archetypal case study: they are used to disrupt standard distribution flows by allowing a film to be viewed long ahead of its home release, they feature enormous textual variation due to video compression and shaky camerawork, and they tend to be consumed in non-standard venues ranging from computer screens to unlicensed theatres. Within the realm of videogames, emulators serve as a similarly productive example. Altice notes that emulator development has helped foster the distribution of games (as ROM files) across corporate-designed jurisdictions, allows for the production and play of countless modified/hacked titles, and is responsible for introducing subversive gameplay conventions such as save states (2015, p. 312). While the legality and morality of user-made videogame emulators has long been debated, their conception was undeniably an informal exercise conducted without the oversight of established media corporations or cultural institutions. Yet, even while actively decried as piracy tools by game publishers, emulators find themselves entwined with formal game distribution due to their inclusion in online storefronts, and they now underpin an extremely lucrative formalised aftermarket for videogames (Altice, 2015, p. 287). While, at first blush, this process appears somewhat one-directional, formalisation processes are not inevitable nor all-encompassing. Formal elements can always be found within the informal, and vice-versa.

The informality-formality spectrum, then, is vital for my media archaeological research because it complicates allegedly strict divisions between developers and users. While informal-formal may seem like simply a different flavour of dichotomy, Lobato and Thomas are more concerned with fluid articulations than typological absolutism. Epistemologically, this perspective can be viewed as part of Apperley and Parikka's strategy for challenging "the narrowly defined user relations that platform studies often assumes" (2018); not just by attending to production and distribution that falls outside of the traditionally-imagined corporate sphere but, importantly, by recognising that videogame histories are constituted by countless formal and informal elements. Earlier, I claimed that my media archaeological approach aims to seek out technologies, practices, and stakeholders that dominant histories of the console have overlooked. As informality is an "analytic concept that refers to a range of activities and processes occurring outside the official, authorized spaces of the economy" (Lobato, 2012, p. 26), I use it as a heuristic to seek out research venues. The less formalised a user, activity, or practice is—as gauged by its disruption of standard media flows, high level of textual variation, or tendency to be consumed in non-standard ways—the more likely it is to have been overlooked by prior games scholarship.

Material Communities

I close my theoretical section with a discussion of community, a topic often discarded in media archaeological approaches that fixate on hands-on technological experimentation. While this forensic research is certainly important, it is equally vital not to "banish, sideline, or transcend the human to get at the machine" (Emerson, 2022). Users, technologies, and practices influence each other through complex articulations of production and distribution and, as Gitelman highlights, defaulting to teleological histories means ceding to media "a history that is more powerfully theirs than ours" (2006, p. 2). As new media emerge, they become "socially embedded sites for the ongoing negotiation of meaning" (Gitelman, 2006, p. 6); meaning that is not solely determined by their presumed creators but, rather, co-constructed by countless stakeholders. Videogames technologies are popular and pervasive media objects have risen in tandem with diverse material communities and studying the processes that underpin their creation and maintenance is invaluable.

Marvin's research on expertise is a valuable starting point to interrogate the development of community ethos, particularly through her reinvigoration of Stock's textual communities. Chronicling the emergence of the electrical profession in the 1800s, Marvin keenly notes the importance of central texts, such as professional magazines and journals, in establishing common truths and expertise: "to be an expert was to have knowledge based on technical texts" (1988, p. 11). Through the mastery and veneration of key texts, the electrical profession created and maintained distinctions between expert and layperson, insider and outsider, and knowledge and ignorance. While these professionals presented such efforts as a quest towards pure knowledge, claiming to "serve no master but truth" (Marvin, 1988, p. 32), such romanticised pursuits can be more accurately characterised as exercises in power. As electrical professionals delineated their occupation, they engaged in a discursive partitioning of knowledge, rules, and concepts; often through the development of particular techniques and practices (Willig & Rogers, 2017, p. 8). As Foucault keenly notes, discourse is all about what can be said (or thought), who can say it, and what authority is ascribed to them. It "transmits and produces power" but it also "undermines and exposes it, renders it fragile and makes it possible to thwart it" (Foucault, 1981, p. 51), preventing it from fully stabilising. Expertise never becomes fully unassailable and requires constant maintenance to sustain it.

When studying communities related to videogame technologies, I find it productive to append Marvin's notion of textual communities with Wershler's theorisation of "material communities" (2019). A direct expansion of Marvin's work, Wershler uses the idea of material communities to examine groups that assemble not just around "texts and their designated interpreters" (Marvin, 1988, p. 12) but also specific protocols, cultural techniques, and technological objects (2019). Protocols, as per Gitelman, are the often taken-for-granted norms related to how a technology is used, ranging from twelve-volt electrical standards to the implicit knowledge to say "Hello?" when you pick up a telephone (2006, p. 5). Fully encapsulating cultural techniques, however, is a bit of a trickier proposition. Siegert describes them as "operative chains that precede the media concepts they generate" (2015, p. 11) and they can be loosely understood as sociotechnical processes that have been developed alongside media technologies. As Sterne notes in his study of sound cultures, even "seemingly natural processes

such as listening are both technical and culturally constructed" (2003b, p. 92) and Wershler adds that simple acts of assembly/disassembly still represent "a crystallized set of social and material relations" (Sterne, 2006, p. 826; in Wershler, 2019). Material communities develop intricate techniques in relation to media technologies as part of efforts to establish the 'best' way to engage with them. These techniques prove invaluable in rendering social and material relations visible, as even the most straightforward act of maintenance is "freighted with the questions of style that are relevant to a given expert community" (2022, p. 226).

Scrutinising the dynamics of material communities means parsing through manifold texts, protocols, and techniques that espouse so-called 'best practices' for interacting with a media technology. Similar to the discourses of truth that Marvin has elucidated, communities will often assert the centrality of authenticity to their work. Commonly imagined to be a natural, verifiable, or objective quality, those who elevate the importance of authenticity typically "plan, strategize, and design to signal this purity and lack of mediation" (Juul, 2019, p. 9). This makes authenticity a paradoxical construct: it needs to be actively produced and maintained but, simultaneously, must present itself as natural and unmediated. Recalling Boym's discussions of nostalgia (2011), authenticity often leads material communities to elevate certain technological configurations over others: emulator developers create software that they claim perfectly reproduces the images, sounds, and even lag from old arcade machines (Murphy, 2013; Vanderhoef, 2017); modders extensively alter digital games to align their narratives, mechanics, and aesthetics with a set of idealised franchise tenets (Iantorno, 2019a; Whiteman, 2008); and enthusiasts may reject remediation and modification entirely by claiming that original hardware is the only way to "play retro video games the way the developers intended" (Moher, 2021). From a more formalised viewpoint, corporate stakeholders tend to align authenticity with distinct production and distribution processes. Nintendo, for example, implements extensive legal-technical parameters to this end, including regional hardware lockouts, embedded trademarks, and authoritative branding (such as their ubiquitous Nintendo Seal of Quality). While authenticity is only one of many themes that percolate through material communities, it is a prevalent one that provides insight into ongoing negotiations of meaning.

These negotiations never fully settle and, as a result, communities are prone to fragmentation and stratification. Marvin states that the pursuit of expertise often demands a "demarcation not only between members of textual communities and outsiders, but also within textual communities" as part of the ongoing process of building power and establishing common truths (1988, p. 49). Adapting aspects of Marvin's work in his study of Internet culture, Jenkins highlights how even informal online communities—despite ostensibly possessing mandates toward open and meritocratic knowledge production—tend to splinter into smaller groups to trade in exclusive knowledge (2006, p. 38). Consalvo brings these discussions directly into the realm of games through her Bourdieu-inspired conception of gaming capital, observing that expertise related to games and their connected industries can bestow social capital that may later be leveraged into community prestige (2007, p. 18). This capital, however, does not travel freely between different material communities. In fact, its inconsistent valuation exposes a heterogeneity in what is often presumed to be monolithic gaming cultures. In a particularly relevant example, Consalvo indicates that users engaging with game alteration technologies

(such as modchips) and third-party cheating devices (such as the Game Genie) often struggle to find their expertise recognised in many corners of the gaming world, as dominant discourses frame these technologies as dangerous and illegal (2007, p. 74). These types of distinctions highlight the importance of formalisation in establishing authority, as contestations over the proper way to engage with game technologies may result in community fractures.

I close this section by briefly reflecting on the idea of maintenance, which takes on multivalent meanings in material communities. First, as I have elaborated, material communities require constant maintenance to demarcate their boundaries and determine what counts as truth, expertise, or authenticity within them. While much of this maintenance work is hidden, central texts, technologies, and techniques crystallise community discourse and, therefore, are laden with meaning. Informal archives rely upon embodied labour ranging from logistical (e.g. paying for server space) to authoritative (e.g. managing which users can control the archive's contents) (De Kosnik, 2016, p. 7); fan-made software applications selectively include the work of users in reaction to everchanging standards and norms (Iantorno, 2021b); and forums and wikis are central arenas for establishing hierarchies of knowledge (Jenkins, 2006). Second, maintenance takes on a more tangible dimension when considering that techniques are often developed by communities to repair, sustain, and modify the game technologies they have grown in tandem with. The replacement of a stock console part—say a cracked button or a burst capacitor—may appear innocuous at first glance, but each reconfiguration or reproduction is a point of contention. Maintenance is of explicit importance for material communities related outmoded consoles such as the SNES/SFC, as they are deeply entrenched in their afterlives. Maintenance and repair manifest in the aftermath, as "sociotechnical systems as they creak, flex, and bend their way through time" (Jackson, 2014, p. 223). Texts, technologies, and techniques crystallise the manifold social and material processes that are produced within material communities, even if they themselves are subject to constant iteration, providing scholarly avenues of ingress.

Methodology: Post-Humanist Media Archaeology

I have a confession to make: I wrote this section of my dissertation last. As I lamented at the beginning of this chapter, media archaeology is an amorphous field that resists easy definitions and distinct methods. Even expansive media archaeological accounts usually fall short of describing tangible approaches, with authors providing personal reflections and philosophical tangents in lieu of detailed methods. Due to this omission, it was not until I served as an assistant instructor for Concordia University's Mess & Method graduate class in 2023 that my research practice really came together. As I helped students hack apart Game Boys and mod SNES/SFC consoles—and, perhaps more importantly, rationalised to them why these dramatic reconfigurations were important—a method began to emerge from the mess. Particularly constructive were my discussions with Lori Emerson and libi rose striegl, who provided me with insights on the post-humanist media archaeological approach they cultivate at CU Boulder's Media Archaeology Lab. Learning about their experiments with videogame consoles and early home computing technologies, which are well documented in Emerson's lecture-turned-blog-post *Flexible, Emergent, and Medium-Specific* (2022), I began to understand

media archaeological methods and their applications in venues ranging from university research labs to my own living room.

My methodology is rooted in post-humanist media archaeology, which embraces material investigations of media technologies and productive consultations and collaborations with expert communities. I divide this approach into two overlapping sets of methods: a) hands-on technological experimentation; and b) hybrid ethnography of material communities. While I will introduce these methods below, this section is more of a point of departure than a full summary. Each one of my case studies required different tools and approaches—many of which I did not anticipate until I was already knee-deep in my research—and I have thus included short methodological interludes in the ensuing chapters to unpack distinct methods, rationale, and challenges. I close this section with a short reflexivity statement, outlining my history and personal stakes in this research.

Hands-on Technological Experimentation

I begin by returning to a central question: why begin my analysis by tinkering with technology? Sterne posits that "technologies are associated with habits and practices, sometimes crystallizing them and sometimes promoting them" (2003a, p. 377). Taking them apart, modifying them, and rebuilding them is enormously useful in learning about how they function and the techniques of those who maintain and modify them. Yet, as Emerson has recounted in her frustrating experiments with the Xerox Memorywriter (2022), there are limits to this hands-on imperative. Consumer electronics have become increasingly complex; their innards shrouded by corporate black-boxing practices. Inevitably, it becomes necessary to seek out expert advice to aid in these investigations, which I will discuss shortly, but I first lay out some methods for the hands-on study of videogame technologies. In this pursuit, I am inspired by Strauven's provocation to "think of media archaeology as an experimental method, that is, as a method of trial and error, of hands-on exercises, of creative thinking" (2019, p. 24). Due to the non-standard nature of my research objects—from reproduction videogame cartridges to bespoke hacker applications—I have found it necessary to be flexible and opportunistic, cobbling together methods from various disciplines. However, I loosely group my technological methods as either software- or hardware-oriented[4] and requiring consistent self-documentation.

Broadly speaking, I analyse **software** at two levels: interface and code. For the former, I primarily utilise the walkthrough method (Light et al., 2018) and videogame interface analysis (Consalvo & Dutton, 2006). The walkthrough method encourages direct interaction with an application in order to study "its technological mechanisms and embedded cultural references to understand how it guides users and shapes their experiences" (2018, p. 882). Through a step-by-step technical walkthrough, researchers dissect the application's key functions—such as registration, features, and discontinuation of service—while also consulting paratexts to determine its environment of expected use (Light et al., 2018, p. 891). While my explorations of informal software do not fully fall within the authors' intended use-case of commercial mobile

[4] Of course, software and hardware are messily entangled within the SNES/SFC, so this divide serves more as a convenient starting point rather than a strict dichotomy.

applications, the walkthrough method is nonetheless useful due to its emphasis on detailed interaction mapping, which I have previously demonstrated in my study of the *Super Metroid* VARIA randomiser (Iantorno, 2021b)[5]. Consalvo and Dutton's interface study, as part of their broader game analysis toolkit, explicitly brings interface analysis into the realm of videogames. Predominantly concerned with the on-screen options presented during play, such as character creators and heads-up displays, their scrutiny of how user agency is mediated through menus and visuals proves extremely useful. So many of the applications, emulators, and tools I study in this dissertation greatly alter a user's relationship to the SNES/SFC and its software library, and tracking these changes is vital to understanding the engagements they are designed to foster.

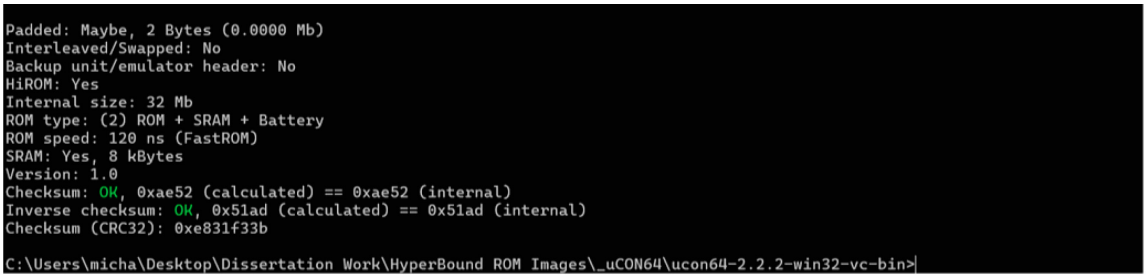
Moving beyond the level of interface, the code level of software proves a bit trickier to contend with. My initial point of departure is Kazemi's investigation into *Jagged Alliance 2* (1999), in which he discusses the ability of game code to reveal the inner workings of a software development community, even when the researcher is not fully versed in the coding language. In fact, rather than trying to fully understand the machinations of software code, Kazemi suggests skimming code structures for provocations—such as the philosophical manifestos entwined within *Jagged Alliance 2*'s AI scripts—which can then be later fleshed out using ethnographic methods. One of the shortcomings of Kazemi's method is his presumption of modern game development structures, in which code is separated from a game's engine in accessible folders and files. In his study of Atari 2600 hackers, Bailey aptly notes that many "classic" console games are not readable in this fashion due to the absence of a formal game engine as code is compressed, written in a low-level programming language, or wedded to a particular hardware device (2008, p. 75). As a result, my software analysis commonly involves studying, using, and modifying hacker-made applications that render the SNES/SFC's game code readable and editable. From hex editors that reveal game data line-by-line to complex software assemblages that can load multiple games for comparative purposes, these applications open the door for novel media archaeological experiments while manifesting existing community practices. And luckily, unlike formal stakeholders, SNES/SFC hackers often provide documentation and instructions in shared code repositories such as GitHub.

Hardware tinkering is perhaps the most challenging aspect of my research—or, at the very least, it was the part that I struggled with the most. Videogame technologies require specialised tools and skills to engage with, are expensive to acquire, and can be irreversibly damaged by inept hands. Scrutinising them requires adopting platform studies' impetus of "technical rigor and in-depth investigation of how computing technologies work" (Montfort & Bogost, 2009) while also deviating from its reliance on formal documentation and technologies. In my work, I adopt a cyclical form of hardware analysis, where I open videogame objects, learn what I can from them, and then converse with material communities to build expertise for future experiments. I am inspired by Wershler's descriptions of "dis/assembling" and "experimenting" in lab spaces, in which he highlights the usefulness of these methods in learning the "best practices, protocols, and standards" (2022, p. 224) of material communities while cultivating

[5] While I was taking Stefanie Duguay's research methods course in the first year of my PhD, she helped me shape the walkthrough method to better fit my research applications.

generalised skills such as soldering. My approach is perhaps best demonstrated in *Pixels and Plastic*, where I assemble cartridge PCBs, flash the memory on ROM chips, and create vinyl label stickers, to better understand the manufacturing and distribution of reproduction videogame cartridges. This process recalls the efforts of artists and scholars who study the SNES/SFC, from Belojevic's (2014) exploratory circuit bending of the Nintendo Entertainment System to Höltgen's (2018) material engagement with the console's sound chip, although I put a greater focus on documentation and connections to broader media ecosystems. Whether I am reconfiguring PCBs or resuscitating decades-old memory cards, I am slowly building a collection of techniques that aid in my research and teach me more about the panoply of material communities that have grown around the SNES/SFC.

Rigorous **self-documentation** is a necessary part of this process, to facilitate detailed analysis and to make my experiments repeatable. When describing the Residual Media Depot's log book, Wershler notes that liminal writing is important for keeping track of findings before they are inscribed into more formal documents or recirculated back into communities of expertise (2022, p. 97). Przybylski similarly notes that "fieldnotes, photographs, videos, and other recordings are not simply records" but they also help us "understand the scene in which we are embedded" (2021, p. 56). Throughout my research, I took daily notes in an (uncreatively named) "Dissertation Logging" Google Doc (Figure 3.1), where I tracked technical processes and made connections to existing theories and methods.



- We are going to use the SNES ROM UTILITY now to split the ROM and remove the header.
- I can already see where I might have gone wrong before. I split the prior ROM into FOUR files rather than EIGHT files, because it was set to 1028 instead of 512. This might have really donked things up.
- What I'll do, then, is take the new ROM and split it. Then, I'll take the old ROM and split it. Then I'll try flashing BOTH. 😊
- (of course I need to bombard them with UV light first).

- SUCCESS! Kinda. The ROM freezes a lot. I wonder if this is because I flashed a new ROM, not the one that was on the website. I'm going to use the website ROM next.
-
- I HAVE DISCOVERED MY DIODES WERE FACING THE WRONG WAY. I'M GOING TO FIX THIS AND TRY AGAIN.
- HECK YEAH IT DID IT.

Figure 3.1. A particularly chaotic excerpt from my dissertation logging document, including a screenshot of the IpsAndSum ROM analysis tool and some notes.

I also included photographs, with annotations, in this document to keep a visual record of my work. While I primarily took these photographs with my cell phone camera, I found it necessary to use higher-quality photographic equipment to document the innards of videogame cartridges and their PCBs. When completing this phase of my research, I borrowed a DSLR and a macro lens from the Concordia University Library's Technology Sandbox, which could capture the text printed on minute electronic components. Finally, when working with informal software, I captured countless screenshots to keep track of diagnostic information and menu configurations. The end result was a sprawling, 100+ page document that comprehensively chronicled my technical experimentation.

Hybrid Ethnography and/as Discourse Analysis

Experimenting with a videogame console is like undertaking an "archaeological dig through the layers of the machine" and inevitably requires the expertise "a community of highly specialized knowledge workers" to assist with the endeavour (2022). And while anti-humanist approaches may regard (dis)assembly and repair as objective, analytical tasks, such activities are always loaded with the values and expertise of material communities (Wershler, 2022; Wershler et al., 2021). These values only become more pronounced when informal console variations are factored into the equation, as making changes to central technologies can spark contentious questions of authenticity and legality. Maintenance and modding protocols are vital for understanding "how videogame technologies have been sites for hobbyists, experts, and corporate actors to navigate power relations" (Custodio, 2023), and much can be gleaned from directly conversing with these actors or studying the vast troves of documents—from forum posts to technical manifestos—that they generate.

At a high level, my research with material communities is guided by Markham's digital ethnography (2017) and Przybylski's hybrid ethnography (2021). While digital ethnography is often imagined as the study of digital spaces, Markham acknowledges the ongoing influence of "the digital" on culture rather than framing it as a separate "virtual" object of study (2017, p. 3). If ethnography allows us to seek the meaning in various cultural phenomena, then digital ethnography is attentive to the fact such phenomena are always mediated by the digital. This is particularly relevant in my study of the SNES/SFC's afterlife, as many activities that are integral to the console's afterlife has been fostered by the widespread adoption of the Internet. Digital ethnography is "the study of cultural patterns and formations that are brought into view as we ask particular questions about the intersection of technology and people in the post internet age" (Markham, 2017, p. 5) and this intersection is further elaborated upon by Przybylski, who recognises that the emergence of digital technologies blurs the roles between researcher and participant, producer and consumer (2021, p. 2). Hybrid ethnographers "must prepare for a role change in which [they] are not the only people who record social interaction" (Przybylski, 2021, p. 6). In fact, as I will demonstrate in my study of citizen archivists in *Satellite Archaeologies*, we are often quite late to the inscription party. Much of the discourse we are seeking out has already been pinned down (Przybylski, 2021, p. 6), and our task involves speaking to informal experts and parsing through their central texts. Thus, I can divide my ethnographic approach into two main areas: interviews and discourse analysis.

I utilise **interviews** in all but one of my case studies, and I rely on them for two reasons. First, speaking with folks from material communities is perhaps the most direct way of learning about their practices and technologies. Second, interviews aid in discourse analysis, as participants often provide resources that are hard to find or difficult to recognise as central texts.[6] Thus, interviews provide access to both tacit expertise and invaluable documentation.

Name	Role	Modality
Luke Usher	Lead developer for the ares emulator	Zoom
Evan Gowan	Hosts and maintains SNEScentral	Zoom
Matthew Callis	Hosts and maintains SuperFamicom.org, sfc.fm, Super Pads, and elude visibility	Zoom
LuigiBlood	A lead voice in the Satellaview preservation community	Text
Cabbusses	Primary author of the SatellaBlog	Text
Derek Quenneville	Digital fabrication artist, educator, and game developer who engages in videogame preservation.	Zoom
Eli K. Coughlin-Galbraith	*Final Fantasy VI* fan localiser	Zoom
kWhazit	*Final Fantasy VI* fan localiser	Zoom
Joe Chiarelli	*Final Fantasy VI* fan localiser and ROM hacker	Zoom

Table 3.1. Research participants.

I reached out to over twenty potential participants for my research, with most declining due to concerns about the legality of their practice—a recurring research hurdle I will elaborate upon in *The Super Nintendo Emulation System*. However, even participants who declined direct participation would commonly aid my research as consultants, of sorts: directing me to tools, documents, and resources that contributed to my research. I directly recruited potential participants who held the status of expert within their material communities and, occasionally, contacted additional participants based on recommendations (i.e. snowball sampling). I gave participants the choice to use their real name or a pseudonym as well as the option to participate in a Zoom interview (between 45-60 minutes in length) or a text questionnaire (approximately 20 questions with no time limit). In total, I completed ten interviews, although one participant rescinded their text questionnaire after completing it. The interviews were semi-

[6] In my previous research on ROM hackers, for example, participants would often pass along community materials that had been removed from online archives (2019a, p. 79).

structured and exploratory; I gave participants the opportunity to answer my questions, express opinions related to their areas of their expertise and direct me to additional resources. I left space at the beginning of every interview to field questions about my scholarship, and I often shared past examples of my work as a videogame hacker and a research assistant at the Residual Media Depot, which lent credibility to my scholarship and established a shared vocabulary with my participants.

I transcribed all my Zoom interviews using Otter.ai before undertaking a two-step coding process that loosely follows Charmaz's grounded theory method (2001). Shortly after completing an interview, I would fully re-listen to it (or re-read it), summarise its key points, identify impactful quotes, and then sort it into a master interview document. My goal of this process is to recognise similarities and points of contention across participant responses, before combining interview data with my technical documentation and the results of my discourse analysis. Occasionally, I would reach out to participants via email or Discord with follow-up questions, particularly regarding technical processes (e.g. how to use a specialised hex editor) that are hard to convey verbally. Several participants also followed up with me, unprompted, with news stories or other updates about the topics we spoke about.

I leveraged **discourse analysis** both before and after interviews, and I broadly define it as a search for the conditions of existence for a material community and its outputs (Marvin, 1988; Wershler, 2019). This a Foucauldian venture in some senses, as I am concerned with construction of power and knowledge through documents and inscribed discussion. Material communities create central texts that establish protocols, techniques, and overarching attitudes toward technology and, thus, finding and analysing these texts is invaluable. Marvin states that central texts are discursive arenas for negotiating key issues and, in her study of electrical experts, she notes the importance of trade magazines and other printed materials (1988, p. 12). However, in the digital age, discourse can be tracked across numerous venues: shared software repositories such as GitHub; conversations on message boards, Discord, and Reddit; video essays and modding tutorials on YouTube; and more. In my research, I sought out and saved these resources in Zotero for easy access before summarising and aggregating them into notes based on topic (e.g. emulators) and debate (e.g. screen-based authenticity). Essentially, I gathered as many documents pertaining to a particular material community as I could, consolidated them into one location (sorted by author, release date, and topic), and attempted to track discursive arguments over time. I found myself revisiting my Zotero collection compulsively—before interviews, after interviews, during my technical experiments, and as I wrote my chapters—with it effectively serving as an archive of informal SNES/SFC activities.

Posthumanist media archaeology leads to "the development of multiple, attuned, situated methods of experimentation that adapt to a given technological medium and thus it creates the possibility for multi-dimensional understanding." (Emerson, 2022, p. 7). As will quickly become evident in my chapters, I am not purporting that my methods are perfect or that they will inevitably lead to a full understanding of the SNES/SFC's afterlives. Rather, I hope to leverage these methods to destabilise the SNES/SFC's platform archive by seeking out the informal technologies and material communities that have helped construct the console's meaning.

Reflexivity Statement

As I discussed in my literature review, fans-as-researchers must accept that tacit knowledge and community relationships are inseparable from their research practice. This perspective is rooted in feminist critiques of objectivism that highlight the impossibility of observing the world from an external and unmediated viewpoint (Haraway, 1988), alongside ongoing fan studies debates that acknowledge how "aca-fans" are privy to the knowledge and traditions of the communities they are a part of (Hills, 2002; Jenkins, 2013). It also furthers the collapsing of roles that Przybylski discusses in relation to hybrid ethnography, where she urges that "we must interpret individual actors in multiple roles—as artists/content makers, audience members, readers" (2021, p. 6), especially if one of the actors is the researcher themself. Thus, I close this chapter with a summary of my own investment and involvement with the SNES/SFC and some of the informal activities that have grown around it.

My brothers and I received a Super NES for Christmas back in 1992, ostensibly a gift from Santa Claus, but more accurately a concession from my parents (whom we had been bugging for a videogame console for years). The console quickly became the central feature of our basement rec room, where we played games ranging from *Super Mario World* (1990) to *EarthBound* (1994) on an old CRT television that would sporadically tinge the screen yellow.[7] Most of my formative videogame experiences involved playing the Super NES with my brothers and, as I write this dissertation, the original console now sits on my desk next to my monitor. Shortly after 3D game consoles had taken over the landscape in the late nineties, I rediscovered the SNES/SFC through emulation. We never owned many games for the system, so being able to go online and download hundreds of titles—including fan-localised Japanese exclusives—proved intoxicating. Throughout high school and undergrad, my laptop was regularly loaded with an emulator (usually ZSNES) and dozens of ROM images, so I could bring the SNES/SFC with me wherever I travelled.

I eventually stumbled into ROM-hacking practices through my involvement in videogame fan communities, predominantly the *EarthBound* fan website Starmen.net. While I initially treated hacking tools as simple toys—fun for seeing how games worked and making inconsequential changes—I eventually decided to bring them into my schoolwork. As a senior undergraduate project at Toronto Metropolitan University, I created a simple narrative hack called *HyperBound* that earned me a B+, but, more impactfully, received a surprising amount of public attention through its inclusion in Anna Anthropy's *Rise of the Videogame Zinesters* and its presentation at a handful of art festivals. Since then, I have cultivated an on-and-off relationship with ROM hacking, with projects including *Unearthed* (2017) and *Super Mario: Clouds* (2021), eventually expanding my practice to encompass homebrew and modding practices as well. This work has embedded me in numerous online hacking communities, from ROMHacking.net to PKHack, and my research is influenced by my history with these material communities.

More recently, I have worked these experiences into aspects of my graduate scholarship. My master's thesis, *Sub-Versions: Investigating Video Game Hacking Practices and*

[7] We later learned that we could temporarily correct the colour by smacking the top-right corner of the television set. However, I do not recommend this as a general repair/maintenance technique.

Subcultures, provided a broad overview of ROM-hacking practices and the creative and legal processes that shape them. The first paper I wrote during my PhD was *See You Next Mission*, a ROMchip article that dissects the VARIA *Super Metroid* (1994) randomiser and its attending community. And my knowledge of the SNES/SFC and its software library has proven useful in my work at the Residual Media Depot, from numerous console modding sessions to my attempts to identify bootleg cartridges. In short, my history with the SNES/SFC and its informal variations aids in my research, granting me a familiarity with the console and lending me a level of credibility within certain material communities. Consequently, I also must be wary of my own biases when engaging in this scholarship. As someone who has a sentimental attachment to the console and has personally benefited from ROM-hacking and modding activities, I must be careful that I am not looking at such practices uncritically.

4. The Super Nintendo Emulation System

Figure 4.1. A screenshot of ZSNES playing *Super Mario World* (1990) on a personal computer.

Chapter Introduction

On February 26 2024, Nintendo of America Inc filed a federal lawsuit against Tropic Haze LLC, the makers of the popular Switch emulator Yuzu (*Nintendo of America Inc., Plaintiff, v. Tropic Haze LLC, Defendant*, 2024a). Emulators are applications that allow one computer system to behave like another (Figure 4.1), with Yuzu enabling Switch games to be played on an array of devices outside of Nintendo's desired purview. While certainly not Nintendo's first foray into intellectual property enforcement—the media giant has established aggressive legal positions regarding emulation (Nightingale, 2025a; Nintendo, 2021) and has repeatedly gone after ROM-hosting websites (O. S. Good, 2018), fangame developers (Frank, 2016), and ROM

hackers (Nintendo of Australia, 2016)—the lawsuit marks the company's most concerted effort to dismantle informal emulation development. Claiming that Yuzu effectively "transforms general computing devices into tools for massive intellectual property infringement of Nintendo and others' copyrighted works" (*Nintendo of America Inc., Plaintiff, v. Tropic Haze LLC, Defendant*, 2024a), Nintendo sought "equitable relief and damages for unlawful circumvention of copyright protection systems (technological measures) and unlawful trafficking in circumvention technology in violation of the DMCA" against Tropic Haze.

The strength of Nintendo's accusations is open to debate. There is little doubt that emulators can play pirated games, which Nintendo strongly argued by foregrounding the illicit circulation of *The Legend of Zelda: Tears of the Kingdom* (2024), but whether or not this counts as secondary liability under American intellectual property law is somewhat unsettled. Also known as contributory infringement, secondary liability arises when "a party materially contributes to, facilitates, induces, or is otherwise responsible for directly infringing acts carried out by another party" ("Secondary Copyright Infringement," 2020), even if the technology in question is otherwise legal.[8] Furthermore, there has yet to be a precedent-setting lawsuit that fully reconciles emulators with the Digital Millennium Copyright Act (DMCA). This is particularly relevant due to Yuzu's latent ability to circumvent technical protection measures—a feature that users activate by sourcing their own "prod-keys" to bypass Nintendo's encryption (Orland, 2024). While scholars and journalists were quick to muse on the potential outcomes of a trial between Nintendo and Yuzu, their debates barely had time to coalesce. On March 4 2024, the two parties filed a surprise joint motion to settle the suit, with Yuzu developers agreeing to pay "monetary relief in the sum of $2.4 million" while shutting down development and distribution of the emulator entirely (Fenlon, 2024; *Nintendo of America Inc., Plaintiff, v. Tropic Haze LLC, Defendant*, 2024b). The ensuing rise and fall of Suyu (Hollister, 2024a; Lewis, 2024), a development fork of Yuzu, and the quiet removal of Ryujinx (Hollister, 2024b), Yuzu's main competitor, has marked the beginning of a uneasy period for Switch emulation. Nintendo may never be able to fully stamp out development and distribution, but heavy-handed legal action is certainly effective at diminishing the propagation of emulation through the chilling effect: where user activities are abandoned or avoided based on their presumed legal status (Ribaudo, 2017), even when a precedent[9] has not been set.

I begin my discussion of emulators with Yuzu because its high-profile lawsuit exposes an important tension underpinning the proliferation of these applications. While the main goal of emulators is to allow digital games to be played on hardware they were not originally designed for, simply stating that they enable new channels of circulation would be selling them short. Due

[8] Secondary liability is commonly determined based on whether or not it provides substantial non-infringing uses, as established through precedent with the famous 'Betamax lawsuit' (*Sony Corporation of America v. Universal City Studios, Inc.*, 1984). With emulation, infringing use is predominantly associated with playing copyrighted ROM images, while non-infringing use includes activities such as homebrew game design, software preservation initiatives, and personal back-ups.

[9] Intellectual property law is based on precedent (i.e., the results of prior court rulings). While Yuzu essentially agreed to Nintendo's demands, the settlement was not established through a court's ruling and is therefore not precedent setting.

to their ability to digitise platforms, emulators are the lynchpin for numerous production and distribution practices (Lobato & Thomas, 2018) and a key arena for debating the ownership and imaginaries of videogame technologies. In formal contexts, emulators have contributed to a gaming ecosystem in which software back catalogues are endlessly repackaged across digital marketplaces, as seen in Nintendo's Virtual Console, and through hardware reproductions, such as with HyperKin's Retron consoles. In informal contexts, emulators have essentially created augmented virtual consoles with features that make them integral to amateur software preservation (see *Satellite Archaeologies*), user-driven ROM hacking practices (see *Final Fantasies*), cartridge reproduction industries (see *Pixels and Plastic*), and countless other activities. And, as I have previously discussed in relation to Lobato and Thomas's work on media production and distribution (2012; 2018), the boundaries between these formal and informal activities are porous. Emulators allow various stakeholders—from hobbyists to corporations—to copy, edit, and build upon a console's core functions and bring it into new contexts. Studying these reconfigurations allows scholars to "[interrogate] the uniformity and (im)mutability of the platform" and "existing practices of hardware and software hacking and modification" (T. Apperley & Parikka, 2018, p. 364), exposing imaginaries of what a videogame was and could have been, rather than simply how it initially arrived as a commercial product.

In this chapter, I study the emergence and continued development of SNES/SFC emulators from the late nineties to the present day. I start by considering how videogame console emulators contribute to Sterne's notion of convivial computing (2007), what role they play in informal and formal contexts (Altice, 2015; Lobato & Thomas, 2018), and how they serve as nostalgia machines that appeal to various media imaginaries (Boym, 2007). Next, I offer a short methodological interlude, where I discuss the difficulties of chronicling emulator history due to the lack of formal records, the ephemerality of the early Internet, and the challenges in securing interviews with emulator developers. Recognising that any attempted history of SNES/SFC emulator development will be incomplete, I choose to instead focus on three distinct areas. First, I track the emergence of the first SNES/SFC emulation projects in the late nineties and the challenges developers faced in making the console playable on home computers. Second, I delve into a hoard of documentation left by the celebrated developer Near, whose quest for hardware accuracy tested the limits of SNES/SFC emulation and resulted in the creation of three different emulator projects. Finally, I consider the turn from closed emulator development teams toward distributed projects with F/OSS licenses on GitHub. I close the chapter by reflecting on media imaginaries, discussing how emulation has rendered the console convivial and enabled the creation of endless variations.

Convivial, Authentic, Imaginary

Sterne's analysis of new media technologies, *Out With the Trash* (2007), is a useful starting point for considering informal emulator development—particularly his framing of convivial computing as an antithesis to the regimes of obsolescence established by media companies. Adapting ideas from Illich (1973), Sterne associates conviviality with a number of aspirational characteristics: "ease of use, flexibility in implementation, harmony with the environment, and ease of integration into truly democratic forms of social life" (2007, p. 28).

Writing in the mid-aughts, when computer processing power was accelerating at a dizzying pace, Sterne believes maintenance and modification are potent counterpoints to how "the digital hardware industry has rationalized, accelerated, and made regular the process of equipment turnover" (2007, p. 19). Of course, Sterne also recognises the difficulty in implementing such ideals within a capitalist milieu. As I outlined in the prior chapter, obsolescence is actively produced in the service of commercial interest—"a yearning for the future not only outstrips an interest in the past but is at least partly contingent on eradicating its memory" (Newman, 2012a, p. 10)—as the old must be buried in order to sell the new. Sterne goes as far as to say that convivial ventures would be viewed as "commercial suicide" (2007, p. 28) by corporate stakeholders, as they would disrupt the endless churn of products that companies rely upon for profit. Videogames, of course, are a standard-bearer for this paradigm of replaceability. Console manufacturers pursue obsolescence intentionally and self-referentially, through bounded hardware generations, declining customer support, and technical protection measures that impeded repair, modification, and maintenance. And, as seen with the Yuzu litigation, media companies are quick to attack technologies that could disrupt this churn.

While Sterne is mostly concerned with hardware, informal emulators nonetheless offer a convivial intervention as they untether videogame consoles from their original hardware configurations and open them to endless variations. Over the course of my dissertation research, I installed SNES/SFC emulators on devices ranging from a thrifted Nintendo Wii to a Steam Deck, tinkered with obscure emulator variants focused on preservation and localisation, and played with third party applications that fuse emulators to online services like Twitch. I am, of course, not the first person to consider the impact of emulation on video game development and distribution. Altice (2015) has extensively traced the emergence of emulators as corporate tools, from their origins within companies such as IBM to their nigh-ubiquitous inclusion in modern consoles and software re-releases. Importantly, Altice has noted that emulators have always been concerned with "not simply replicating, but also augmenting their target platforms" (2015, p. 299), allowing a programmer to "configure, text, and modify a computer" (2015, p. 292). In fact, while it is easy to imagine that Nintendo Entertainment System/Famicom (NES/FC) emulators emerged in the aftermath of the console's commercial lifespan, as clandestine doppelgangers, Altice reminds us that Nintendo used in-house emulators for software development: "Famicom emulation preceded the Famicom console" (2015, p. 299). Emulators are not simply tagged on to a console following its commercial release but accompany it throughout its entire trajectory.[10] Furthermore, they do not lead to conviviality simply by existing—many remain closely guarded corporate secrets—but rather contribute to as users circulate them, iterate upon their code, and port them to new devices.

While emulation has been around for a long time, videogame console emulation underwent a significant change in the nineties as home users began to develop relatively lightweight console emulators that could run on personal computers. As a result of this

[10] This ties into Guins' theory of "prebirth" (2014, p. 4), an evocative term that suggests we attend to the histories of games before they are officially released into the world. Guins alludes to the idea only once but suggests it could involve studying game prototypes and other unreleased technologies.

newfound mobility, which was no doubt hastened by early file sharing and community-building on the burgeoning Internet, emulators quickly became entwined with a multitude of nascent informal practices. Altice (2015) and Consalvo (2016) have both reflected on the role emulators play in encouraging the circulation of ROM images between geographic regions, catalysing previously-unseen "cultural cross-fertilization between Asian, European, and American nations" (Altice, 2015, p. 317). Murphy (2013) and Guins (2014) have discussed the centrality of emulators in amateur software preservation, and their power to circumvent "the copyright problem that continues to plague video game preservation efforts" (Murphy, 2013, p. 47). And I have written about emulators in the context of speedrunning and ROM-hacking practices (2019b, 2021a), such as the popular *The Legend of Zelda: A Link to the Past* (1991) and *Super Metroid* (1994) randomizers that reconfigure SNES/SFC titles in ways that would be impossible using original hardware configurations. All of these activities embody key aspects of informal media practices: a disruption of standard media flows, a high level of textual variation, and a tendency to be consumed in non-standard ways (Lobato, 2012, p. 45).

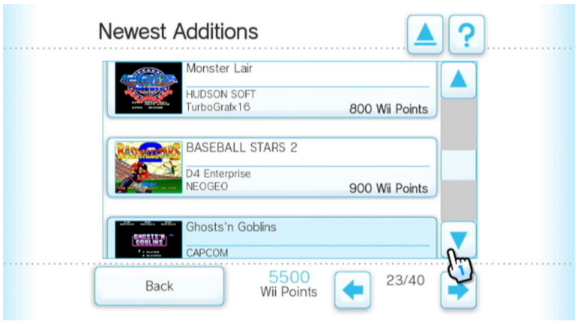


Figure 4.2. A screen capture of the Nintendo Virtual Console shop, where users could download and play titles from prior consoles.

Figure 4.3. A screen capture from Animal Crossing for the Nintendo GameCube, showing a room with several different NES/FC furniture items.

Parallel to the emergence of informal projects, game companies began to integrate emulation into their platforms through highly formalised digital marketplaces. The Wii was widely lauded as the first Nintendo console that was backwards-compatible, emulating numerous platforms to (re)sell users a rotating selection of games through its Virtual Console (Jones & Thiruvathukal, 2012, p. 104). Custodio notes that the Virtual Console (Figure 4.2), accompanied by a wave of legal action against emulator developers and ROM-sharing websites, was part of a concerted effort by Nintendo to retake some measure of agency over its back catalogue:

> Licensed rereleasing of selected classic games through the Virtual Console can be seen as the company's riposte to videogame piracy and their attempt to retain control over their IP; it provides access to titles currently unavailable through traditional retail networks, even as it acknowledges the ubiquity of software emulation. (Custodio, 2020, p. 153)

While the Virtual Console was perhaps the 'killer app' for console emulation, it was not Nintendo's first attempt at embracing the technology. Nintendo had previously experimented with the inclusion of NES/FC console furniture items (Figure 4.3) in the GameCube title *Animal Crossing* (2001) that allowed players to access games such as *Excite Bike* (1984) and *Balloon Fight* (1985) using a proprietary emulator called ksNES (*NES Game*, 2024). This re-formalisation represents Nintendo's desire to take advantage of "consumer habits formed through informal media production and exchange" (Lobato & Thomas, 2018, p. 16) much in the same way that the Apple Music store capitalised on the habits formed through informal MP3 distribution following the RIAA's dismantling of Napster. Formal and informal economies are connected by exchanges of personnel, ideas, content and capital (Lobato & Thomas, 2018, p. 45) and, in the case of emulation, game companies have attempted to constrain their use to a set number of official channels. Regardless of their formal or informal status, emulators are nigh-ubiquitous technologies; digital matryoshkas enabling new forms of production and distribution.

Of course, transporting a game from one platform to another raises complex questions regarding authenticity. For example, retro-gaming enthusiasts may reject their remediation in favour of alleged 'original' hardware configurations, with one oft-cited debate being console visuals. Hardware collectors passionately claim that original consoles and CRT televisions are "the absolute best way—some would go so far as to say the only way—to play retro video games the way the developers intended" (Moher, 2021). While this rhetoric is somewhat inflammatory, there are persuasive arguments that emulators do not faithfully reproduce the imagery (and other aspects) of the system they are mimicking. SNES/SFC emulators are overwhelmingly used on modern computing devices with high-definition displays—a type of screen that did not have widespread consumer adoption during the console's commercial lifespan—and render pixels that are brighter and sharper than would have been possible in the typical nineties living room. While these vivid, crunchy pixels are anachronistic, they are simultaneously denounced and celebrated in user discourse—as Juul has noted, "authenticity is often signaled by visual styles that suggest materiality" (2019, p. 8) rather than materiality itself. And even among hardware diehards, there are intense debates on how to obtain the best possible video signal from a console, from modding its video output to activate latent affordances (Wershler, 2022) to using specialised cables and test suites to optimise a CRT's performance (Moher, 2021). Paired with the fact that the SNES/SFC did not have a default display and was designed to be played on almost any CRT television, visual authenticity can be quite elusive.

There are many other debates of authenticity that percolate through emulator discourse—with the comprehensive yet elusive idea of hardware accuracy chief among them—and developers commonly find themselves negotiating authenticity, practicality, and features. There are many ways to characterise this balancing act. Bolter and Grusin would perhaps frame it as a tension between immediacy, which strives toward a transparent remediation that occludes the new host medium in pursuit of immersion (1999, p. 21), and hypermediacy, which draws attention to the medium by embracing the affordances of new media technologies (1999, p. 31). Emulator developers pride themselves on accuracy, down to replicating the lag of overtaxed hardware and the distorted colours of living room televisions, but consistently add new features (save states, video recording, etc.) that appeal to modern sensibilities. I could also

turn to Boym (2001) and consider emulation as a form of reflective nostalgia; an antithesis to the restorative nostalgia endorsed by original hardware enthusiasts. Those engaging in restorative nostalgia strive for a "transhistorical reconstruction of the lost home" (Boym, 2001, p. 13)—perhaps reconstructing a childhood living room setup with original hardware—and regard their actions as a quest for objective truth rather than subjective nostalgia. Reflective nostalgia, instead, calls perfect reconstruction into doubt and instead dwells upon the contradictory and complex dynamics of longing itself. Embracing the varied nature of memory and the emulator-as-simulacrum, developers commonly provide filters that mimic the scan lines, faded colours, and bulbous distortion of CRTs, allowing users to create an experience that best matches their own imaginaries for a console.

Through the media archaeological lens, Kluitenberg's (2011) theorisation of imaginary media is a useful framework for understanding why a panoply of competing emulators have grown alongside what is ostensibly a singular videogame console. Imaginary media, in this context, are not simply fictitious or speculative technologies rooted in science-fiction. Rather, Kluitenberg recognises that users project their desires onto media technologies and, while many of these go unrealised, some manifest as real hardware or software. There is no shortage of imaginary media related to the SNES/SFC, from commercial reproduction consoles to subversive ROM hacks, each of which manifests different community values and techniques. If nostalgia is the "unrealized dreams of the past and visions of the future that become obsolete" (Boym, 2001, p. xvi), then emulators embody real and speculative trajectories for videogame consoles. As Kluitenberg muses, "the imaginaries of imaginary media tend to weave in and out of the purely imagined and the actually realized media machineries" (2011, p. 48). Emulators have been leveraged in formal and informal contexts, are simultaneously viewed as faithful re-creations or unworthy facsimiles, and mimic and diverge from their base consoles in unpredictable ways.

Every platform is "in part defined by the possibilities that lie outside what it was designed to do" (Jones & Thiruvathukal, 2012, p. 118) and emulators speak to a "mediated understanding of what the game is and what we want (or wanted) it to be" (2020, p. 148). As Wershler has noted in his study of hardware variations and mods, the SNES/SFC has long transcended its status as (ostensibly) a singular hardware object and is now more of a heterogeneous family of technologies that can be found embedded in digital storefronts, installed on smartphones, and subject to numerous "important and unusual variation[s]" (2022, p. 108). And as each variation offers insight into different ways the console has been adopted during its afterlife, I believe that documenting SNES/SFC emulators is an important first step before studying other use cases that heavily rely upon the technologies. For the remainder of this chapter, I consider how these applications arose, what discourses shaped their development, and how they led to ideas of what the SNES/SFC was and has the potential to be.

Methodological Interlude: Tracking Emulation Discourse

In addition to potentially slowing the development of Switch emulation, the Yuzu lawsuit's chilling effect has a troubling secondary implication: heavy-handed litigation sows fear among informal developers, hackers, and archivists and makes them reluctant to publicly speak

about their work. As their work often exists in contested legal areas, emulator developers are understandably cautious about discussing their projects. After all, why would they risk exposing themselves to greater scrutiny from Nintendo and other notoriously litigious companies?

I bring this up because, in early 2024, I had secured interviews with three prominent figures involved in early SNES/SFC emulator development with the intent of learning more about the emergence of ZSNES, Snes9x, and other foundational projects. It had taken me almost a year to track down these participants, loop them together on an email chain, and pin down a time for an interview. However, after the Yuzu news broke, my participants pulled out citing concerns that Nintendo may extend their legal action to include emulators for legacy consoles such as the SNES/SFC. While my personal belief is that Nintendo is disinterested in stamping out emulation for a platform that passed its commercial lifespan nearly three decades prior—the company appears most concerned with current-generation emulation and the piracy it allegedly fosters—I was sympathetic with their concerns. After all, my research would do little to benefit them, and the spectre of a $2.4 million settlement is a harsh deterrent.

Unfortunately, legal scares are not the only reason emulator developers are not available for interviews. When I initially proposed my dissertation, I had intended to reach out to Near, a programmer well-known for developing the SNES/SFC emulator bsnes and the multi-system emulator higan. Since the emulator's inception, bsnes has been lauded for its accuracy and it has achieved widespread distribution as a standalone application and as numerous cores[11] within multi-system emulators. Near was undoubtedly one of the driving forces behind SNES/SFC emulator development over the past two decades, but they tragically took their life on June 27 2021 after years of online harassment (K. Bailey, 2021; Klepek, 2021b). The void they left behind weighs heavily upon this research project and the SNES/SFC emulation community at-large. Many of my participants lamented Near's death, celebrated their achievements, and credited them for providing the bedrock for their emulation, preservation, and hacking work.

Whether due to caution or tragedy, I have adjusted my research approach significantly. While I still aim to map the trajectory of SNES/SFC emulation, this research is now primarily rooted in informal documentation. Emulator development is marked by intense competition and community drama and, luckily, when Internet debates become heated users tend to publish manifestos and contribute to (occasionally heated) written exchanges. While Near was not involved in the earliest of these disputes, they were an extremely diligent self-documentarian who left behind a trove of development updates on their blog. As Przybylski notes, researchers "are not the only people who record social interaction" and often our first step is catching up on user-inscribed discourse. Furthermore, while I was unable to speak with early emulator developers, I was able to connect with a few key figures involved in SNES/SFC documentation and emulator development. In the summer of 2024, I interviewed Luke Usher, who currently maintains the multi-system emulator ares (successor to higan and, by extension, bsnes) and is one of many developers who have taken up Near's work since they passed away. And early on in

[11] I will talk about emulator cores in more depth later in this chapter, but they are essentially implementations of a standalone emulator within a multi-system emulator ecosystem.

my dissertation research, I spoke with Evan Gowan and Matthew Callis, who founded SNESCentral and superfamicom.org, respectively. Gowan and Callis are citizen archivists—a concept I will unpack further in *Satellite Archaeologies*—who have gathered resources to aid folks who tinker with the SNES/SFC, providing information ranging from cartridge PCB scans to detailed console specifications.

Name	Description
Luke Usher	Luke Usher is the current lead developer of ares, a cross-platform, open source, multi-system emulator, focusing on accuracy and preservation. A descendant of higan and bsnes, Usher directly continues the work of Near (and others).
Evan Gowan	Evan Gowan runs SNESCentral, a fan website dedicated to the documentation and preservation of materials relating to the Super Nintendo Entertainment System and Super Famicom.
Matthew Callis	Matthew hosts and runs several SNES/SFC fan websites, including SuperFamicom.org, sfc.fm, Super Pads, and elude visibility. He also volunteers with the Video Game History Foundation.

Table 4.1. Research participants for *The Super Nintendo Emulation System*.

To close this interlude, while my overarching research approach is heavily informed by hands-on experimentation, you will not see me trying to develop, modify, or otherwise tinker with SNES/SFC emulators in this chapter. Unlike my forays into software preservation, ROM-hacking, and reproduction making, emulator development requires a level of coding expertise that is well beyond my capabilities. As Emerson has noted when discussing the flexibility needed in studying digital technologies, sometimes it is difficult to move past documentation and interface without a high degree of expertise that few people in the world possess (Emerson, 2022). However, there is still a great deal that can be learned by examining graphic user interfaces and configuration options. In addition to my interviews and study of informal archives, I have completed an interface analysis of ZSNES, Snes9x, bsnes, higan, ares, and BizHawk (Consalvo & Dutton, 2006; Light et al., 2018) to better understand how the emulators enable and constrain various use cases. Similar to my approach to studying the *Super Metroid* (1994) VARIA randomiser (Iantorno, 2021a), I found this multi-pronged methodology useful in identifying how informal software crystallises user practices and imaginaries.

SNES/SFC Emulation I: Early Origins and Technical Challenges

While my aim in this chapter is to discuss the emergence and stabilisation of SNES/SFC emulation, establishing a definitive history of SNES/SFC emulation is a Sisyphean task. Like many projects with roots on the early web, SNES/SFC emulators were developed by anonymous or reclusive users, released with unreliable commentary, and hosted on obscure websites (many of which no longer exist outside of incomplete archived pages). There simply is no way to fully

verify facts or confirm details with influential figures. Still, I believe that even an incomplete chronicling can provide useful insights on the console's software re-creation and the diverse informal practices it has helped bring about.

The Emulation General Wiki has compiled a lengthy list of SNES/SFC emulators released between 1994 and 1997 and, among these projects, the Virtual Super Magicom (VSMC) likely holds the strongest claim to being the first widespread release[12] (Levicoff, n.d.) (Figure 4.4). Attributed to Chris "TheBrain" George of Damaged Cybernetics,[13] the application's initial version booted in DOS and could only play a small selection of homebrew demos. While later versions of the emulator ran on Windows and were compatible with a selection of popular commercial releases such as *Super Mario World* (1991) and *Final Fantasy II* (1991), VSMC proved to be relatively short lived. Likely contributing to the emulator's swift downfall was the fact that George released VSMC as shareware[14] and requested a $35 (USD) mail-in payment in exchange for a fully functional version. Early VSMC releases imposed a strict time limit upon players and the final known iteration shipped with a "crippled display" that presented games with a horrific "eight-color, yellow palette" (George, 1997) (Figure 4.5). However, $35 proved to be too steep a price, leading users to circulate cracked versions rather than shelling out cash or putting up with the shareware's pallid aesthetic (Modern Vintage Gamer, 2021). George discontinued VSMC in 1997 and the project quickly fell out of use (Levicoff, 1996).

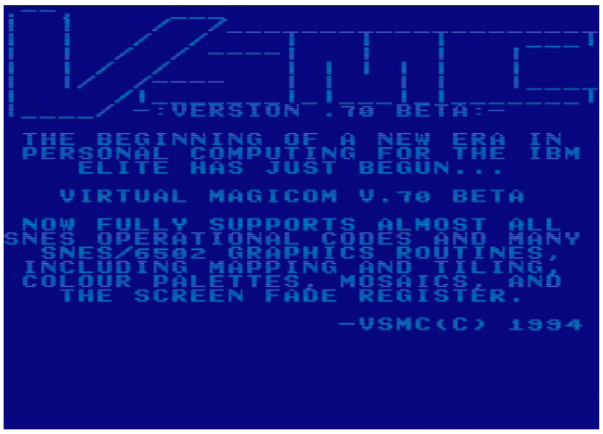


Figure 4.4. The title screen for an early release of VSMC, among the first SNES/SFC emulators.

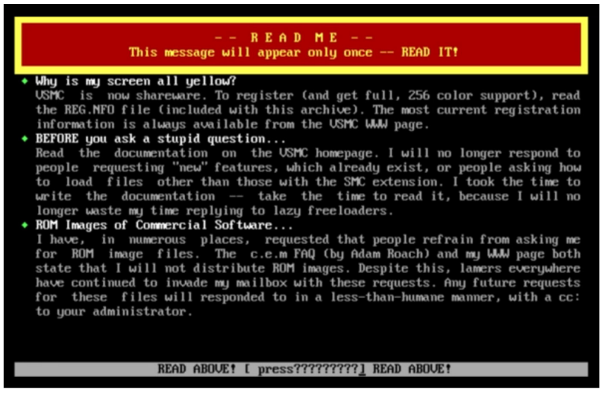


Figure 4.5. A README message within VSMC, informing users that if they want full colour support, they will have to register their software.

This jockeying for access and control would become a recurring theme in an early SNES/SFC emulator scene that was largely defined by competition between different teams.

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[12] Of course, pinning down the 'first' SNES/SFC emulator is unfeasible. In addition to publicly-shared emulators, there are no doubt informal and formal development projects that stayed behind closed doors.

[13] Damaged Cybernetics was a gray hat hacking group that was known for audio piracy, ROM sharing, and free information exchange. In the emulation community, they were somewhat infamous for stealing NESticle's source code (Modern Vintage Gamer, 2021; Zophar, 1998).

[14] Shareware is software that is released for little to no cost with limited features, but which can be upgraded upon payment of a fee to the author.

Game history YouTuber Modern Vintage Gamer and *archaic ruins* blogger Luke Sneeringer have characterised this period as “the SNES emulation war of 1997” (Modern Vintage Gamer, 2021) where developers competed for “the first place trophy as the greatest of the SNES emulators” (Sneeringer, 1997). While there were notable successes during this period, most projects were ephemeral, possessing generic names and ambiguous provenances. SNESemul, superpasofami, SNESlite, GrimSNES, SNeSe, and SNES Professional all made their mark but, due to their lack of longevity, left few traces outside of a handful of archived web pages. However, the war itself allegedly ignited shortly after two emulators—ESNES, written by Lord ESNES, and SNES ‘96, created by Jerremy Koot (and later taken over by Gary Henderson, as Koot began work on SNES ‘97)—coalesced and began to achieve widespread adoption. Despite working on ostensibly competing projects, Lord ESNES and Koot/Henderson were amicable and would often help each other out with technical issues and feature design (Sneeringer, 1997). Tensions only began to flare when a new challenger entered the arena: a programmer known as Nerlaska. Although Nerlaska’s emulator, Nerlaska SNES (NLKSNES), lacked a number of features compared to ESNES and SNES ‘96, it rapidly grew in popularity due to its operating speed (Sneeringer, 1997). NLKSNES was fast enough to emulate SNES/SFC games on Pentium-class machines at reasonable framerates—a considerable feat at the time when most applications struggled to achieve even half speed emulation—making it much more viable for the average home computer. In the eyes of many, Nerlaska had pulled the rug out from under other SNES/SFC projects, devaluing their expertise.

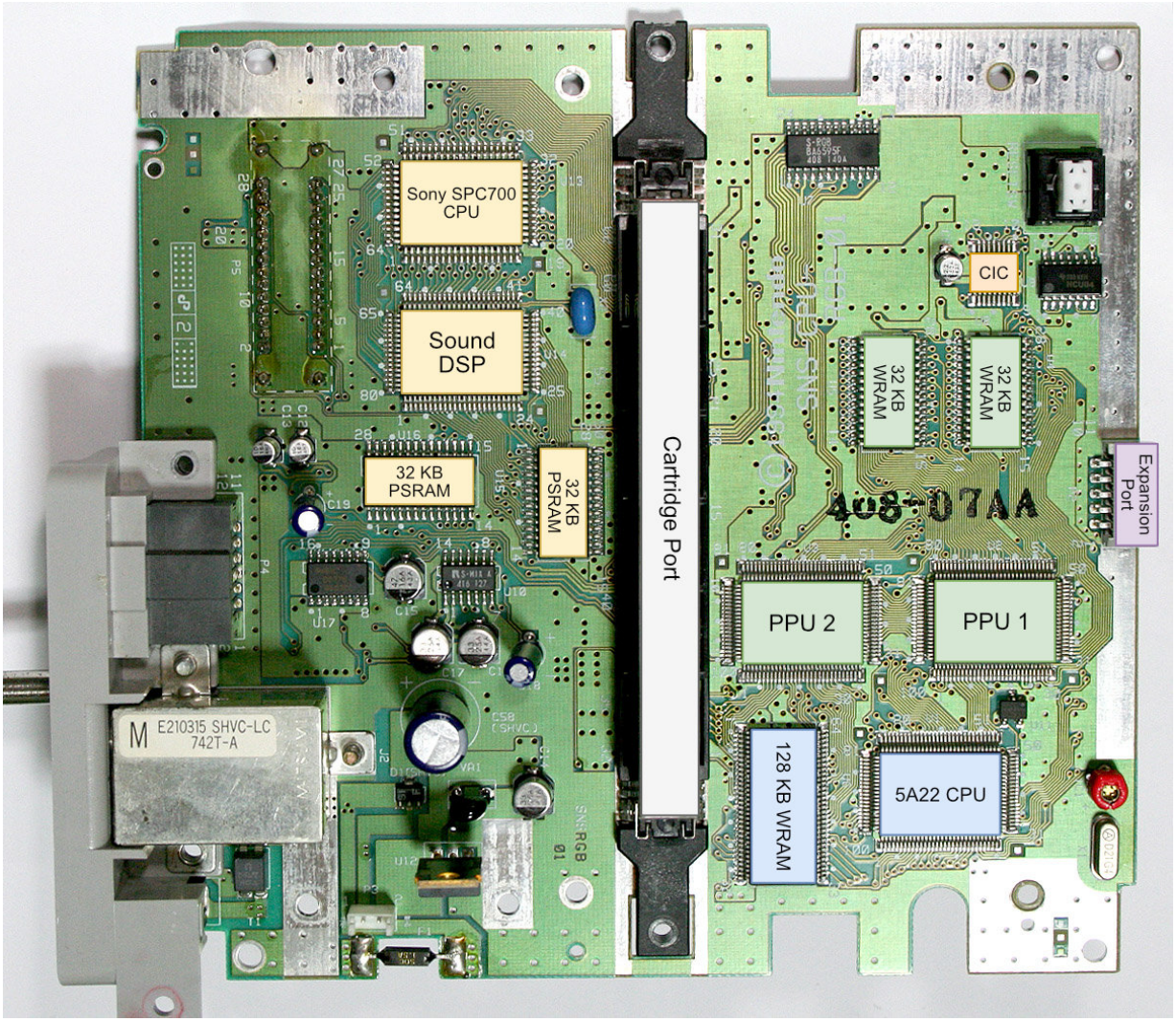


Figure 4.6. A labeled scan of a SNES/SFC console board, version SHVC-CPU-01 (dougfraker, 2020).

Before I describe the outcomes of this community drama, I would like to take a moment to discuss what engineering hurdles emulator developers were trying to overcome. In the most basic sense, emulation is the "attempt to imitate the internal design of a device" and can be done with "anything which has a microprocessor inside" (Fayzullin, 2000). Altice further elaborates that it is not just a matter of replicating a CPU but also "any additional co-processors, I/O devices, lower level instructions sets, and so on" (2015, p. 302), which makes emulating the SNES/SFC console a particularly challenging task. Nintendo's hardware design embraces Gunpei Yokoi's philosophy of "lateral thinking with seasoned (or withered) technology" and, as a result, the SNES/SFC uses a highly "decentralized, networked mode of operation, with specialized components dedicated to specific aspects of the process" (Arsenault, 2017, p. 88). In addition to a central processing unit (CPU), a pair of picture processing units (PPU)s, and an independently operating audio processing unit (APU), the console also contains a cartridge

connector that allows some games to bypass the CPU entirely (Figure 4.6). Compounding these issues is the fact that the SNES/SFC features a number of hardware revisions that significantly alter its chip configuration (Wershler, 2022, p. 105). There are at least seven variations of the console, including major changes such as its post-1995 switchover to a single PPU, and there is much debate among modders as to which iteration features the best longevity and video output quality (lo55net, 2024). To add a further wrinkle, for the SNES/SFC, Nintendo embraced the idea of "cheap baseline hardware" that could be upgraded, as needed, through the "ex-centric" inclusion of specialised chips within individual cartridges (Arsenault, 2017, p. 88). I will explore these variations in-depth in *Pixels and Plastic*, but for now it is sufficient to say that every SNES/SFC cartridge has the potential to radically reconfigure the base console through the inclusion of chips that act as modular upgrades.

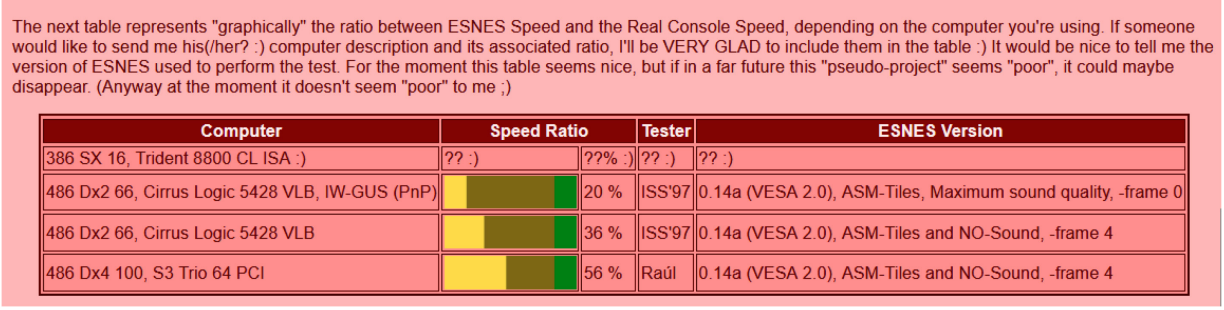
Perhaps unsurprisingly considering this deluge of variations, one of the biggest challenges for SNES/SFC emulator developers (especially in the early days) has been documentation. When I spoke to Matthew Callis, who hosts several websites including the expansive SNES Development Wiki, he lamented that it was very difficult to find any reliable technical information related to SNES/SFC throughout the nineties and early aughts. One of the stated goals of his wiki is to consolidate dispersed information into a single venue, from reference documents for the console's 65816 processor to pin-mappings of its cartridge slot.

> For many years information has been literally scattered across the world, in old text files, in aging and now disappearing web sites, in dead forums, in some wiki's that never quite made it happen, in books... basically it's been attempted but hasn't even been made *quite right*. (Callis, 2022)

Detailed documentation is particularly important for the SNES/SFC as each game cartridge has the potential to act as a hardware upgrade—emulator developers must reverse-engineer individual game PCBs in addition to the console itself. Evan Gowan, who runs SNES Central, mentioned that his website's extensive collection of cartridge PCB scans is one of its most popular features. "In order to get the game to work properly [with an emulator], you need to know the memory mapping of the board", and many emulator developers consult Gowan's scans to figure out a board's model number and chip configuration. While modern users can simply consult these now-well-established technical resources, early emulator developers did not have the same luxury. As Altice has noted in relation to NES/FC emulator development, which occurred around the same period in time, "access to such documents was reserved for official licensees and protected legally, as Nintendo held copyrights over the form and function of their console" and "circumventing the licensing track required outright theft or tedious reverse engineering" (2015, p. 302). As the relationships between development teams were often tense, these resources were certainly not shared equally.

Even when developers had gathered enough technical information, they still had to create an application that was not just capable of emulating the SNES/SFC, but also usable on the average home computer. "Emulation is a constant balancing act between speed, allegiance to the source hardware, compatibility, and providing useful tools for the players" (Altice, 2015, p. 302) and these factors would be elusive goal posts for emulator development teams. As demonstrated by the quick adoption of NLKSNES, users highly valued speed due to the limited

processing power of contemporaneous personal computers. While I can now download countless emulators on my phone that are capable of effortlessly running SNES/SFC games at full speed, nineties computers were considerably less sophisticated. Intel i386 and i486 chips were considered the bare minimum for SNES/SFC emulation and, even when these specifications were met, early releases of ESNES were barely capable of 50% speed (Figure 4.7).



The next table represents "graphically" the ratio between ESNES Speed and the Real Console Speed, depending on the computer you're using. If someone would like to send me his(/her? :) computer description and its associated ratio, I'll be VERY GLAD to include them in the table :) It would be nice to tell me the version of ESNES used to perform the test. For the moment this table seems nice, but if in a far future this "pseudo-project" seems "poor", it could maybe disappear. (Anyway at the moment it doesn't seem "poor" to me ;)

Computer	Speed Ratio		Tester	ESNES Version
386 SX 16, Trident 8800 CL ISA :)	?? :)	??% :)	?? :)	?? :)
486 Dx2 66, Cirrus Logic 5428 VLB, IW-GUS (PnP)		20 %	ISS'97	0.14a (VESA 2.0), ASM-Tiles, Maximum sound quality, -frame 0
486 Dx2 66, Cirrus Logic 5428 VLB		36 %	ISS'97	0.14a (VESA 2.0), ASM-Tiles and NO-Sound, -frame 4
486 Dx4 100, S3 Trio 64 PCI		56 %	Raúl	0.14a (VESA 2.0), ASM-Tiles and NO-Sound, -frame 4

Figure 4.7. A diagram from an ESNES information page (ISS'98, 1997), which lists several CPUs and the speed at which ESNES was capable of emulating games using them.

Emulating the SNES/SFC was not simply a question of speed but also one of features. Most early emulators ran in silence as they were incapable of emulating sound, with ESNES being among the first applications to add this core functionality, albeit with a notable drop in performance (Modern Vintage Gamer, 2021). Other features such as transparency effects and graphic modes took time to implement, due to a lack of documentation and computing power (Modern Vintage Gamer, 2021). Game compatibility was also a major obstacle, as developers endeavoured to make their emulators work with the growing collection of SNES/SFC ROM images[15] available online. As I discussed with VSMC, early emulators could only play a small number of games, and developers would often share growing compatibility lists on their websites as an advertisement to potential users (George, 1997).

Ironically, much like the formal console war between Sega and Nintendo weaponized technobabble and buzzwords to elevate one platform over another (Arsenault, 2017, p. 85), emulator development teams constantly boasted about their own achievements, diminished those of others, and engaged in shady activities ranging from slander to theft. Perhaps envious of the new kid on the block, SNES '96 developers threw the first stone by insulting Nerlaska for his emulator's inferior compatibility with ROM images:

> And for those of you who think Bloodlust should design an SNES emulator, well, you'll have a long wait! For those that think NLKSNES is best because it's fastest, well, good luck finding a ROM for it! (Sneeringer, 1997)[16]

[15] I am not going to delve too deeply into where SNES/SFC ROM images originated. Many were dumped from legitimate cartridges using back-up devices such as the Super Magicom (Staff, 1992) and then proliferated rapidly across the Internet (Pettus, 1999).

[16] Sneeringer notes that this is an approximate quote, sourced from a readme file that no longer exists, but captures the sentiment of the conflict accurately.

Nerlaska initially responded combatively to the challenge: “We are not like Gary Henderson who can’t take an ounce of competition!” (Sneeringer, 1997). However, by the end of 1997, he seemed keen to extend an olive branch. Nerlaska pleaded for the animosities to stop with the message “STOP THE WAR!” inserted into a readme file included in NLKSNES’ next release. Ironically, while this caused the NLKSNES controversy to dissipate rather quickly, it preceded the outbreak of major restructuring and drama. Vertigo 2099, a ROM releasing group, surreptitiously distributed a private beta version of SNES ‘96 on their website and were subsequently attacked, insulted, and banned from various online emulation communities. SNES ‘96 and SNES ‘97 merged into Snes9x, and ESNES and NLKSNES merged into NLKE, marking an important consolidation of expertise. And when ZSNES hit the scene—an emulator originated by _Demo_ and zsKnight that rivaled all others for speed, sound, compatibility, and other features—it was met with accusations of theft. A contributing author, GrimSNES, who had previously worked on an eponymous emulator and (briefly) Snes9x, was accused of stealing code from Snes9x and integrating it into ZSNES. While these allegations were dubious, at best, the ZSNES team nonetheless removed parts of their source code to allay user concerns.

The stabilisation of Snes9x and ZSNES marked the beginning of a period of relative calm for SNES/SFC development, as both projects received rapid updates and were widely adopted throughout the late nineties. Fully chronicling the technical achievements of this period would be an exhausting exercise, as both development teams undertook an enormous amount of work to improve their projects (Koot & Henderson, 2006; zsKnight et al., 2007). In short, the ensuing months and years saw the standardisation of full-speed (although not fully hardware accurate) emulation, intuitive graphical user interfaces, compatibility with speciality chips such as the Super Accelerator 1 (SA-1), and new features such as netplay and movie recording. Interestingly, much as formal videogame companies frame their consoles through generational breaks, informal retrospectives on emulator development often use ZSNES and Snes9x as a transition point. Brad Levicoff, the founder of the venerable emulation website Zophar’s Domain, has noted that “ZSNES and SNES 9x are in a completely different generation than [VSMC]” and other early projects (1996). However, I do not want to risk falling into a teleological history that frames emulator development as a segmented progression of increasingly sophisticated projects. The applications that emerged from this tumultuous scene have had incredibly varied trajectories, with some of them still in use to this day, and the 2000s and 2010s saw emergence of a panoply of new projects and development forks with diverse objectives and use cases. In the next section I choose to focus on one of these emulators, bsnes, due to its central role in pursuing SNES/SFC hardware accuracy.

SNES/SFC Emulation II: The Quest for Hardware Accuracy

In the early days of SNES/SFC emulator development, it was common for developers to cheat a bit to get games running on home computers. Cheating, in the context of emulation, means implementing game-specific or global hacks—bits of code that “artificially boost

compatibility" with a single game or the console's entire library[17] (Near, 2007)—in lieu of perfect hardware emulation. ZSNES was particularly notorious for its reliance on ad-hoc integrations that, though maligned by emulation purists, helped make the application compatible with almost every single commercially released SNES/SFC game. Once ZSNES had reached a level of stability, its development team spent a great deal of time increasing its hardware accuracy in order to remove "many, many hacks" from its code and, by the mid-aughts, even claimed to have "less than a dozen…the least of all the emulators that use hacks" (zsKnight et al., 2007). Despite these efforts, ZSNES is known to this day for its unorthodox functionality.

While widespread compatibility was one of the defining goals of early emulator development, not everyone was pleased with the tendency of emulators to cut corners. In the mid-aughts, Near[18] emerged as one of the most prominent voices advocating for improved SNES/SFC hardware accuracy. Now widely known for their extensive work on bsnes, higan, and ares, Near first dipped their toes into informal development through fan localisation efforts (Klepek, 2021a), contributions to Snes9x (Koot & Henderson, 2006), and a general proclivity to be entangled with almost every SNES/SFC documentation project. As we were discussing the origins of SNESCentral, Gowan relayed that a great deal of its content was provided by Near who had "scanned every cart, box and PCB, and dumped the games with very specialized hardware to capture the exact mapping that allows the game to run accurately in an emulator" (Gowan, 2021). Gowan went as far to claim that almost every modern SNES/SFC emulator and hardware reproduction owes a great deal to Near's comprehensive documentation.

In 2004, Near released the first of many blog posts about the state of SNES/SFC emulation, which included the bold claim that the popular ZSNES emulator "fails to simulate even the most basic attributes of the system" and that a "true attempt at hardware emulation is long overdue" (Near, 2004). This rhetoric might seem a bit puzzling as, by the aughts, SNES/SFC emulation had entered somewhat of a golden age of usability. ZSNES and Snes9x had long been available as free, lightweight emulators and were compatible with almost every commercially released SNES/SFC game. But, as Near was quick to point out, just because an emulator can play a game does not mean that it is accurately mimicking hardware.

> Even if every game you throw at your emulator of choice plays perfectly, it's still not properly emulating a real SNES. The authors claim to be emulating the hardware, but they're not. They may be extremely capable of running commercial ROM images, but none behave like a true SNES with all its limitations. (Near, 2004)

Near's manifesto-like post highlights a gap between day-to-day use and the lofty ideal of perfect emulation. While the average user would likely never notice when an emulator sacrifices hardware accuracy in favour of game compatibility, if the overarching goal of videogame

[17] Near mentions that hacks may adjust the CPU speed for a specific game or ignore SNES/SFC hardware quirks (Near, 2007).

[18] I will be referring to them as Near as this was their preferred pseudonym, even though a great deal of their early work was written under the name byuu. While their legal name is now public, I do not believe they shared it publicly during their life, so I will not share it here.

emulation is to perfectly replicate the base console, then all the projects developed throughout the nineties and early aughts had unquestionably fallen short.

Despite ending their first blog post by explicitly stating it was not their job to create a more accurate SNES/SFC emulator, by 2007, Near had effectively made it their job to create a more accurate SNES/SFC emulator. In a follow-up post, they announced that they had created their "own SNES emulator to achieve my ideals" (Near, 2007). The result of Near's efforts was bsnes, a SNES/SFC emulator focused on hardware accuracy. Right out of the gate, bsnes was compatible with all known commercial game releases with zero bugs,[19] but Near lamented that it still fell well short of their goal of perfect accuracy. This gap between aspiration and reality is one of the most striking aspects of Near's developmental chronicles—published online between 2007 and 2020—which outline why perfect hardware emulation for the SNES/SFC is likely impossible and perhaps not even desirable for most users.

It may seem odd that the SNES/SFC hardware took approximately three years for Nintendo to develop (Arsenault, 2017, p. 44) but, after a decade of emulator development, perfect hardware emulation appeared to be an unreachable goal. There are, of course, overarching logistical obstacles—the disparity of resources between formal development and informal reverse engineering comes to mind—but also some distinct technical hurdles that proved troublesome to overcome. Earlier, I mentioned that the SNES/SFC featured numerous console variations that frustrate the documentation efforts of hackers and modders, but Near went as far to delve into the variances of individual electrical components.

> Emulation of actual hardware can get very, very close to perfect; but those last fine details can never be fully emulated. Eventually, you start to find cases where even the hardware itself returns different outputs for the exact same inputs. Randomization, essentially. But randomization from what? Physics. Things like hardware component tolerances and interference. Even essential components like the crystal clocks that drive the frequencies of processors can vary from console to console.

While it is possible to emulate these small deviations in a way that is good enough (i.e. by averaging them out to establish a baseline across console and component variations), this results in an 'average' version of a console rather than accounting for its multiplicities or real-world physics. Near's elucidations on component variations borders on the pedantic, but they prove useful in discovering the absolute limits of console emulation. And, if we pull back a bit, this focus on individual components highlights some of the major challenges in reverse-engineering the SNES/SFC.

Analysis and documentation have been persistent struggles for emulator developers, especially since each chip within the SNES/SFC (and its game cartridges) comes with its own unique diagnostic challenges. In fact, one of the major throughlines across Near's blog posts is their framing of the console's PPUs as a sort of final boss for them to overcome.

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[19] Near refers to this as 100% compatibility, meaning that "multiple people have tested every commercially released SNES game, looked for any bugs they could find, and I've fixed every last one found. It's not the same thing as perfection, or 100% accuracy" (Near, 2007).

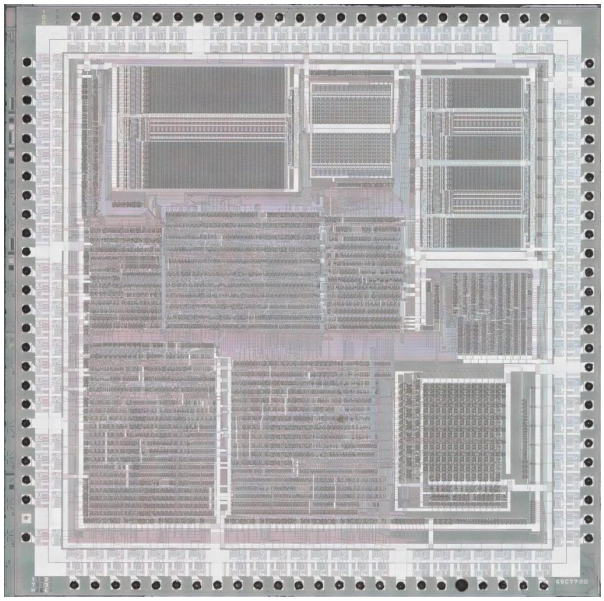

Figure 4.8. S-PPU1 20x die scan, as sourced from Near's website.

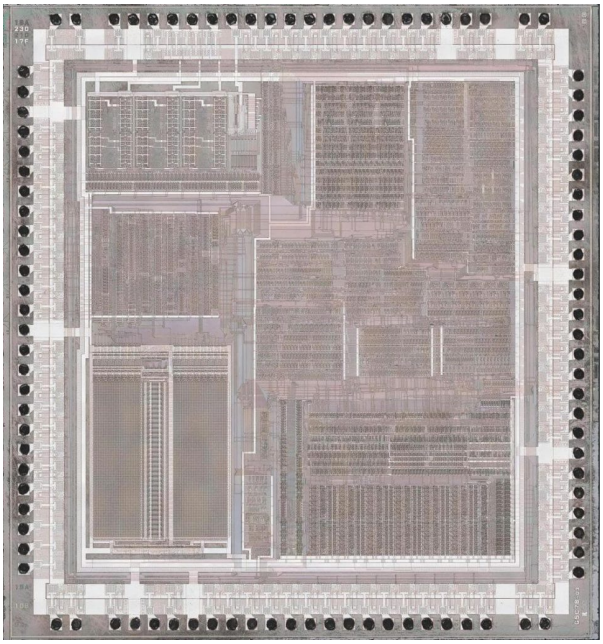

Figure 4.9. S-PPU2 20x die scan, as sourced from Near's website.

To generate its video output, the SNES/SFC relies on two PPUs chips, the PPU1 and PPU2 (Figure 4.8 and Figure 4.9).[20] Unfortunately, unlike many of the console's other components, these chips are effectively black-boxed and "you cannot analyze the pixels it generates, as they are sent directly from the PPU2 out through the analog MultiAV connector on the back of the SNES console" (Near, 2020). Many of the chips' inner workings are mysterious to emulator developers and, consequently, cannot be fully replicated as software. While some broad technical specifications have been discovered—there are 52 writable PPU registers, 12 readable registers, and various types of memory (VRAM, OAM, and CGRAM)—details such as the chip's number of internal registers and precise PPU cycle timings are not fully known. In a 2020 blog post, Near proposed a number of methods for scrutinising the PPUs: reading and writing to the OAM and CGRAM during rendering to catch a glimpse of their operation, diagnosing games that have known rendering issues, analysing analog RGB output through the use of carefully-designed test ROMs, directly monitoring the pin-outs of the PPUs, creating custom-designed breakout boards, or acquiring x50 die scans of the chips in order to "recreate transistor-perfect copies of them in a Verilog/VHDL-like language" (Near, 2020). Unfortunately, Near also admitted that all of these methods fell well outside of their expertise, going as far to request help from the community at-large: "If we can solve this last problem, we can have almost completely perfect SNES emulation, to a state where even I could be satisfied that the SNES has been preserved for future generations" (Near, 2020). To this day, the inner workings of the PPUs are still not completely understood.

[20] And not all console iterations contain this exact configuration of chips (Wershler, 2022, p. 105).

There is another problem that has stymied Near's quest for hardware accuracy: most emulator users do not care about further improvements as they have little-to-no positive effect on how they play games. In fact, further accuracy improvements often end up *worsening* user experience. As seen in the early days of emulator development—when developers were trying to integrate sound and transparency effects—there is always a trade-off between accuracy and performance. One of the issues that Near grappled with while developing bsnes is the persistent fear that their quest for hardware accuracy would come at the cost of destroying the emulator's usefulness to the average user.

> Perhaps the worst of this, is that all of the future complexity and performance penalties are going to be for hardware features and support of things that virtually nobody cares about. Emulation is always a system of increasing costs and decreasing rewards. (Near, 2016)

While their imaginary for bsnes was perfect re-creation, most folks simply desired to play games as seamlessly as possible. As an example, in 2010 Near switched the S-PPU renderer to a model where "each pixel is now rendered in real-time" (byuu, 2010), which resulted in better accuracy but made bsnes emulation roughly 40% slower. This dramatic impact on performance only ended up improving the graphics of a single game, *A.S.P. Air Strike Patrol* (1994), making the shadow of the player-controlled plane visible (Figure 4.10), assisting with positioning and aiming, as intended in the original release. But while every single user would likely notice the dip in performance, very few would appreciate a single gameplay improvement for a relatively uncelebrated SNES/SFC title.

Figure 4.10. A side-by-side comparison of *A.S.P. Air Strike Patrol* running in two different emulators, showcasing the difference in how the plane's shadow is rendered (El-Jauncho, 2020).

Interestingly, while Near expressed concern about performance, the breaking point for most users turned out to be interface-related. In the mid-aughts, Near overhauled bsnes to utilise a bespoke gamepak system. Instead of loading ROM images as a list of singular files, as

had been the standardised method for years, Near believed it was more effective to "have one folder for each video game, where all the files for said game would be stored" such as "coprocessor firmware, cartridge mapping information, and MSU1 audio/data files" (Near, 2016). Although a novel solution to the growing complexity of bsnes—Near was in the process of moving on from one-size-fits-all solutions (e.g., generic memory maps) to more nuanced ones (e.g., custom memory maps for each SNES/SFC game)—user reception was cold.

> This change also created severe backlash amongst bsnes users; literally decimating the userbase from ~100,000 downloads a release to around ~10,000 per release. It alienated many long-time supporters, turned some into foes of the project, and resulted in roughly a dozen forks of bsnes. (Near, 2016)

In reaction to this backlash, Near came to the conclusion that they could not please everyone with a single emulator. On August 9 2012, they released higan, an offshoot of bsnes that doubled-down on accuracy while also fully embracing multisystem support.[21] Featuring a notably more complex interface and higher system requirements, Near wanted higan to become an all-in-one solution that allowed for greater scope and complexity, allowing the standalone version of bsnes to transition into a pure SNES/SFC emulator focused on "performance, features, and ease-of-use" (Near, 2019).

This friction between day-to-day use and perfect accuracy is not unique to emulators. Returning to Sterne for a moment, I can find many parallels with bsnes and the discourse surrounding MP3s (2006). MP3s are a ubiquitous audio file format designed for compact file sizes and maximum compatibility across platforms, particularly online marketplaces and streaming services. Though MP3s are a lossy file type (i.e. some data has been removed during compression), they use a "specific form of data compression based on a model of how the human ear works" that "anticipate how its listeners perceive music and to perceive for them" (Sterne, 2006, p. 828). While listeners ostensibly do not get the full sonic experience when listening to an MP3,[22] Sterne argues that is somewhat beside the point. MP3 are designed for "massive exchange, casual listening and massive accumulation" rather than fidelity—they are convivial technologies predicated on circulation rather than perfect execution (Sterne, 2006, p. 838). Similarly, most SNES/SFC emulators sacrifice absolute hardware accuracy in favour of usability because the average user does not particularly care if the application is wholly faithful to the base console as long as they can play their desired games. Whether listening to music or playing a videogame, most users will embrace usability over absolutist notions of accuracy.

Near split development between higan and bsnes to pursue their vision of hardware accuracy, but user aspirations for SNES/SFC emulation go far beyond debates of compatibility versus ease-of-use. bsnes has been split into countless development forks, persists as a core within higan (and other multi-system emulators), and there are now standalone SNES/SFC

[21] Around the time Near implemented gamepak functionality, bsnes began supporting additional game consoles. At first, these were adjacent systems such as the Super Game Boy, the BS-X Satellaview, and the Sufami Turbo. Over the years, higan grew in complexity to support dozens of additional systems.
[22] There are differing opinions on the psychoacoustic qualities of MP3s and if the difference between lossless and MP3 audio can be perceived on the average audio playback system (Sterne, 2006, p. 838).

emulators for almost every conceivable use case, from speedrunning to software preservation. As Near reiterated across their blog posts, there is no universally agreed-upon method for emulating the console.

> That there is no one single 'right' approach to emulation. There are just a myriad of tradeoffs at all different points on the spectrum. ZSNES and Snes9x have aimed at maximizing speed, and by doing so, have enabled millions of people to enjoy and relive childhood memories of playing their favorite SNES games, and they deserve the utmost of respect for that, regardless of how 'accurate' the emulator itself is. (Near, 2010)

Emulators are intriguing objects of study as they crystallize the expertise and priorities of material communities that have grown alongside videogame consoles. I chose to focus on Near in this section not just because of their large influence on the SNES/SFC emulation scene, but also due to their status as the designated interpreter for hardware accuracy—a status that has persisted long after their death. Their blog posts and technical documentation serve as central texts (Marvin, 1988, p. 12) that document and propose standards for re-creating the SNES/SFC console as software, and their recognition that there can be no universally-embraced emulator was part of a growing movement toward distributed development. As I will explain in the next section, modern emulator development is predicated on the open sharing of documentation and expertise through shared repositories—although certainly not without contention.

SNES/SFC Emulation III: Distributed Development and Software Imaginaries

As Near toiled to increase hardware accuracy, an important trend emerged across emulator development teams: the migration of projects to GitHub. Currently one of the largest software development and code hosting services on the Internet, GitHub is widely used by stakeholders ranging from massive corporations to individual programmers. In her study of the platformisation of software development, Bounegru notes that GitHub is a hybrid space where "both proprietary and F/OSS development practices may be found" (Bounegru, 2023, p. 2) and where they abide by standardised actions such as forks, branches, and pull requests.[23] She describes these as "grammars of action" (2023, p. 8) that predefine and standardise possibilities for users, but I could also align her term with various theoretical threads: repertoire, the "doing, repeating, and mimetic practices" that transfer knowledge and maintain structures within an archive (De Kosnik, 2016, p. 7; Taylor, 2010, p. 2); protocols, the often taken-for-granted norms related to how a technology is used (Gitelman, 2006, p. 5); or cultural techniques, sociotechnical processes that both precede and are shaped by media technologies (Siegert, 2015, p. 11; Sterne, 2006, p. 826). Regardless, while emulator development has always been developed collaboratively,[24] the turn to GitHub demonstrates a growing desire to formalise

[23] A fork is a copy of an existing repository that allows users to make changes without affecting the original, a branch is a contained area of a repository where users can experiment, and a pull request is a way to ask that changes made a branch be merged back into the mainline release.

[24] ZSNES and Snes9x feature sprawling lists of contributors on their websites (Koot & Henderson, 2006; zsKnight et al., 2007) despite early competition and community drama.

processes and foster open development structures. “Standardising possibilities for action enables social media platforms like GitHub to render selected activities, projects and people measurable, calculable and comparable” (Bounegru, 2023, p. 8) and, in the case of emulators, it provides users with the infrastructure and opportunity to create bespoke variants or contribute features that can be re-incorporated into a mainline release.

While not fully correlated with the adoption of GitHub, throughout the 2000s and 2010s it became increasingly common for emulator developers to release their projects under F/OSS (free and/or open-source software) licenses. Rather than relying on ambiguous terms of use or closing off their code entirely, software licenses allow developers to establish how their projects should be adopted and distributed, giving them some measure of control over their source code once it is released into the wild. Fully documenting emulator licenses is not as straightforward as sifting through readme files, however, as projects often contain a myriad of contributions, diverse forks, and can change their licenses over time. However, at a glance, the mainline release of bsnes and higan both use the GNU General Public License (Free Software Federation, 2007), ares the ISC Open Source Software License (Internet Systems Consortium, 2024), BizHawk the MIT License (MIT, 2025), and Snes9x a bespoke non-commercial license that classifies it as “freeware for PERSONAL USE only” (snes9x2010, 2018).

Snes9x is an interesting case study into how opening development can occasionally lead to undesirable outcomes. While the emulator features a distinct non-commercial license, it has been surreptitiously integrated into multiple commercial products. Gowan has extensively documented these incidents on SNESCentral as part of his ongoing chronicling of informal SNES/SFC history. Perhaps the most brazen violation of Snes9x’s license was its inclusion in the Retron 5 (Figure 4.11), one of Hyperkin’s many multisystem console reproductions, alongside several other similarly-licensed emulators (Gowan, 2015; Schulenberg, 2014). As a commercial product with closed software architecture—users are not allowed to view or modify the console’s code—the Retron 5 violates both the non-commercial and the open-source/copyleft conditions of emulator licenses. While Hyperkin eventually corrected the latter issue by releasing their source code publicly, they never secured permission from Snes9x developers to use the application for commercial ends (Schulenberg, 2014). Gowan also documented the unauthorised inclusion of Snes9x in the Steam release of *Bubsy Two-Fur* (2015), a digital repackaging of the SNES/SFC games *Bubsy: Claws Encounters of the Furred Kind* (1993) and *Bubsy II* (1994) (Figure 4.12). While Piko Interactive claimed that they had secured permission from Snes9x’s original developers, Gowan doubts the veracity of this claim. First, Koot and Henderson had been radio silent for years leading up to the incident, unreachable even by other folks continuing Snes9x’s development (Gowan, 2015), making it unlikely that they gave their blessing. Second, even if Piko Interactive had gained permission from both, at least a dozen other developers contributed to the development of Snes9x, meaning their consent alone would have been insufficient (Gowan, 2015; snes9x2010, 2018). However, as Gowan laments, even when a company has been proven to be in the wrong, emulator developers “do not have enough interest or resources to take legal action” (Gowan, 2015). Much like how Yuzu’s developers lacked the resources to challenge Nintendo’s lawsuit, Snes9x developers could still not prevent undesired commercial use.

Figure 4.11. HyperKin's Retron 5 console.

Figure 4.12. A screenshot of *Bubsy Two-Fur* (2015), running on Snes9x on Steam.

Despite these contentious incidents, or perhaps conceding to the inevitability of unintended appropriation, emulator development has become progressively more open in recent years. Near's final emulation project, ares, is both comprehensive in its scope and gregarious in its distribution. On March 25 2020, Near created ares as a GitHub fork of higan to build on the success of bsnes's recent revival and to make available an easy-to-use, multi-system emulator capable of handling so-called "modern" systems such as the Nintendo 64 and PlayStation[25] (Usher, 2024). On July 5 2021, ares became an ISC licensed emulator with Luke Usher serving as the new project lead, opening the door to adoption and modification by commercial and non-commercial stakeholders alike. As an all-in-one emulator anyone can contribute to—ares includes 'cores' for consoles ranging from the Atari 2600 to the Sega Game Gear—ares serves as a convivial site of hardware re-creation. When I spoke to Usher about his stewardship of the project, his role seemed to mirror that of a managing editor:

> Now that we're on GitHub, it's become more of a community project. I still have final say about what goes in and what doesn't, and I add features, make bug fixes, and tweak emulation… People are free to add what they want, as long as the code they add is high quality and fits the standards of the rest of the emulators.

Despite its distributed development, Usher pointed out that parts of ares have de facto owners. Much like Near specialised in SNES/SFC emulator development, there are two people who are "basically running the N64 core because that's their specialist subject" and contribute updates on a regular basis. The combination of GitHub hosting, an open license, and a stable review

[25] The first generation of 3D consoles are notoriously difficult to emulate and are currently not capable of running in a way that meshes with higan's stringent accuracy requirements.

workflow means that anyone can create a branch of ares, make their own tweaks and additions, and submit a pull request to have their work integrated back into the project.

This does not mean, of course, that ares has subsumed all other projects.[26] Usher recalled that there are still many debates about what roles an emulator should fulfill, and the desire for specialised features has resulted in countless variants. It is not unusual to find numerous bsnes cores within a multi-system emulator, each with slight compatibility or feature tweaks, or standalone versions enhanced to accomplish very specific tasks (such as software preservation, which I will elaborate upon in *Satellite Archaeologies*). Still, ares is a central example of a modern, multi-system emulator that consolidates the expertise of countless development teams.

While accuracy, compatibility, and performance were initially the main points of divergence between SNES/SFC emulation projects, once their central functionality had stabilised, developers began to shift their focus to applications built around the needs and desires of specific communities. While Near was driven by the idea of a perfectly hardware accurate emulator—perhaps an impossible apparatus that signifies more than it is capable of delivering (Kluitenberg, 2011, p. 56)—once they and countless other developers had rendered the SNES/SFC convivial, it opened the door for endless other imaginaries. As emulators crystallise different sets of protocols and techniques related to the SNES/SFC, each application provides a window to the expertise and desires of a different material community.

[26] RetroArch, managed by LibRetro, is another prominent multi-system emulator. While it similarly supports numerous cores, from what I have gathered from informal documentation, it adopts these elements using more of a top-down approach. The LibRetro team did not respond to my requests for an interview or further elaboration on this topic.

Figure 4.13. BizHawk playing *Super Mario World* (1990).

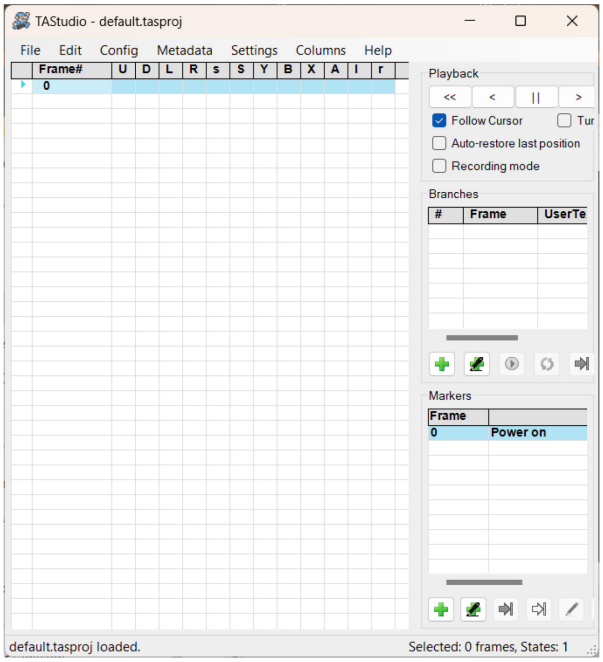

Figure 4.14. BizHawk's TAStudio feature, a tool built specifically to facilitate complex Tool-Assisted Speedruns.

BizHawk[27] is a useful example (Figure 4.13), as the emulator is rooted in hardware accuracy but simultaneously offers a number of features that far surpass the capabilities of the SNES/SFC. A multi-system emulator that focuses on recording, playback, and debugging tools, BizHawk touts itself as "the first choice for TASers (Tool-Assisted Speedrunners)" (YoshiRulz & Morilli, 2023). Tool-assisted speedruns (TAS) are "a specialized play style devoted to completing games as quickly as possible using software assistance" (Altice, 2015, p. 10), where users meticulously program button inputs to create theoretically perfect or highly performative[28] speedruns that can be played back. BizHawk both reifies and enables the imaginaries of TASers through its inclusion of custom features: detailed speed controls such as frame stepping and rewinding; a heads-up display that showcases inputs, frame rates, and other data; an input mapper for emulated gamepads; easy integration with Lua or C# for more advanced software configurations; and input recording through TAStudio that enables its core use case (Figure 4.14). Though these features allow interactions that would never be feasible with a stock console, they signal a desire to build upon hardware-rooted speedrunning practices (Iantorno,

[27] Strangely, BizHawk seems to oscillate between 'BizHawk' and 'EmuHawk' in its branding. I have chosen to use BizHawk, as this name appears when the emulator is opened, but it seems that informal projects struggle with the same naming inconsistencies as commercial hardware (Custodio & Iantorno, 2023).
[28] TAS speedruns have become a mainstay at events such as Awesome Games Done Quick, where ingenious TASers have pulled off feats such as turning *Super Mario World* into an anachronistic version of *Super Mario Maker* by manipulating memory with incredibly fast button inputs (Orland, 2016).

2021a; Koziel, 2019) by pushing the SNES/SFC and its software library to the absolute limits of their functionality. Interestingly, while BizHawk is a specialised tool and tool-assisted speedruns remain a niche practice, the standardisation of emulator development allows the emulator to cater to various desires. Users can pick from five different SNES/SFC emulator cores: faust, Snes9x, and three separate variations of bsnes. Although the BizHawk development team recommends bsnes v115+ to achieve the necessary accuracy for TAS speedruns (YoshiRulz & Morilli, 2023), users can also easily boot up Snes9x for a casual play session. This flexibility has led to a productive, yet messy, landscape for SNES/SFC emulator development where projects are specialised but capitalise on the growing standardisation of development practices.

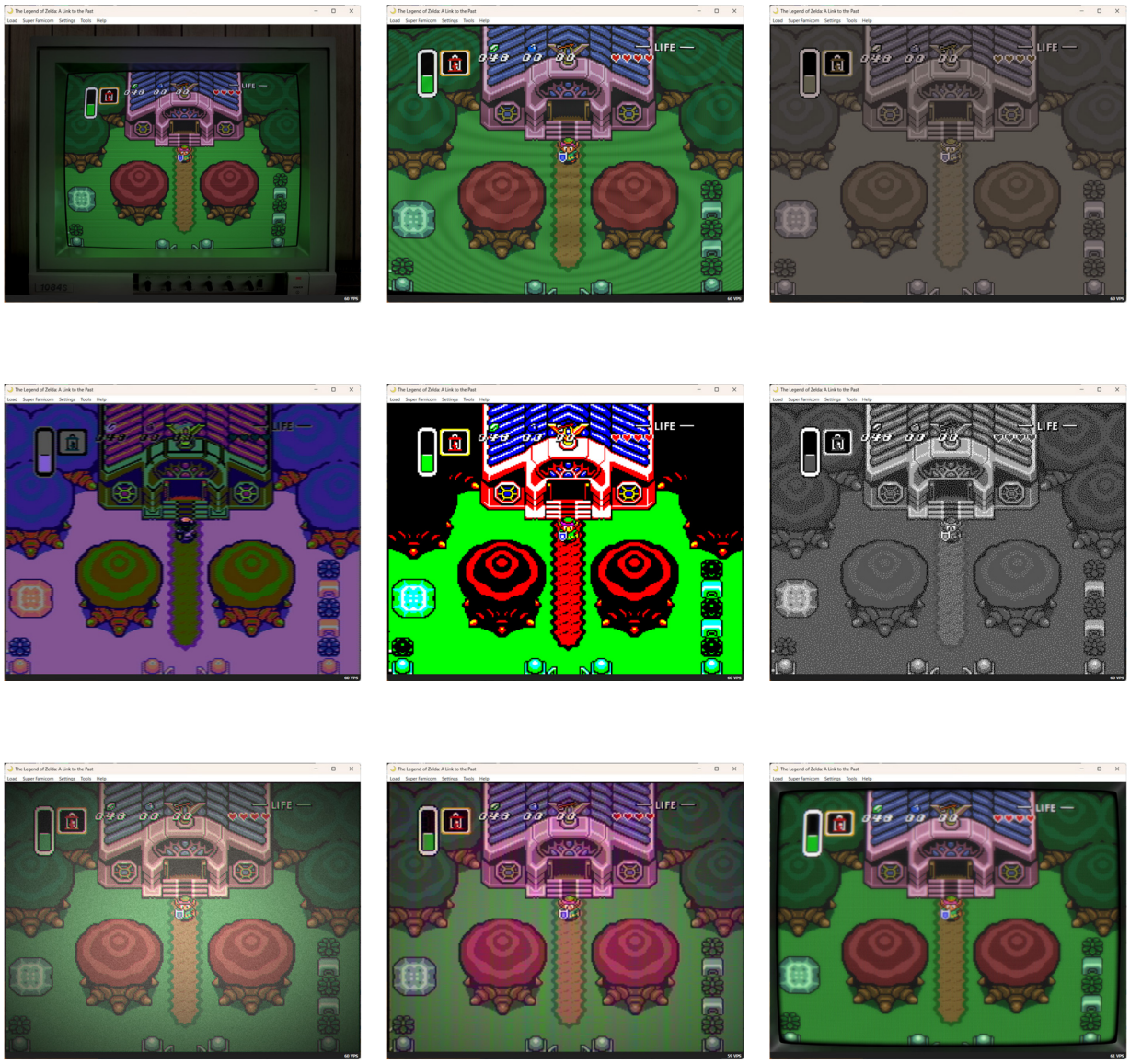

Figure 4.15. Nine shaders, applied to *The Legend of Zelda: A Link to the Past* in ares using librashader.

Building on this idea of modularity and circling back to the visual authenticity of the SNES/SFC, the complex imaginaries of console emulation are further demonstrated through librashader. Created by Ronny Chan, librashader is a "complete reimplementation of the RetroArch slang shader pipeline that allows standalone emulators to easily and optionally implement support for RetroArch-style shaders and shader presets" (Chan, 2023). That is a mouthful, but essentially librashader allows any emulator to integrate a vast collection of shaders—filters that change the appearance of games to make them look as if they were played on various types of screens—into their functionality. These shaders and shader presets (suggested combinations of shaders) simulate screens ranging from CRT televisions, such as the highly sought after Commodore 1084, to impossible configurations, such as film stock or cel-shaded animation (Figure 4.15). Rather than presenting a default or baseline of what screen a given console should be played on—such as the CRT aficionados who insist that broadcast-quality Sony PVM monitors are the ultimate way to play retro games (Moher, 2021)—librashader can hypothetically be added to any emulator to allow users the freedom to combine consoles and displays in endless ways. A user may boot up Snes9x with a simple CRT shader to quickly recreate their memories of playing SNES/SFC on an old television set, while a speedrunner may combine a bsnes core in BizHawk, alongside a handful of Twitch extensions, as part of a complex streaming assemblage. Echoing Near's lamentation that satisfying every user's desire for a perfect return is impossible, developers have instead opted for a reflective nostalgic approach. Users can customise their experience, through endless software variations and configuration options, to best match their imaginaries for the console.

Closing Discussion

In 2017, Nintendo released the Super NES Classic Edition, a miniature reimagining of the original SNES/SFC console (Figure 4.16). Rather than creating a full hardware reproduction that was backwards-compatible with official game cartridges—a strategy that numerous companies have adopted after the console's patent expired—Nintendo instead created a miniaturised device loaded with their in-house SNES/SFC emulator Canoe (*Canoe*, n.d.) and a small selection of ROM images. The Super NES Classic Edition features 720p HDMI video output, technical specifications that far eclipse the original console, and a flashy GUI that mimics the 'rounded rectangle' aesthetic that made its debut on the Nintendo Wii (Figure 4.17). When users boot up the device, they are greeted with a curated collection of 21 of the SNES/SFC's greatest hits, from *Super Mario Kart* (1992) to *Megaman X* (1993), that they can easily play using the console's included reproduction controllers.

Figure 4.16. A product shot of the Super NES Classic Edition.

Figure 4.17. A screen capture of the Super NES Classic Edition's interface.

The Super NES Classic is a perfect encapsulation of emulator formalisation as it selectively incorporates features popularised by informal projects, combines them with established intellectual property, and integrates them back into a closed hardware ecosystem.[29] Users can switch between pixel perfect, 4:3, or CRT Filter (4:3 with scanlines) display options; choose from a number of colourful frames that fill the black space around the game visuals; keep up to four different save states for each game; and even rewind their gameplay within a five minute limit. Though offering a relatively small game library and configuration features that pale in comparison to those offered by informal emulation projects, endless customisation is not Nintendo's objective. As Payne has noted in his study of plug-and-play (PNP) consoles, the "history performed by PNP devices is monolithic and corporate" and a stark contrast to the efforts of informal emulator developers (2008, p. 62). And, as Custodio has discussed, Nintendo has leveraged emulators as part of a concerted re-release strategy that "concentrates decades of user-generated content into a narrow, controlled channel through which they can extract the greatest profit" (Custodio, 2020, p. 145). Rather than allowing users to pick-and-choose features, the Super NES Classic Edition offers a "limited, immutable retro experience" (Payne, 2008, p. 62), priced at a premium, and released just in time for the holidays.

While I may come across as a touch cynical, I recognise that Nintendo's commodification of nostalgia embodies a widespread user desire for the SNES/SFC: an official revival. The Super NES Classic edition mimics the look and feel of the original, requires no advanced set-up, is compatible with modern television sets, and provides a (legal) collection of greatest hits without any additional purchases or downloads. There is undoubtedly a strong desire for pre-packaged nostalgia—Nintendo sold over five million units during the Classic's commercial run, and it remains a highly-sought after collector's item—that sheds the complexity

[29] Of course, the Super NES Classic Edition was inevitably reverse engineered and hacked by users, who managed to add (almost) the full SNES/SFC library to the console.

of downloading an emulator, sourcing ROM images, and configuring features[30] in favour of visually-attractive usability. Of course, this reflects the same sentiments Near butted against as they were toiling away at hardware accuracy: users are not always enticed by robust features or absolutist notions of authenticity. In fact, as many folks simply want to play their games as frictionlessly as possible, some of the most formalised emulator integrations tend to render themselves invisible. I had to consult numerous hacker wikis to figure out which emulator Nintendo used in the Super NES Classic Edition, and the company's official product pages avoids the term 'emulator' entirely in favour of generic buzzwords: "the original look and feel of the '90s home console, only smaller" (*Nintendo Classic Mini*, 2017). Even convivial multi-system emulators such as RetroArch have embraced streamlined approaches, such as offering preset configurations or automatically loading an emulator core when a ROM image is selected.

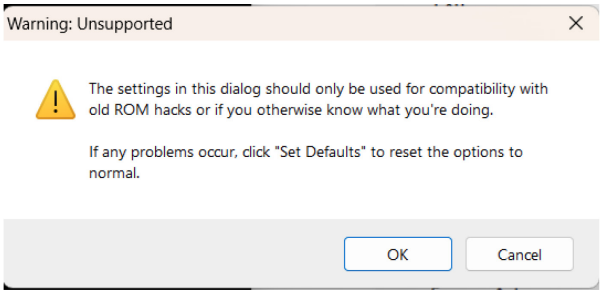

Figure 4.18. The "Warning: Unsupported" pop-up that appears when you access "Emulator Hacks" in Snes9x 1.63.

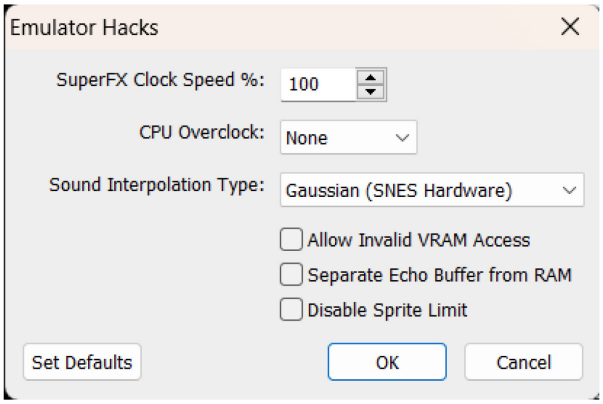

Figure 4.19. The "Emulator Hacks" menu in Snes9x 1.63, which allows the emulator to run non-standard ROM images.

Nintendo's in-house efforts should not be viewed as an end point for emulation, with the software coming full circle back into the corporate domain. Rather, the widespread and varied adoption of the applications is further proof that they have become ubiquitous. There is a SNES/SFC emulator out there for everyone, from TASers crafting the perfect speedrun to home users desiring a return to form. In fact, as I began research on my *Final Fantasies* and *Pixels and Plastic* chapters, I noticed a curious feature that was packaged in a number of emulator releases: the ability to deliberately *decrease* hardware accuracy. Some versions of Snes9x allow users to reintegrate "emulator hacks" through dedicated menu options, such as allowing invalid VRAM access or even changing the clock speed of specialised cartridge chips (Figure 4.18 and Figure 4.19). As ROM-hacking practices have been both enabled by emulator development and helped encourage their adoption, the ability to play modified games has become a central feature of their design. Clearly, these "old ROM hacks" have become a core part of SNES/SFC

[30] While ares is now my emulator of choice, it took me a full hour to figure out how to activate its shaders without creating immense amounts of visual lag (it turns out that the application needs to be manually assigned to run using a computer's graphics card).

history, at least for some material communities, despite their at-times tenuous legal status and their frequent compatibility struggles with original hardware.

Figure 4.20. A comparison of a section of the Sistine Chapel roof, before and after its restoration in the 1980s.

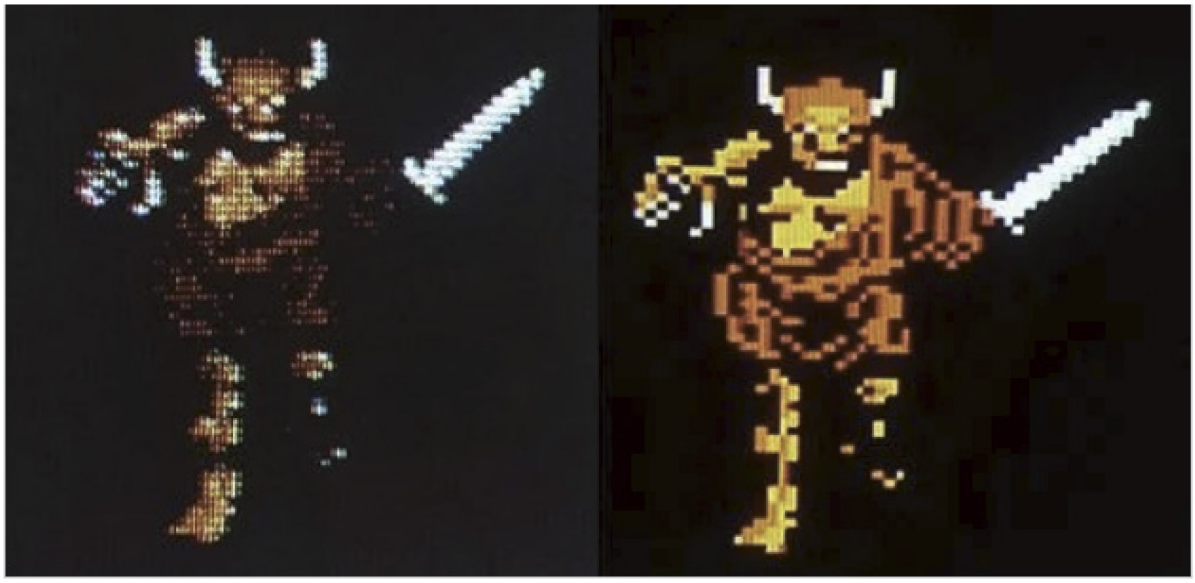

Figure 4.21. A comparison of a NES/FC game sprite, photographed on a CRT and screen captured from an emulator. Photo credit: Benj Edwards.

To close this chapter, I cannot help but draw a connection between emulators and Boym's musings on the tumultuous eighties' restoration of the Sistine Chapel's ceiling frescoes (Figure 4.20 and Figure 4.21). Using advanced computer technology, restorers attempted a total

re-creation of the chapel's original ceiling which was "to look old and brand-new at the same time" (Boym, 2001, p. 46). Over the course of years, they worked diligently to refresh its colours, patch over cracks and seams, and remove the "patina of time made of candle smoke, soot, cheap Greek wine and bread used by ingenious seventeenth century restorers and a few hairs from the artist's brush that were stuck in the painting" (2001, p. 46). Following the chapel's restoration arguments inevitably arose, in which "all sides accused the other of distorting Michelangelo and engaging in nostalgia or in commercialism" (2001, p. 46). The colours were too bright, the ceiling too smooth and perfect, and the absence of imperfections allegedly removed the artist's final flourish—an ambiguously-defined aura related to material constraints, authorial intent, and the natural passage of time. Amusingly, after all the work that had gone into rendering the masterpiece more vivid, visitors were treated to a rather dimly lit spectacle once the Chapel reopened. It turns out that, due to both budgetary constraints and a desire to diminish the overly bright hues, the curators had decided to turn down the lights (Boym, 2001, p. 47).

Unlike those tasked with restoring the Sistine Chapel's priceless ceiling, emulator developers need not worry about sullying a unique original—although they certainly face the same criticisms related to authenticity and nostalgia. Transformed into convivial software, the SNES/SFC can be shaped to fulfill any number of developer and user imaginaries, from (nearly) perfect re-creation to playful deviation. Within histories of media "the interplay of the imaginary and the actual, the realized and the desired, is constantly at work" (Kluitenberg, 2011, p. 54), and emulators manifest and mediate user desires in diverse ways. As a result, the applications are foundational to a bevy of user practices that question both what the console was and what it can become. In the next three chapters I study three of these practices: informal software preservation, reproduction cartridge manufacturing, and localisation ROM hacking.

5. Satellite Archaeologies

Figure 5.1. In a Satellaview television advertisement, Mario floats in space.

Chapter Introduction

So many media archaeologies begin with a mystery, and there has never been a shortage of myths concerning the SNES/SFC. Released at a time when the game industry was highly formalised and resistant to user inquiry (Keogh, 2019, p. 23), rumours about the console ran rampant and could not be easily verified or disproven. Users would feverishly speculate on the functionality of seemingly neglected hardware features or the fates of games that were teased in magazines then quietly shelved. Despite the excitement associated with these rumours, videogame mysteries are usually rooted in the mundane. Cancelled hardware releases and regional distribution strategies are common across various media industries, after all, and they only reach mythic status through the combination of corporate opacity and fan tenacity. The resolution of these mysteries can sometimes be dramatic—such as the oft-cited unearthing of Atari cartridges at the Alamogordo dump (Chappell, 2014)—but more often they are slowly unravelled through persistent user efforts.

One of the most compelling mysteries connected to the SNES/SFC involves a Japan-exclusive peripheral known as the Satellaview (Figure 5.1). Developed by Nintendo and the satellite broadcasting company St.GIGA, the Satellaview is a pedestal-like add-on for the SNES/SFC that allowed users to access a rotating collection of games, digital magazines, and other content using a satellite dish. However, unlike Japanese-exclusive SNES/SFC cartridge games that made informal trips overseas on the back of free emulators, online marketplaces, and fan localisations, the Satellaview's software library has remained somewhat evanescent. Most of the device's content was stored on memory packs that users rewrote during each broadcast, meaning that they were never given the opportunity to accumulate stable software libraries. Additionally, there appears to be no formal archive of Satellaview content and little corporate desire to revisit its content, leading to what Salvador refers to as an "abandoned ecosystem" of videogames (2023). With the absence of formal stewardship and scant material remains to draw upon, much of the Satellaview's software library appears to be lost in the aether.

In this chapter, I will discuss the ongoing user efforts to recover and reconstruct the Satellaview during its afterlife. I begin with a short overview of the device, where I briefly summarise its corporate history and contextualise it in relation to other SNES/SFC add-ons and contemporary networked videogame technologies. Next, I outline its technical configuration and day-to-day operation to flesh out how Japanese users would have interacted with the device during its designed commercial lifespan. I then turn toward theory, contemplating how the Satellaview's ephemerality complicates the construction of the platform studies archive (T. Apperley & Parikka, 2018, p. 354) and forces scholars to embrace informal technologies, user-created techniques, and paratexts to learn more about the device. Bringing in discussions from Nicoll (2019), Custodio and Iantorno (2023), and Salvador (2024), I identify the Satellaview as an abandoned ecosystem whose games are mostly unavailable due to a critical lack of formal stewardship. This leads me to material communities who engage in Satellaview recovery efforts, whose users I refer to as 'satellite archaeologists,' and how their undertakings as citizen archivists (Navarro-Remesal, 2017, p. 128; Salvador et al., 2024) fill in gaps left by existing institutions of memory. In the central sections of this chapter, I take an in depth look at the techniques and technologies cultivated by satellite archaeologists—paratextual analysis, emulator development, memory pack data recovery, and informal archives—to better understand what traces are left of the Satellaview and, importantly, how users reconcile the completionist archival impulse with the realisation that the device will never be fully restored. I close by reflecting on how the Satellaview fits within the purview of other game history and media archaeology practices, and what the future may hold for satellite archaeologists.

The Satellaview

While the SNES/SFC contains many mysteries, a simple one that many users confront is: "what exactly does the port at the bottom of the console do?" Covered with a thin strip of plastic labelled 'EXT' and fully unacknowledged by the SNES/SFC's user manual (Nintendo, 1992), the port hints at possibilities but provides no straightforward explanation for its existence (Figure 5.2 and Figure 5.3). North American users, intrigued to learn more about their console's

capabilities, eventually discovered two facts about the neglected interface. First, the EXT port was not designed in anticipation of a specific piece of hardware but, rather, Nintendo implemented it to facilitate *potential* peripherals and add-ons for the console. This mirrors the design philosophy used for the NES's EXT port, which was used as a peripheral port in Japan but had no function in other jurisdictions[31] (*Expansion Port*, 2023). Second, while the EXT was mostly neglected, it was eventually leveraged for two devices: the niche Life Fitness Exertainment LifeCycle 4500 and the now-infamous Super NES CD-ROM. Before turning my attention to the Satellaview, I would like to briefly describe these peripherals to provide some context about the overall design space for SNES/SFC add-ons.

Figure 5.2. The EXT port on a Super NES, with the plastic cover removed.

Figure 5.3. The EXT port on a Super Famicom, with the plastic cover removed.

Released in 1994 by Life Fitness, the LifeCycle is an exercise bike that interfaces with the Super NES through the console's EXT port (Figure 5.4). Retailing for $799 (USD) and only available through a phone-order line and a limited number of retail outlets, it was one of Nintendo's early forays into 'extertainment'—a paradigm that they would not fully figure out until the release of the Nintendo Wii (Jones & Thiruvathukal, 2012, p. 98). Its hardware assemblage combines user pedal inputs with handlebar-mounted controllers to play a very small selection of cycling games (Kelsey Lewin, 2018). While Life Fitness promised the development of new games and the creation of a whole line of hybrid exercise equipment, user reception was tepid, and the device soon faded into sweaty obscurity.

[31] In the Japanese release of the NES/Famicom, the controllers were hardwired into the system, meaning that peripherals (such as the famous NES Zapper) were connected through the EXT port.

Figure 5.4. The Life Fitness LifeCycle 4500, in a promotional video, sourced from Kelsey Lewin's video documentation (2018).

Figure 5.5. A concept drawing of the Super NES CD-ROM (provenance unknown).

The Super NES CD-ROM is an unreleased peripheral for the SNES/SFC and perhaps Nintendo's most infamous hardware prototype (Figure 5.5). Conceived of during a short-lived, contentious collaboration between Sony and Nintendo, and similar in design to Sega's Sega CD add-on, the device was imagined as a stackable addition to the core system (Arsenault, 2017, p. 195; Staff, 2020). While never coming to fruition, the peripheral gained notoriety due to its role in Nintendo's late-nineties lull—Sony went on to create their own CD-based console to challenge the N64 (Arsenault, 2017, p. 195)—and a 2020 auction in which the only known Nintendo PlayStation prototype was sold to Greg McLemore[32] for the astounding sum of $380,000 (Machkovech, 2020). While the (re)discoveries of devices such as the LifeCycle and SNES CD-ROM are intriguing, they also appear to cement the EXT port as a mostly untapped aspect of the Super NES's technical configuration, at least in North America.

However, for Super Famicom owners in Japan, the functionality of the EXT port was far less mysterious—it was used to connect their console to the Satellaview, a widely available peripheral that allowed users to download game content using a satellite dish. The Satellaview's origins can be traced back to St.GIGA, a company known for launching one of the world's first digital broadcast station and for its quirky scheduling strategies (B. Watson, 1991). Rather than adhering to standard hourly intervals, St.GIGA's broadcasts were arranged based on "tidal patterns, sunrise and sunset and the changing phases of the moon" (Toop, 1995, p. 153) and their programming predominantly consisted of ambient music blended with environmental sounds. After a year of providing free broadcast service, St.GIGA introduced a subscription fee in March 1991, presumably to shift focus from building an audience to turning a profit. However, it accumulated an enormous amount of debt as it "struggled to convince the Japanese public,

[32] McLemore refers to himself as a Real Estate and Technology Entrepreneur and is notable for founding Toys.com and Pets.com. He currently owns one of the largest private collections of vintage arcade games (Ryan, 2015).

who were living through a recession at the time, to pay for the costly subscription fee and the necessary equipment including an antenna and tuner" (Yarwood, 2023). By 1993, the company had racked up losses to the tune of $40 million and had only managed to attract between 40,000-70,000 subscribers across the entirety of Japan (Asahi News Service, 1993; McClure, 1994). It became clear that the company's current status quo was not financially sustainable.

Like many technology companies are wont to do, Nintendo saw St.GIGA's financial turmoil as an opportunity to acquire new technologies and infrastructure. In January 1993, Nintendo of Japan bought a 19.5% interest in St.GIGA for $6.7 million, immediately becoming their largest shareholder (Asahi News Service, 1993). It is always tricky to accurately track corporate histories—internal documents are highly protected and public-facing materials are usually steeped in marketing buzz or wild speculation—but it appears that Nintendo's plan from the start was to leverage St.GIGA's satellite infrastructure to provide users with remote access to games and game-related content through their consoles. While there are definitely a few ideas that fell to the wayside as the Satellaview was developed, such as a multi-jurisdictional release strategy (Special K, 1995), the central idea behind the Satellaview persisted to its final iteration: a satellite add-on that allowed users to access a rolling selection of content.

Figure 5.6. An early newspaper advertisement for the SEGA Channel.

Figure 5.7. A Taito WoWoW prototype from the 1992 Tokyo Game Show.

Of course, Nintendo was not the only game company to experiment with remote content delivery in the nineties. Magazine previews of the Satellaview suggested that the peripheral was Nintendo's response to the Sega Channel (Special K, 1995), a service that provided users with a rotating library of games that they could play through a cable connection (Burrill, 1996) (Figure 5.6). Even satellite content delivery was not fully untrodden ground, with Taito unveiling the WoWoW at the 1992 Tokyo Toy Show—essentially a Taito arcade machine for the living room that allowed users to "stream the latest games via satellite, and rather than buying them outright, would essentially pay a monthly subscription fee to JSB" (Lambie, 2015)—although the device never made it past the prototype stage (Figure 5.7). While many Satellaview aficionados claim that the device was ahead of its time, it can be more accurately characterised as one of

several nineties-era videogame devices that toyed with emerging telecommunication technologies.

Gaming Over Satellite

While a full media archaeology of early networked videogame distribution would make for a fascinating research project, it is beyond the scope of this chapter. Instead, I will briefly summarise how the Satellaview was acquired, installed, and operated during its designed lifecycle before I analyse how users have taken up the device during its afterlife. While St.GIGA had implemented a subscription fee for their broadcast audio service by the mid-nineties, Nintendo opted for a different model for the Satellaview. Satellaview broadcasts were monetised through advertising and sponsorships; all that users needed to pay for was the prerequisite hardware to receive and unscramble the incoming satellite signal (Yarwood, 2023). Luckily, second-hand Satellaview bundles are relatively easy, albeit expensive, to track down and collectors have extensively documented the peripheral's technological assemblage during its afterlife (*Satellaview*, 2023) (Figure 5.8). This assemblage began with a broadcast signal (BS) satellite dish, mounted outside the user's home, that received St.GIGA's signal at scheduled periods during the day. This signal was unscrambled by the BS Tuner then passed along to the AV Selector, which served as a hub between the Satellaview base unit and a television set. The base unit of the Satellaview locks into the bottom of the SNES/SFC in a pedestal-like configuration (Figure 5.9)—a design quite like what is seen in early Super NES CD-ROM mock-ups—and linked together using the EXT port and an L-shaped Power Supply Relay Box. From atop this assemblage, the Super Famicom fulfilled its normal role while incorporating new satellite functionality (*Satellaview*, 2023).

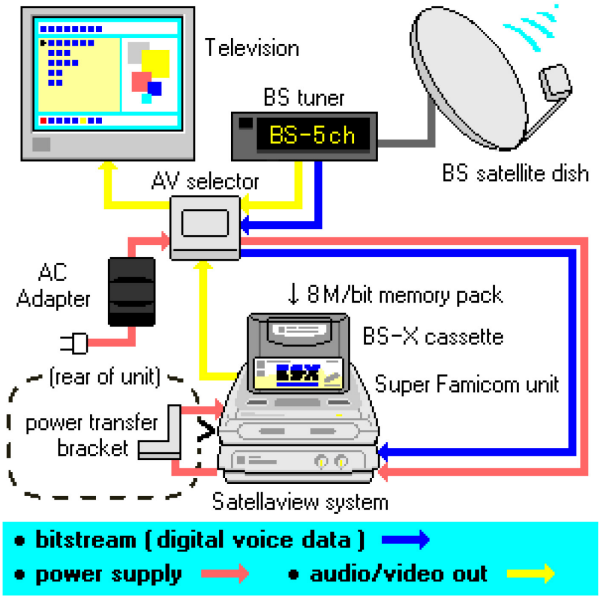

Figure 5.8. A diagram showing the technological assemblage needed for the Satellaview, created by Wikimedia user Muband.

Figure 5.9. The Satellaview add-on for the Super Famicom.

In addition to this elaborate hardware configuration, the Satellaview required two specialised cartridge technologies to access and download content. The first was *BS-X: Sore wa Namae o Nusumareta Machi no Monogatari*, roughly translated into *BS-X: The Town Whose Name Was Stolen*, a slotted cartridge that was bundled with every Satellaview system and served as an interface[33] for accessing content. When booted, the slotted cartridge presents users with a small, colourful town that they can navigate with a simple, lightly customised (name and gender) avatar. As seen in Figure 5.10, the town is home to various buildings (shops, homes, skyscrapers), terrain features (a beach, train tracks, a fountain), and NPCs, each of which provides access to a unique function.[34] Interestingly, while *BS-X: Sore wa Namae o Nusumareta Machi no Monogatari* has been translated into English and intensely scrutinised by the hobbyist community (more on this later), the function of every structure in the town is still not known.[35] According to the Satellaview wiki, "my house" served as the main menu, "news wall" allowed users to download magazines, "broadcasting station" and "game factory" were used to download game software, and several shops sold items that were added to the user's inventory (*BS-X*, 2024). These features are accessed in a very RPG-like fashion, with users

[33] Users will sometimes refer to *BS-X: Sore wa Namae o Nusumareta Machi no Monogatari* as the "BIOS" for the Satellaview.

[34] Laine Nooney has documented the prevalence of domestic spaces in nineties computer interfaces—ranging from living rooms to small towns—and how they represent developer efforts to render networked affordances approachable for new users (2024).

[35] It is also possible that some buildings simply did not have functionality and were inserted in anticipation of features that never came to fruition, echoing the speculative design of the EXT port.

wandering into buildings and speaking with NPCs, reducing the need for extensive text menus and evoking the feel of contemporary games such as *EarthBound* (1994).

Figure 5.10. A labelled map of the titular *Town Whose Name Was Stolen*, created by user MaddHatts on the Satellaview wiki (2024).

Figure 5.11. A photograph of *BS-X: Sore wa Namae o Nusumareta Machi no Monogatari* with an 8M Memory Pack half-inserted.

The second part of the Satellaview's cartridge configuration is a specialised 8M Memory Pack that fits snugly into the top of *BS-X: Sore wa Namae o Nusumareta Machi no Monogatari* and stored data from broadcasts (Figure 5.11).[36] Like how modern consoles use SD cards and internal hard drives to store game data, memory packs essentially housed the user's current Satellaview game library. While cartridge-based games do have the ability to save data internally, on hardwired SRAM chips, this memory is volatile (i.e. requires a battery to consistently provide power to it) and extremely limited in space.[37] The most common use for SRAM is game save data, which was preserved using a tiny watch battery. As the Satellaview's memory packs possess much more storage[38] and use flash memory, they were better suited for the constant writing and rewriting required for transient broadcast content.

As a brief historical aside: providing users with external rewritable storage was not a new concept for Nintendo and was part of a business strategy they experimented with throughout the eighties and nineties (well before flash memory became commonplace). As Altice has documented, the Famicom Computer Disk System peripheral for the NES/Famicom allowed users to take rewritable diskettes to Nintendo Kiosks where "store employees [copied]

[36] Other types of data could also be saved on the 8M Memory Pack, such as save files from *RPG Tsukūru 2*, an early entry in the *RPG Maker* series.

[37] Some information from broadcasts did save data in volatile memory, creating complications for those recovering data from memory packs (as this data was expunged as soon as the device was shut off).

[38] As a point of clarification, the 8M Memory Pack held 8 Mbits of data (which equates to about 1MB).

new software to their existing disks for less than the cost of a new game" (Altice, 2015, p. 167). Additionally, between 1997 and 2007, Nintendo hosted Nintendo Power kiosks in stores where users could download Super Famicom or Game Boy titles onto a flash memory cartridge for a lower price than a full retail release of a game (Nielsen, 2011; Nintendo, 1999). The key departures for Satellaview content were the venue and the expected length of engagement. Instead of travelling to a retail location to access new games, users would have them beamed directly to their living room. And while Nintendo Power kiosks offered full versions of games that users could permanently add to their software libraries, Satellaview broadcasts held more in common with promotional content that was consistently cycled in-and-out.

But what exactly did users receive over satellite? This is a difficult question to fully answer as broadcasts were time-limited, content was persistently overwritten, and there is currently no complete record of the Satellaview's broadcast schedule. However, by looking through ROM images and paratexts consolidated on fan websites (*Satellaview*, 2023), it is possible to identify the three most common types of content.

Games, which were sometimes play- or level-limited versions of commercial releases, that users downloaded from the service. *Radical Dreamers* (1996), a text-based entry in the *Chrono* franchise (Figure 5.12), is one of the more famous Satellaview titles, but games ranged from Mahjong simulators to demos of existing games.

Game data, which users could integrate into slotted cartridge games. For example, users could receive additional map data for use with the *SD Gundam G-Next* slotted cartridge (Figure 5.13).

Magazines and books, which users could open and read on-screen. *PokéCam Magazine*, which focused on the Game Boy Camera, is an example of the type of promotional magazine material available on the service (Figure 5.14).

Figure 5.12. The title screen from *Radical Dreamers*.

Figure 5.13. An *SD Gundam G-Next* slotted cartridge with memory card.

Figure 5.14. A screenshot from *PokéCam Magazine*.

Users could also access **SoundLink** games on the Satellaview: hybrid games that combined the device's ability to download software data and stream satellite radio. In some cases, SoundLink broadcasts would offer enhanced or remixed versions of an existing game, such as *BS F-ZERO Grand Prix*'s addition of narration, voice acting, and a rearranged musical soundtrack (KiddoCabbusses, 2008b). In other cases, games were designed specifically for use with the

Satellaview, such as the *Satella-Q* quiz game, in which an announcer would present questions for users to answer alongside popular music tracks (*Satella-Q*, 2023). These SoundLink broadcasts were often episodic and were occasionally re-broadcast with remixed content at the request of Satellaview users (KiddoCabbusses, 2008a; *SoundLink Game*, 2023). However, the precise nature of these broadcasts is still somewhat of a mystery, as they combine the transience of broadcast audio with the instability of flash memory. Outside of a few video recordings and references in formal paratexts, there is little documentation of what a complete SoundLink broadcast looked and sounded like.

Lost In Space

While SoundLink broadcasts are particularly ephemeral, all Satellaview content is difficult to access, document, and archive due to the fleeting nature of Nintendo's distribution strategy. Accessing new Satellaview content required users to write-over old content on their memory packs, effectively precluding the accumulation of a back library. Herein lies the central problem of studying the Satellaview: it is impossible to construct anything close to a complete platform archive for the device as most of its content has never been made available in a fixed, stable form. Even more frustratingly, due to a lack of comprehensive broadcast schedules, it is hard to even discern the extent of the content that was available for the device.[39] The Satellaview's software persists only on traces left on memory packs, a limited collection of paratexts, and scattered user documentation.

These challenges hearken back to Apperley and Parikka's (2018) discussion of platform studies' epistemic threshold—particularly the material prerequisites they posit are required under the dominant paradigm of platform scholarship. The assumption underlying much platform studies research is that, in order for a platform to be viable for study, "the evidence of its existence must be unambiguous" and it must achieve "a degree of *stability and consistency* as a technical object" (T. Apperley & Parikka, 2018, p. 353). For videogame consoles, this means that the device must have "produced and distributed a sufficient volume of software and other secondary materials to make up an archive that allows it to be stably reconstituted through platform studies" (T. Apperley & Parikka, 2018, p. 354). While second-hand Satellaview hardware is relatively easy to acquire, and Nintendo certainly produced a large amount of content for the device—broadcasts began on April 23 1995 and continued until June 30 2000—accumulating the materials necessary to construct the platform studies archive is not as straightforward. Observing the device's full functionality is not possible as its satellite infrastructures are now dormant, and it is not possible to collect its games by bidding on eBay listings, raiding retro game stores, or visiting game archives—waylaying standard platform study approaches.[40]

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[39] This mirrors many of the challenges present in radio and television preservation practices, where archivists attempt to discern broadcast content and audience experience from extremely limited traces (Socolow, 2023).

[40] I can also find parallels between Satellaview content and frequently patched/updated games such as mobile applications and MMORPGs, which similarly resist archival efforts.

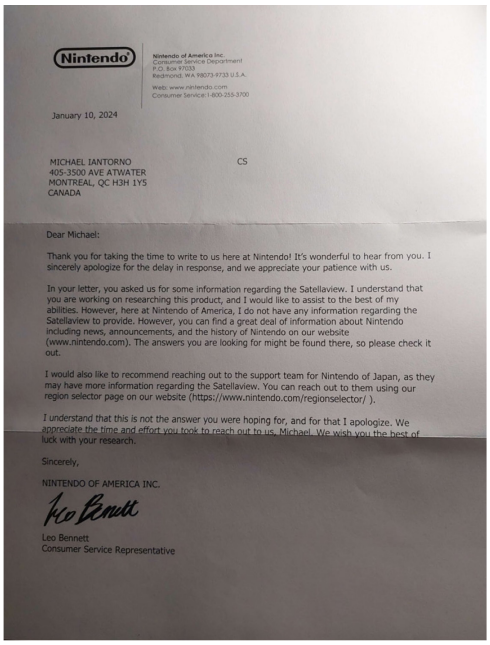
Media archaeology is a useful intervention when studying the Satellaview as its proponents encourage the expansion of platform scholarship to include oral histories, unofficial paratexts, and cultural activities (T. Apperley & Parikka, 2018, p. 354) and embrace the idea that some technologies are recalcitrant and perhaps even unknowable (Nicoll, 2019, p. 13). Nicoll's notion of minor platforms is worth considering in this context, as he claims that ancillary videogame objects grant us insight into "moments of *difference* and *discontinuity* in videogame history" (Nicoll, 2019, p. 13) and help us move beyond binary distinctions between success and failure. By all accounts, the Satellaview was a commercially successful device: it featured 115,000 users at its peak, broadcasted for half a decade (*セント・ギガの歴史[衛星デジタルラジオSt.GIGAのファンサイト]*, 2010), and was tethered to an extremely popular base console in the Super Famicom. The lack of residual materials is not caused by unpopularity or an early demise—like so many platforms that simply could not gain a foothold in a competitive market—but instead due to how its software was distributed. As I have previously discussed with my colleague Alex Custodio in our study of unexceptional consoles, game scholars will often turn to "longevity and stability in establishing whether a videogame platform is worthy of study and veneration" (Custodio & Iantorno, 2023). The Satellaview has plenty of the former but little of the latter, but its lack of stability is mundane in nature. There are no games secretly buried in the desert and no high-profile licensing disputes precluding the circulation of its back catalogue. It appears that the nature of its distribution strategy, paired with a corporate disinterest in revisiting the device, has resulted in the creation of a chronically incomplete platform archive.

I could further tease out whether I believe the Satellaview should be characterised as a 'standard' platform, a minor platform, an unexceptional console, or something else entirely, but I choose instead to pivot toward a more software-oriented point of reference: Nicoll's documentation of the Sega Saturn and user efforts to reconstruct the infamous vapourware title *Sonic X-Treme*. As I touched upon in my literature review, *Sonic X-Treme* is a game that is inherently unarchivable due to the simple fact it was never finished. Planned as the first 3D *Sonic* title, Sega developers toiled away at *Sonic X-Treme* between 1994 and 1996 before the project was cancelled due to production challenges and the Sega Saturn's overall lack of market uptake (Staff, 2006). The thought of a hidden entry in the franchise has proven to be a siren's call for *Sonic the Hedgehog* fans in the years following its cancelation. After all, as Reinhard aptly notes, so much of videogame archaeology is predicated on searching for myths, from long-lost prototypes to hidden content within commercially-released games (2018, p. 27).

Unlike the platform studies tendency to rely upon official content and corporate documentation, *Sonic X-Treme* revivalists have undertaken "residual remediation" that is necessarily more opportunistic and improvisational—compiling materials ranging from incomplete game builds to leaked design documents (Nicoll, 2019, p. 135). Realising that the *Sonic X-Treme* archive will never be truly complete, users construct imaginaries of what the game *could* have been based on official previews, development documentation, and other scraps of information. Nicoll is quick to highlight the tensions that arise among users who wish to restore *Sonic X-Treme* to an 'original state' but also recognise the necessity of altering the game in order to render it playable—a dialectic of obsolescence that has resulted in numerous, fragmentary, outcomes (2019, p. 148). With Sega showing no inclination of completing the

game themselves, these variegated *X-Tremes* are probably as close as Sonic fans will get to experiencing a formal release of the infamous vapourware.

The Satellaview shares much in common with *Sonic X-Treme* due to its patchwork history and the user-driven efforts to recover its past. The key difference, of course, is that *Sonic X-Treme* never fully came into existence, while the distribution of the Satellaview's software was evanescent rather than absent. User efforts at residual mediation are an attempt to fill in developmental gaps and more akin to sifting through the remains of the console to determine just how much of it is left in the world.



Nintendo

Nintendo of America Inc.
Consumer Service Department
P.O. Box 97033
Redmond, WA 98073-9733 U.S.A.

Web: www.nintendo.com
Consumer Service:1-800-255-3700

January 10, 2024

MICHAEL IANTORNO
405-3500 AVE ATWATER
MONTREAL, QC H3H 1Y5
CANADA

CS

Dear Michael:

Thank you for taking the time to write to us here at Nintendo! It's wonderful to hear from you. I sincerely apologize for the delay in response, and we appreciate your patience with us.

In your letter, you asked us for some information regarding the Satellaview. I understand that you are working on researching this product, and I would like to assist to the best of my abilities. However, here at Nintendo of America, I do not have any information regarding the Satellaview to provide. However, you can find a great deal of information about Nintendo including news, announcements, and the history of Nintendo on our website (www.nintendo.com). The answers you are looking for might be found there, so please check it out.

I would also like to recommend reaching out to the support team for Nintendo of Japan, as they may have more information regarding the Satellaview. You can reach out to them using our region selector page on our website (https://www.nintendo.com/regionselector/).

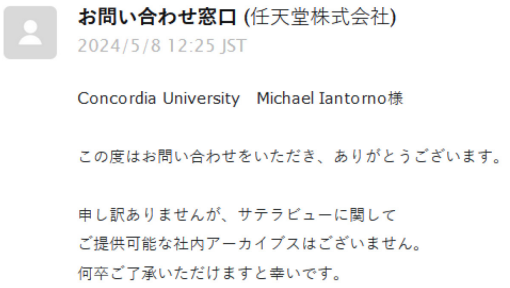
I understand that this is not the answer you were hoping for, and for that I apologize. We appreciate the time and effort you took to reach out to us, Michael. We wish you the best of luck with your research.

Sincerely,

NINTENDO OF AMERICA INC.

Leo Bennett
Consumer Service Representative

Figure 5.15. A letter from Nintendo of America, received on January 10 2024.



お問い合わせ窓口 (任天堂株式会社)
2024/5/8 12:25 JST

Concordia University　Michael Iantorno様

この度はお問い合わせをいただき、ありがとうございます。

申し訳ありませんが、サテラビューに関して
ご提供可能な社内アーカイブスはございません。
何卒ご了承いただけますと幸いです。

Figure 5.16. An email response from Nintendo of Japan, received on May 8 2024.

Much like the problems plaguing the curation and recovery of orphan films—works whose copyright is ambiguous or possess no corporate stewardship (Lukow, 1999)—the lack of formal, material curation of the Satellaview is a key barrier for those who wish to historicise it. While Nintendo of Japan has rarely commented on the Satellaview since the service was shut down, I was curious if the company had secreted away an archive somewhere. In early 2024, I sent email and letter mail requests to Nintendo of America to inquire about the state of the Satellaview's back catalogue. Luke Benett, a customer service representative, somewhat predictably redirected me to Nintendo of Japan (Figure 5.15). After a few inquiries through letter mail and their online contact form,[41] Nintendo of Japan responded to me with the following message (translated from the original Japanese, as seen in Figure 5.16):

[41] Many thanks to Gina Hara for translating my communications into Japanese, as Nintendo of Japan does not accept research-related requests in English.

> Thank you for your inquiry. We are sorry, but we do not have any in-house archives available for Satellaview. We appreciate your understanding.

While I do not consider this definitive proof of the absence of a formal Satellaview archive, it at least confirms a general ambivalence on behalf of Nintendo of Japan with sharing these materials with the public. When considering that St.GIGA, the other major corporate player involved in the Satellaview, went defunct in 2003, there appears to be little hope of the console's materials becoming available in a formal capacity.

Salvador, in the Video Game History Foundation's *Survey of the Video Game Reissue Market in the United States* (2023), notes that the piecemeal availability of past games, particularly those that were only made available through digital platforms, plagues efforts for comprehensive preservation. Indirectly building on the idea of orphan films, he identities that some videogame platforms are "abandoned ecosystems"[42] whose owners do not put forth even a "minimal concerted attempt to recommercialize" them, resulting in software libraries that are mostly unavailable through official channels (Salvador, 2023, p. 20). These platforms represent some of the biggest gaps in videogame history as their stewards have neglected them due to disinterest, rights and distribution issues, or technical challenges they do not wish to navigate (Salvador, 2023, p. 20). The Satellaview fits neatly into this categorisation as its formal stakeholders have very little motivation to revisit the platform's titles beyond extremely rare ports and re-releases. *Radical Dreamers* (1996) eventually received several formal localisations that were bundled together with regional releases of *Chrono Cross: The Radical Dreamers Edition* (2022), and levels from *BS Fire Emblem: Archanean Chronicles* (1997) were later integrated into *Fire Emblem: New Mystery of the Emblem: Heroes of Light and Shadow* (2010) as bonus content. These revivals, however, are outliers for an otherwise abandoned software ecosystem.

Methodological Interlude: Citizen Archivists

So far in this chapter, I have spoken somewhat ambiguously about user desires to revive the Satellaview during its afterlife. In this methodological interlude, I take a moment to establish who these users are, how they organise their knowledge, and how I went about approaching them. Building on Salvador's ruminations on corporate neglect and its effects on software preservation, I return to the idea of citizen archivists that I first teased in my discussions of SNES Central and superfamicom.org in *The Super Nintendo Emulation System*. According to Salvador, citizen archivists are those who "are not affiliated with an institution, they're not attached to a museum, but they take history into their own hands" by developing expertise and building archives outside of formal venues (2024). Their diverse activities range from tracking down rare game prototypes to developing console emulators, but all tend to share an informal bent. That is, they often operate "without gatekeepers" and "outside legal boundaries" in ways that more formalised institutions cannot (Salvador et al., 2024). While informal activities are

[42] In addition to abandoned ecosystems, Salvador also poses the idea of "neglected ecosystems" and "active ecosystems" based on the amount of corporate stewardship.

often excluded from formal preservation practices due to their murky legal status, they have been embraced by citizen archivists to preserve and showcase aspects of videogame history.

Especially important in the context of my research are the websites that citizen archivists maintain compile information about the Satellaview and other under-documented videogame technologies. Ranging from blogs to how-to guides, these are central texts (Marvin, 1988) that elucidate community discourse and fill in historical gaps left by other institutions of memory.[43] While user archival efforts are often dismissed for their alleged lack of rigour (Taylor, 2010, p. 14) or renounced as archives altogether (Steedman, 2001, p. 52), they address important absences. Navarro-Remesal notes that "users will record aspects of the history of the medium that are usually left behind" by formal institutions such as museums and universities (2017, p. 128). Fan curation is more "anarchic, unruly and organic" (Navarro-Remesal, 2017, p. 128) than what is offered by existing stakeholders, and this turn away from formal logics is more inclusive of minor, unexceptional, and unavailable platforms (2017, p. 133). As Przybylski recalls, scholars must acknowledge the blurring of roles between researcher and participant and that many of our research objects have already been pinned down outside of the institutional purview (Przybylski, 2021, p. 6). In my Satellaview research, I sift through informal texts, from ad-hoc archives to detailed tutorials, and engage with citizen archivists who serve as their designated interpreters.

There is a small, but dedicated, group of Satellaview enthusiasts who have spent years collecting its material remains, translating its paratexts, developing emulators add-ons, and archiving memory pack data. However, I am careful not to classify this as a singular community or a coordinated preservation campaign. Sterne, while leveraging aspects of Bourdieu's work (1990, 1998), cautions that when scholars document so-called community-driven efforts they often conflate academic logics with "practical" ones (2003a, p. 375). Specifically, he warns against projecting scholarly notions of community and practice upon research subjects—if we do so we often "wind up writing as if the people we study are running around making use of concepts we devised in studying them!" (Sterne, 2003a, p. 375). In the same vein, I wish to make two points of clarification. First, while I will now coin the term 'satellite archaeologist' as a catch-all to refer to my research participants, this is not a title that they use to describe themselves. In fact, they are not particularly inclined to be united under a shared label and will interchangeably use terms ranging from hacker, to hobbyist, to fan. Second, while users commonly collaborate to acquire, study, and archive technologies, these affiliations are much more ad-hoc than what takes place in formal media preservation contexts. As a result, I will not attempt to fully unify user activities in this chapter. Rather, I will pose several challenges involved with Satellaview preservation and then describe and engage with the techniques users have developed to address them.

Of course, the first question I must answer is: who exactly are these satellite archaeologists? My interest in the Satellaview was sparked in my conversations with Evan

[43] I relied upon similar resources while cataloguing the Residual Media Depot's collection of early home computing technologies (Custodio & Iantorno, 2023). It would have been impossible for me to verify facts about Magnavox's lesser-known *Odyssey* consoles, for example, if not for the *Online Odyssey Museum*.

Gowan and Matthew Callis, whose informal archival activities I touched upon in *The Super Nintendo Emulation System*. During our interview, I expanded my initial question list to learn foundational information about the Satellaview and the material communities that have grown around it. In addition to sharing their thoughts on the Satellaview, they also directed me to two satellite archaeologists who are heavily involved in informal preservation efforts, LuigiBlood and Cabbusses, who I later interviewed using text questionnaires.[44] As a fortuitous coincidence, after mentioning my curiosity with the Satellaview to my Broken Games Collective colleague Derek Quenneville, he revealed to me that he was well-versed in the practice of dumping 8M Memory Packs. As this is one of central techniques involved with Satellaview preservation, we set up a session and collaborated to recover the data from a memory pack that I had purchased online—a process that I will document, in detail, later in this chapter. These interviews with community experts serve as the foundation of my Satellaview research.

Name	Description
Evan Gowan	Evan Gowan runs SNESCentral, a fan website dedicated to the documentation and preservation of materials related to the Super Nintendo Entertainment System and Super Famicom.
Matthew Callis	Matthew Callis hosts and runs several SNES/SFC fan websites, including SuperFamicom.org, sfc.fm, Super Pads, and elude visibility. He also volunteers with the Video Game History Foundation.
LuigiBlood	Also known as Yakumono, LuigiBlood participates in preservation work surrounding the SNES/SFC, Satellaview, and Nintendo 64DD. He is known for his role in developing emulator support for the Satellaview, his expertise on dumping 8M Memory Packs, and his contributions to the Satellablog.
Cabbusses	Cabbusses, sometimes referred to as KiddoCabbusses or Kiddo, is the primary author of the Satellablog—a Satellaview research blog that documents and archives data dumped from 8M Memory Packs.
Derek Quenneville	A digital fabrication artist, educator, and game developer from Toronto, Derek Quenneville is one of many Satellaview enthusiasts who purchases 8M Memory Packs and dumps their data for preservation purposes.

Table 5.1. Research participants for *Satellite Archaeologies*.

I would also like to take a moment to acknowledge the voices that I have not included in this chapter. As I previously noted, Nintendo of Japan stated they had no available information or archives, and I believe it would have been fruitless for me to follow-up with them further. However, perhaps more importantly, I did not reach out to any Japanese Satellaview users even

[44] These participants preferred text questionnaires to maintain full anonymity, but they also made themselves available to follow-up questions and clarifications.

though this was the region in which the device was formally released.[45] I have several reasons for this omission. First, as someone who does not speak Japanese and does not have the budget to travel to Japan or hire a professional translator, I did not feel I could engage with these potential participants in a meaningful way. Second, after my interviews with LuigiBlood and Cabbusses, who have previously investigated Japanese preservation efforts, my belief is more preservation work is occurring in English than in Japanese (despite the obvious language barrier). Finally, as Japan does not possess fair use/dealing exceptions under copyright law (*Copyright Law of Japan*, 2023) and has significantly ramped up anti-piracy efforts over the past decades (Asia Pacific Foundation of Canada, 2023; Steadman, 2012), it is less likely that those who are involved with informal preservation practices in Japan would be willing to speak on record. The lack of these voices in my research is assuredly a loss but, just as my research participants have done, I have incorporated content from Japanese user paratexts, documentation, and fan websites to help patch together the Satellaview's history of use.

Through interviews and analysis of user-created resources, I document and analyse how satellite archaeologists learn more about the Satellaview and restore access to its hardware and software. First, I will discuss the role of paratexts in guiding non-Japanese audiences toward the Satellaview and, importantly, fleshing out its day-to-day use decades after its broadcasts took place. Second, I turn my attention to Satellaview emulation, and chronicle how LuigiBlood and others have modified existing SNES/SFC emulators to access and customise the device's content. Third, I will dissect the most widespread practice associated with Satellaview preservation—the hunt for 8M Memory Packs and the broadcast data stored within them—and recount my own efforts to acquire, dump, and archive game content. Finally, I conduct a quick analysis of the Satellablog, an informal archive that documents memory pack data and makes it available to the public.

Zelda From Space? Paratexts as Clues and Evidence

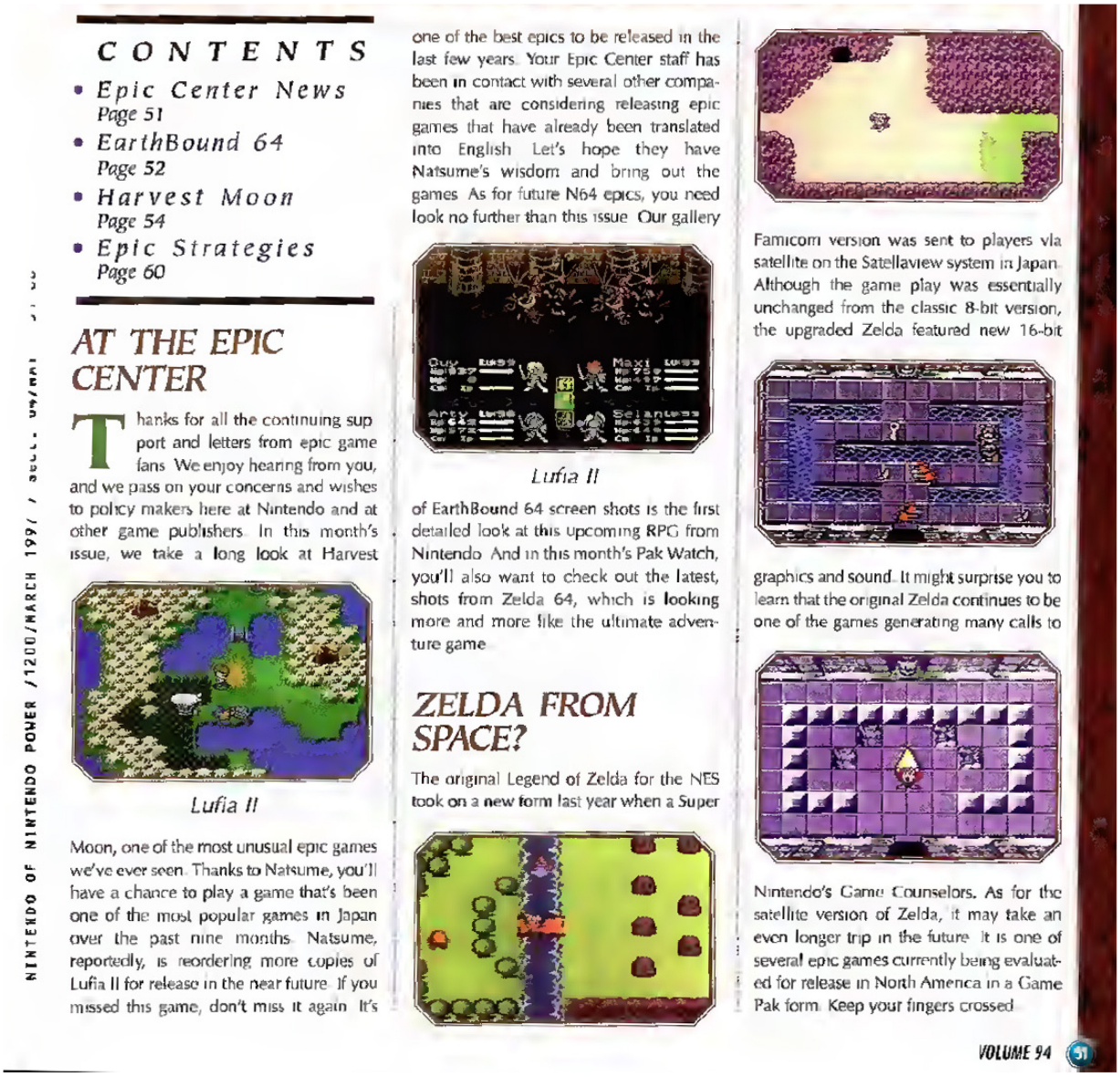
The Satellaview's paratexts, ranging from magazine articles to television commercials, have played two important roles in the device's afterlife. First, despite Nintendo's[46] ultimate decision to release the device exclusively in Japan, previews in English-language media were integral to sparking interest in the device among budding satellite archaeologists. This is not an uncommon phenomenon: North American videogame fans were often made aware of Japanese-exclusive releases through early previews of games whose release destinations were later altered[47]. I will delve into this narrative of loss more deeply in my *Final Fantasies* chapter, particularly in the context of (in)formal localisation practices, but the Satellaview represents a

[45] While I cannot reveal where my participants are located due to anonymity, I can confirm that every participant I speak with in this chapter is currently situated outside of Japan.

[46] I will use the title "Nintendo" rather loosely in these next sections to describe Nintendo, St.GIGA, and the developers who created content for the Satellaview. Admittedly, this is an oversimplification, but a necessary one in the absence of robust formal documentation about the device's corporate history.

[47] Many of the sources I have cited in this chapter are English-language previews of the Satellaview or magazine articles that claim to have insights into Japanese production and distribution.

slightly different paradigm. It is an entire game ecosystem, tethered to an extremely popular base console, that never travelled outside of Japan.



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AT THE EPIC CENTER

Thanks for all the continuing support and letters from epic game fans. We enjoy hearing from you, and we pass on your concerns and wishes to policy makers here at Nintendo and at other game publishers. In this month's issue, we take a long look at Harvest

Lufia II

Moon, one of the most unusual epic games we've ever seen. Thanks to Natsume, you'll have a chance to play a game that's been one of the most popular games in Japan over the past nine months. Natsume, reportedly, is reordering more copies of Lufia II for release in the near future. If you missed this game, don't miss it again. It's one of the best epics to be released in the last few years. Your Epic Center staff has been in contact with several other companies that are considering releasing epic games that have already been translated into English. Let's hope they have Natsume's wisdom and bring out the games. As for future N64 epics, you need look no further than this issue. Our gallery

Lufia II

of EarthBound 64 screen shots is the first detailed look at this upcoming RPG from Nintendo. And in this month's Pak Watch, you'll also want to check out the latest, shots from Zelda 64, which is looking more and more like the ultimate adventure game.

ZELDA FROM SPACE?

The original Legend of Zelda for the NES took on a new form last year when a Super

Famicom version was sent to players via satellite on the Satellaview system in Japan. Although the game play was essentially unchanged from the classic 8-bit version, the upgraded Zelda featured new 16-bit

graphics and sound. It might surprise you to learn that the original Zelda continues to be one of the games generating many calls to

Nintendo's Game Counselors. As for the satellite version of Zelda, it may take an even longer trip in the future. It is one of several epic games currently being evaluated for release in North America in a Game Pak form. Keep your fingers crossed.

NINTENDO OF NINTENDO POWER /1200/MARCH 199/ / SELL. US/MAI

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Figure 5.17. An excerpt from the "Epic Center" article in the March 1997 issue of Nintendo Power.

Two of the most prominent satellite archaeologists, LuigiBlood and Cabbusses, recounted that their interest in the device was partially ignited by a *Nintendo Power* preview for *BS Zelda No Densetsu* (1995). Advertised as an upgraded version of the original *The Legend of Zelda* (1986) for the Nintendo Entertainment System, the game was referred to as "Zelda From Space?" (Figure 5.17), teased with grainy screenshots, and accompanied with a promise that it was "one of several epic games currently being evaluated for release in North America in Game Pak form" (Staff, 1997). While this game pak never manifested, Internet file sharing certainly did, creating informal channels for *Zelda* fans to find information about the game. Consalvo notes

that fans will make great efforts to consume Japanese-exclusive videogame content—downloading emulators and ROM images to play games on their PCs, purchasing console mods to circumvent regional protections, and importing game content through online storefronts (2016, p. 34)—but also warns that, as these processes become more specialised and labour-intensive, fewer individuals will be willing or able to engage with them (2016, p. 35). Users were eventually able to solidify the existence of *BS Zelda No Densetsu* and the Satellaview through scans of Japanese advertisements and, eventually, through modified ROM images that could be played using SNES/SFC emulators. But through this process they also learned that the mysterious 'Zelda From Space' was only one title from a larger software library, and that fully unravelling the mystery of the Satellaview would be much more complex than they could imagine.

This leads to the second role that Satellaview paratexts play: they serve as a record of the device's day-to-day use and help circumscribe what content was created for the add-on. To this day, satellite archaeologists rely upon paratexts to ground their findings and learn more about the device's ethereal software library. Official advertisements and promotional materials from Nintendo are certainly useful in this regard but, as Arsenault has documented in his analysis of nineties marketing practices, first-party content is often steeped in exaggeration and technobabble, such as Sega's "Blast Processing" (2017, p. 81) and Nintendo's "Advanced Computer Modeling" (2017, p. 85). Luckily, as the Satellaview was viewed as a relatively novel technology at the time, Nintendo made a concerted effort to provide simple introductory guides for prospective customers. One example of this is the Satellaview order form, packaged in magazines and some SNES/SFC game purchases, in which the device's mascots Parabô (パラ坊) and Satebô (サテ坊) explain how the service works (Figure 5.18 and Figure 5.19).

Figure 5.18. The front view of a Satellaview order form, which came packaged with *Yoshi's Island* (1995).

Figure 5.19. The back view of a Satellaview order form, which came packaged with *Yoshi's Island* (1995).

As simple as this information may seem, it is extremely useful in establishing foundational facts about the Satellaview. For example, there is persistent misinformation circulating across English-language resources as to whether-or-not the Satellaview required users to pay a

subscription fee. While many fan wikis and articles state there was a monthly fee to access content, Satellaview researchers in Japan (任天堂が「サテラビュー」で行っていた衛星放送についての解説。, n.d.) and North America (Yarwood, 2023) insist that this is simply not true. The official Japanese application forms ("Satellaview Application Form," 1995) help establish the absence of a paid subscription and solidify the idea that Nintendo monetised the service through advertisements, promotions, and hardware sales (LuigiBlood, 2021).

Third-party paratexts offer more nuanced information than subscription forms, with *Satellaview Tsūshin* being an especially useful resource. A magazine from the *Famitsū*/*Famicom Tsūshin* family of videogame publications, *Satellaview Tsūshin* ran for 12 issues from May 1995 to May 1996 and centred its content around the add-on.[48] Each issue provided readers with detailed broadcast schedules, content previews (under the banner of "On Air Games"), and behind-the-scenes featurettes (Figure 5.20). During the device's afterlife, *Satellaview Tsūshin*'s schedules have become essential scaffolding for satellite archaeologists as they are one of the few reliable chronicles of the device's broadcasts (Figure 5.21). In addition to detailing how users engaged with the device on a day-to-day basis, this documentation has been adopted as a 'to find' list for memory pack recovery efforts. In contrast to the simple layout of broadcast schedules, game preview sections provided users with additional context for upcoming broadcasts. Akin to the previews that would have been found in any number of contemporaneous gaming magazines, they teased upcoming content with short blurbs and screenshots. Satellite archaeologists value these sections as they provide details about their recovered data and describe irrecoverable broadcast content, such as SoundLink audio.

[48] While focused on the Satellaview, *Satellite Tsūshin* also featured content geared around movies, music, and other media.

Figure 5.20. A preview of *Soreyuke Ebisumaru Karakuri Meiro – Kieta Goemon no Nazo!!* In the April 1996 issue of Satellaview Tsūshin.

Figure 5.21. A broadcast schedule from Satellaview Tsūshin's first issue, featuring details for Thursday June 1 1995.

Behind-the-scenes featurettes range from interviews with game developers about their latest contributions to the Satellaview's library ("Square Presents," 1996) to playful overviews of production processes, such as the technical configuration of recording studios ("Recording Site Special Report!," 1995). In the present, these interviews are useful for providing rare 'word of God' testimony from key figures involved in Satellaview development. As an example, a recently translated interview with BS-X writer Yusuke Akamatsu in the May 1995 of *Satellaview Tsūshin* reveals his plans for developing and expanding the meta-plot embedded within *BS-X: Sore wa Namae o Nusumareta Machi no Monogatari*.

> Right now there's only one background music track, and you can only go to the city, but after the summer we should be able to change the music, show photos via magazines, and develop it into something closer to a full-fledged RPG. In this particular story, the player's powers of imagination and expression are more important than growth via combat. I'd like the content to question players in that capacity. (Akamatsu, 1995)

While the meta-plot of the Satellaview is ill-documented, with many fans claiming that it was never fully fleshed-out or completed, interviews such as these are vital in understanding what Nintendo's imagined trajectory for the device was.

Unfortunately, *Satellaview Tsūshin* was only published for a year, meaning there is considerably less information about Satellaview development, content, and broadcasts from

June 1996 onward[49]. Fan-created resources, although somewhat scattered and ephemeral, do help to fill in the gaps left by formal media. For example, the Japanese websites *The Satellaview History Museum* and *Satellaview Heaven* contain additional game information and broadcast schedules, but the former is now offline (and only accessible through archived pages) while the latter has not been updated since 2016. Perhaps most coveted by satellite archaeologists, however, are VHS recordings of the Satellaview in action. These video snippets are invaluable as they showcase broadcast elements that were never saved to a user's memory pack, namely SoundLink audio and RAM content. During our interview, Cabbusses referred me to YouTube user kukun kun, whose channel features a number of VHS recordings of nineties Satellaview broadcasts (kukun kun, n.d.). One of these videos features a live broadcast of *Shitamachi Ninjō Gekijō*, an officially licensed virtual magazine conceived by Japanese humourist Lily Franky. Watching the video shows how users would navigate the digital magazine's slideshow-like interface as audio elements (in this case, humorous voice-overs) played in the background (Figure 5.22).

[49] Other publications under the *Famitsū*/*Famicom Tsūshin* banner would occasionally feature Satellaview content, but not nearly to the same extent as *Satellaview Tsūshin*.

Figure 5.22. The November 17 1995 broadcast of *Shitamachi Ninjō Gekijō*, in which Mario pulls a drill out of his scrotum, shows it to Toad, and then uses it to tunnel out of their concrete prison cell (*Shitamachi Ninjō Gekijō*, 2024).[50]

Cabbusses also mentioned that one hacker used video recordings of *BS The Legend of Zelda: Ancient Stone Tablets* (1997) to restore missing graphical data, which was stored to PSRAM and thus absent in the game's memory pack dump. By painstakingly watching the VHS recording of the game for reference, he reconstructed the game's missing background tiles and re-inserted them into a ROM image, demonstrating the role of paratexts in both inspiring and filling-in-the-gaps left by other Satellaview recovery efforts.

The Town With No Name: Emulating the Satellaview

The desire to play Satellaview games has always been a driving factor for satellite archaeologists and is an activity that requires approachable and accurate emulation. I have extensively discussed SNES/SFC emulation in the prior chapter, but I would like to highlight that Satellaview emulation emerged long after projects such as Snes9x, ZSNES, and bsnes had been

[50] Yes, this was an officially licensed Nintendo program. No, I will not elaborate further on its narrative.

established. This is for various reasons: the initial lack of awareness of the Satellaview outside of Japan; the absence of a readily available game library; and the difficulty in acquiring technical information about the device, especially in the mid-to-late nineties when emulation practices began to coalesce. Thus, much like how the Satellaview was an add-on for the SNES/SFC, conceived of after the release of the base console, its emulation was created as an add-on for pre-existing SNES/SFC emulators.

LuigiBlood is the primary developer behind Satellaview emulation and began his reverse-engineering efforts in the 2010s. Somewhat curiously, LuigiBlood did not own a Satellaview or other key aspects of its technological assemblage when he first started out. Instead, he relied upon existing documentation and resources to figure out how the Satellaview communicated with other parts of its technological assemblage.

> I did not initially have access to a physical Satellaview. Then I did later, but the Satellaview was not that useful by itself, it has been mostly second-hand documentation and reverse engineering of my own with an emulator and a debugger, understanding the software that makes use of it and what it expects from it, and then hacking and making experiments to what it expects.

This type of reverse-engineering is a common part of emulator development, where coders painstakingly analyse aspects of a technical assemblage to run hardware-as-software within a different platform. Luckily, LuigiBlood did not have to start this process from scratch. Where early emulators were often privately stewarded by a small number of programmers, by the time LuigiBlood had entered the scene many noteworthy projects had been released under F/OSS licences[51] and were available on code repositories such as GitHub. There are many public-good arguments for F/OSS software—which have been summarised at length by Coleman (2013), Levy (2010), and others—but to quickly recap *The Super Nintendo Emulation System*, central to the adoption of these licences among emulator developers. First, as seen in the wake of the Yuzu litigation, F/OSS emulators are more resilient to legal action from commercial stakeholders, as they proliferate freely rather than being entirely contained in a centralised location (or ascribed to a single developer).[52] Second, the formalisation of emulator development processes provides users with the infrastructure and opportunity to create bespoke variants or contribute features that can be re-incorporated into a mainline release.

LuigiBlood initially created his own forks of two popular SNES/SFC emulators, bsnes and Snes9x, to implement Satellaview compatibility. Building on the documentation of two other programmers, nocash and ikari_01, his experiments first bore fruit with a fork of bsnes-sx2 that supported the loading of memory packs and a few other key Satellaview features:

[51] For example, BSNES is available on GitHub under the GNU General Public License.

[52] After the initial Yuzu emulator lawsuit forced its original developers to remove their source code, Nintendo went after an additional 8,535 GitHub repositories that had forked the source code (Gach, 2024). However, there are still numerous forks of the emulator, with Nintendo effectively playing a game of whack-a-mole with websites that host its source code.

> I reimplemented the BS-X mapper entirely based on ikari_01's research, reimplemented Memory Pack support based on the Type 1 Memory Pack with almost full support of Flash commands, especially for games like *RPG Tsukūru 2*, and added Satellaview satellite signal emulation based on external files.

There is quite a bit to unpack in this statement, but LuigiBlood effectively: a) instructed BSNES how to use operate in tandem with the Satellaview; b) made the emulator compatible with memory pack data for *BS-X: Sore wa Namae o Nusumareta Machi no Monogatari* and other slotted cartridges; and c) allowed users to simulate satellite broadcasts by adding server data files to a folder within BSNES's installation directory. Around the same point in time, LuigiBlood also created a fork of Snes9x called snes9x-sx2 that added the same functionality into Snes9x but eventually decided to shift his development strategy. Rather than maintaining his own software forks, he merged bsnes-sx2 into Acker's BSNES-Plus (a pre-existing fork of bsnes) and snes9x-sx2 into the mainline release of Snes9x. When I asked him about the impetus for this change, he noted that he wanted to allow other "emulator developers to improve upon it, if they feel like they can make it better." Handing off further development makes sense when considering that he had already solved the primary use cases for Satellaview emulation—accessing its software and simulating broadcasts.

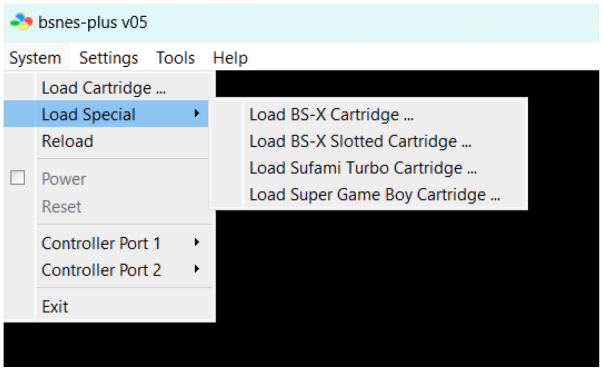


Figure 5.23. The loading menu for BSNES-Plus, showcasing its ability to load various types of atypical cartridges.

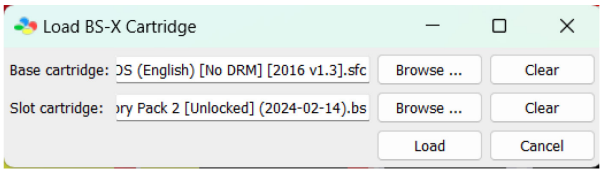


Figure 5.24. The "Load BS-X Cartridge" submenu within BSNES-Plus.

It is worth taking a moment to quickly walkthrough how Satellaview content is handled by an emulator, as straightforward emulation is one of the reasons the device went from being virtually unknown to non-Japanese audiences to something they can access with relative ease. In fact, one of the best tricks that emulator developers have played on users is distilling complex technological assemblages into simple menu items, and loading Satellaview content is no exception. In bsnes-plus, the emulator that I used for the majority of my Satellaview research, the functionality comes down to a single menu option: 'Load BS-X Cartridge' under 'Load Special' (Figure 5.23). Opening this menu option reveals a small window where users select ROM images for use as a 'base cartridge' and a 'slot cartridge' by navigating to files stored locally on their computer (Figure 5.24). The base cartridge is a ROM image of *BS-X: Sore wa Namae o Nusumareta Machi no Monogatari*, which effectively serves as the interface for the

device,[53] while the second is a ROM image of whatever memory pack data a user wishes to load. bsnes-plus also supports slotted cartridges such as *RPG Tsukūru 2* and *SD Gundam G-Next* through the 'load slotted cartridge' option, which provides access to bonus game content. Once both files have been assigned into the emulator's interface, users can click 'load' to boot up *BS-X: Sore wa Namae o Nusumareta Machi no Monogatari* and access their content.

Figure 5.25. A player standing in front of their home, where they can access and manage broadcast data.

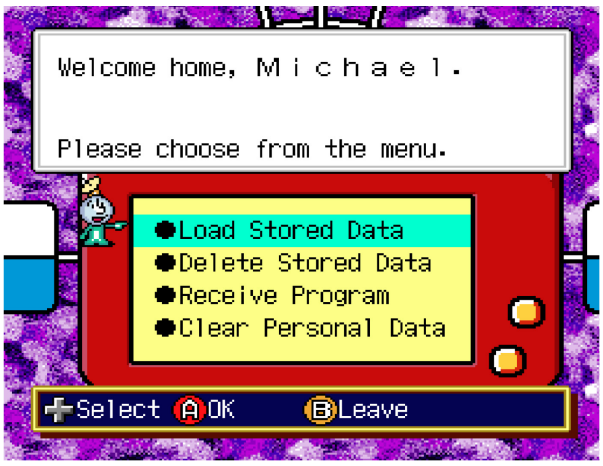


Figure 5.26. The stored data menu, available through the user's home, where they can load, delete, receive, and clear data.

As I mentioned earlier in this chapter, *BS-X: Sore wa Namae o Nusumareta Machi no Monogatari* displays a town-like interface where users can interact with buildings and NPCs to access and manage content. By wandering to their home—a nondescript brick house in the northwest corner of town—users can load, delete, receive, or clear data on their memory packs (Figure 5.25 and Figure 5.26). However, whereas Satellaview users in the nineties would procure their content over the airwaves, bsnes-plus users instead access data as if it were already loaded on their memory pack. Instead of receiving data via satellite, the most common configuration for the emulator is simply loading *BS-X: Sore wa Namae o Nusumareta Machi no Monogatari* and memory pack data in tandem. Thus, bsnes-plus acts as a streamlined interface that better reflects the current state of the device's game library: exchanging satellite infrastructures for a collection of ROM images.

But that does not mean that the Satellaview's broadcast functionality has been neglected. LuigiBlood has created a method for simulating Satellaview broadcasts, albeit with a bit more finagling than loading already-existing memory pack data. His SatellaWave software creates binary files for bsnes-plus and Snes9x that mimic broadcast data, allowing users to add 'downloadable' content to *BS-X: Sore wa Namae o Nusumareta Machi no Monogatari* and change elements within the titular town. For context, during the Satellaview's commercial life cycle, the town was a dynamic setting that changed based on the time of year and what content was

[53] LuigiBlood has created an English version of *BS-X: Sore wa Namae o Nusumareta Machi no Monogatari*, by hacking its text and graphics, making it viable for English-speaking users to navigate the software.

currently available. NPCs appeared and disappeared, the town's palette shifted between seasons, and new downloads were made available based on Nintendo's broadcast schedules. SatellaWave allows users to curate their own changes, customising the town by flicking on/off options and altering what NPCS and buildings say and do. With a little extra effort, users can even use an additional application called SuperFamiconv (Lindecrantz, 2015/2024) to create their own custom graphics for use within SatellaWave, such as my own experiments with *EarthBound*'s (1994) Dungeon Man character.

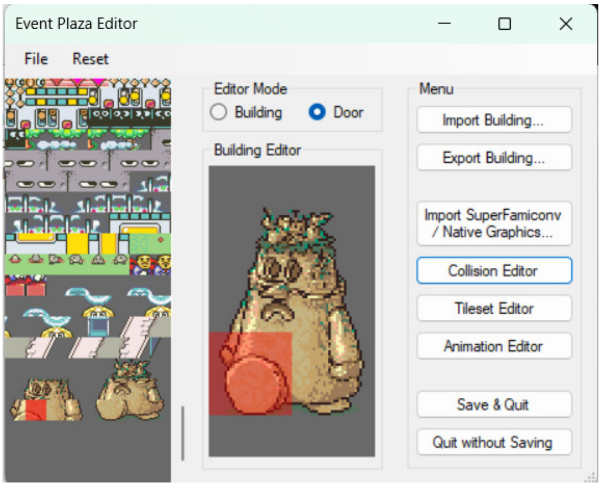


Figure 5.27. The 'Event Plaza Editor' found within SatellaWave. I chose to import Dungeon Man from the SNES/SFC game *EarthBound* as my custom Satellaview building as he embodies the grad student aesthetic: a distressed expression concealing a labyrinthian mind.

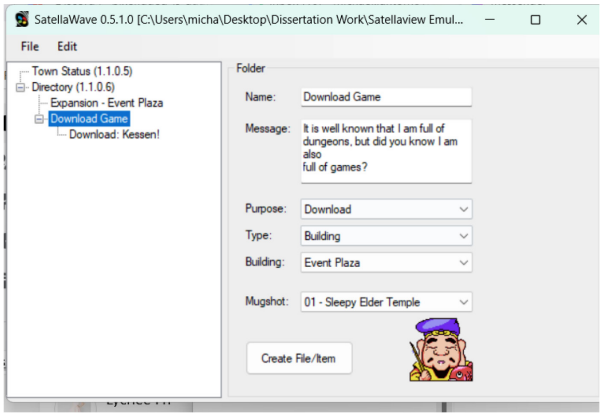


Figure 5.28. A portion of the SatellaWave interface, which allows users to change various settings for a building within *BS-X: Sore wa Namae o Nusumareta Machi no Monogatari*.

As a test of SatellaWave's functionality, I imported Dungeon Man's sprite and transformed him into a simple building that allows users to download *Kessen! Dokapon Oukoko IV*, a role-playing game that was broadcast in 1997 and later recovered from a memory pack by ikari (Figure 5.27 and Figure 5.28). After configuring the necessary dialogue and download options within Satellawave, I exported the binary files into bsnes-plus's 'bsxdat' directory and then booted up *BS-X: Sore wa Namae o Nusumareta Machi no Monogatari* to see if everything worked. While, admittedly, I was not successful on my first attempt, I was eventually able to create my bespoke Dungeon-Man-as-download-building within the town (Figure 5.29 and Figure 5.30).

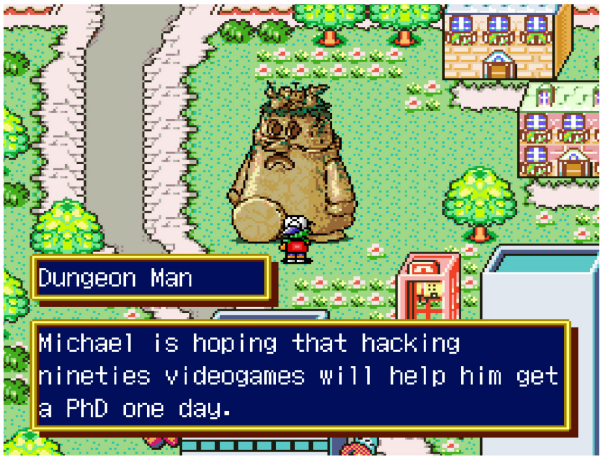


Figure 5.29. My new building is implemented in *BS-X: Sore wa Namae o Nusumareta Machi no Monogatari*, echoing the hopes and dreams of its creator.

Figure 5.30. When a user interacts with Dungeon Man, a menu opens that allows them to download the new game content.

One of the most impressive aspects of Satellaview emulation is that binary files can be tweaked on the fly, meaning that users can change aspects of *BS-X: Sore wa Namae o Nusumareta Machi no Monogatari* while it is loaded, with no interruption. I was able to change the text and download parameters of Dungeon Man while bsnes-plus was still running, with the only delay being a quick loading screen that popped up whenever I implemented new binaries.

Despite the seamlessness of this emulation, and the creative possibilities it provides, LuigiBlood is quick to point out that he has still not emulated the Satellaview perfectly due to the absence of satellite affordances. This is most evident when users 'download' new content from a building or NPC (Figure 5.31), like I had done with *Kessen! Dokapon Oukoko IV*. Whereas normal Satellaview downloads were quite slow—they were travelling across the airwaves, after all—simulated broadcasts access files from a local computer directory and are much quicker. Not only does the default speed not match the original, but users can literally hit fast-forward on their emulator to bypass wait times entirely.

Figure 5.31. One of many download screens for the Satellaview. This one features a surfing dog (chased by a currently off-screen dolphin) and a progress bar at the bottom of the screen.

Furthermore, emulating SoundLink broadcasts is currently not possible, due to both technical challenges and the absence of archived audio (which, as I have mentioned, was not saved to memory packs). Cabbusses laments this lack of functionality as he believes the combination of games/magazines and live audio was one of the defining features of the Satellaview:

> There are some magazines which have interesting fanart, and some magazines with interesting Soundlink audio meant to accompany them. "Yuuki Nae no Ge-mu no Tsubo" was an example of a combination magazine-and-audio-program with several segments, including one called "Game Side Story", where Nae would read out loud a user-submitted fan's short gag story with an accompanying illustration.

While SoundLink audio functionality may be the holy grail for satellite archaeologists, simply being able to play Satellaview games and content is a feat in and of itself. However, playing Satellaview content is only one half of the challenge; finding it is the other.

Memory Fragments: Hunting for Satellaview Content

Acquiring and dumping 8M Memory Packs is at the heart of Satellaview restoration efforts and is the activity that the most users participate in. While the process is expensive and requires some specialised hardware, it does not require the Japanese-language proficiency needed for paratextual analysis or the coding expertise of emulator development. Anyone who has a bit of money, a few pieces of specialised technology, and access to online auction websites can join the search for unrecovered Satellaview content.

At the risk of repeating myself, Satellaview content is ephemeral. Outside of a small number of slotted cartridges, the device's content was delivered through satellite onto rewritable memory packs, meaning that the average user was not given the option to accumulate persistent game libraries. However, this churn was not solely predicated on broadcast schedules. As the purpose of many Satellaview broadcasts was to tease new content and encourage users to purchase full versions of SNES/SFC games, Nintendo implemented an early form of Digital Rights Management (DRM) that made content expire after a set number of plays. This process was facilitated through the inclusion of a simple countdown timer within a game's ROM header.[54] When a user accessed downloaded content through *BS-X: Sore wa Namae o Nusumareta Machi no Monogatari*, the slotted cartridge would tick down the game's timer by one value. When the timer was reduced to zero the content would be permanently flagged as 'unplayable' (*Satellaview ROM Header*, 2012). While the content was not deleted, it was rendered inaccessible, leaving users with no other option than to overwrite it with another broadcast. For satellite archaeologists, this means that the content they discover on memory packs has a strong recency bias, with later Satellaview broadcasts being much more prevalent than older ones. During our interview, Gowan lamented that one of the most common memory pack finds is *BS Panel de Pon '98* (1998), a demo/event version of a game that non-Japanese audiences know as *Tetris Attack*, which was released at the tail-end of the Satellaview's commercial lifespan.

Nintendo's content distribution strategy effectively has led to a situation where, every time a satellite archaeologist purchases a memory pack in search of new content, they are entering into a game of chance. Callis likens this content hunt to gambling, with each online purchase akin to entering a lottery with the odds stacked against you:

> It's sort of like a scratcher ticket, because you don't know what you're gonna get. I'm paying $40 for this little card—let's hope there's literally anything on it. And when you get it, sometimes it's just garbage. Sometimes it's blank. Sometimes you get very lucky and there's like a new dump or a new magazine or a new version of something.

As one of the few material traces of the Satellaview, memory packs are durable goods that circulate through retro-gaming marketplaces, predominantly in Japan. While the occasional sojourn to Akihabara is not completely out of the question for satellite archaeologists, online marketplaces are a much more practical venue. Most of my participants noted that they keep a

[54] A ROM header, as part of the ROM image, includes a great deal of fundamental information about a game including its title, publisher, and release date. I will delve more into ROM mapping and formatting in *Pixels and Plastic* and Final *Fantasies*.

close eye on online auction websites for memory packs, most commonly Yahoo! Auction Japan[55], but not all listings are created equal. Sellers will often state outright if a memory pack is blank, has previously documented content on it, or is new-old-stock (and therefore incapable of having any data). Furthermore, non-Japanese sellers are generally considered off limits as there is a strong chance their listings have been previously dumped by hobbyists before being resold to recoup costs. The ideal purchasing scenario for a satellite archaeologist is a used memory pack, from a Japanese seller, with unconfirmed data—giving them a fighting chance at finding something new.

Even with these guidelines buying memory packs is an expensive prospect, especially since most people are already priced out of retro-game collecting. PriceCharting.com noted that the value of an "average retro video game increased 33% from the start of the pandemic lockdowns in March 2020 until March 2021" (2021) and collecting Satellaview content is a particularly costly endeavour. The base console sells for between $450-1200 (USD) but is luckily not needed for memory pack recovery and generally only sought after by collectors. A copy of *BS-X: Sore wa Namae o Nusumareta Machi no Monogatari*, however, is necessary to dump memory pack content, and typically retails between $50-$150 (USD) (*PriceCharting*, 2024). Memory packs can vary greatly in price but generally cost $50 or more, with no guarantee that they will hold unique data. In addition to being affected by broader pricing fluctuations, Satellaview technologies have also been somewhat susceptible to accidental price inflation. As interest in preserving the device grows, more buyers bid on auction listings, consequently raising the average prices. Callis recalled that, several years back, he found himself accidentally bidding against Frank Cifaldi at the Video Game History Foundation for a retro-game listing, and decided it was time to coordinate individual efforts:

> I collected everyone I knew in the scene to be like: "We're on a Slack, here are auctions I am interested in bidding on, is anyone else going to bid on these? If not, I will let you bid on them." It eventually became like, since we're not outbidding each other, if someone needed $100, we'd chip it in.

Even with collaboration over backchannels, the search for Satellaview memory packs is a costly endeavour. I will touch a bit about the cost of preservation and how this restricts who can participate in the conclusion of my dissertation, but for now I will discuss what satellite archaeologists do with these memory packs once they have arrived on their doorsteps.

In addition to his extensive emulation work, LuigiBlood is known for inscribing a best practice guide for memory pack dumping. Almost every one of my inquiries into memory pack analysis ended with "you should really talk to LuigiBlood" or with a nudge toward his *How to dump Satellaview Memory Packs* (LuigiBlood, 2017) guide, which is considered the authoritative resource for aspiring satellite archaeologists. LuigiBlood has essentially crafted a central text that aggregates and reviews existing expertise related to memory pack dumping and consolidates it into a set of best practices, establishing himself as a designated interpreter at

[55] Contrary to the opinions of my participants, I had more success ordering from Japanese game retailers directly. The memory packs I used for my research came from the website Okiniland (although this is not an endorsement).

the heart of a material community (Marvin, 1988, p. 12; Wershler, 2019). As he acknowledges himself, his guide represents a stable point in an ongoing chain of user-created techniques:

> Back in the day, dumping Memory Packs was a huge mess that required mostly unique pieces of hardware and hacky ways to dump them. But lately more ways have been done to facilitate the dumping to everybody [*sic*]. So I figured I should write about it and give you ways to do it. (LuigiBlood, 2017)

"Documentary skill" and being "well up" on technical methods are integral to expertise (Marvin, 1988, p. 16), and LuigiBlood demonstrates both in spades. He provides details of various hardware configurations and opines on their strengths and weaknesses, but his recommended process is relatively straightforward regardless of the exact technologies involved. Step one, acquire a device that can dump a ROM image from a SNES/SFC cartridge. These devices range from open source projects like the Arduino Cart Reader (sanni, 2016/2024) to commercially-released products like the Super Nt (Analogue, 2018), which cannot dump ROMs by default but can be jailbroken to add the functionality. Step two, carefully slide an acquired 8M Memory Pack into the *BS-X: Sore wa Namae o Nusumareta Machi no Monogatari* slotted cartridge, then insert it into whatever device you have on hand. Finally, following device-specific instructions, dump the cartridge at least twice to create a pair of ROM images that can be compared for consistency.

While LuigiBlood's guide is excellent, it always helps to have direct mentorship, and Quenneville was kind enough to walk me through the process of dumping and analysing memory packs over Zoom. As I sat amidst stacks of boxed consoles at the Residual Media Depot, we worked through the process using an Analogue Super Nt and a memory pack I had purchased through the Japanese game retailer Okiniland (Figure 5.32). Luckily for us, there were no major hardware hiccups, and once we had dumped the memory pack data twice the moment of truth had arrived: it was time to see if we had recovered new game content or if our efforts were for naught. The first step in parsing through the dumped memory pack data is verification—seeing if the memory pack has any data and if the dumping process was completed successfully. I will talk more about the technical affordances of SNES/SFC cartridges in *Pixels and Plastic* and *Final Fantasies*, but for now the only required knowledge is that data is stored on cartridges using hexadecimal values and that "FF" is a null value that indicates no data is present. So, when a satellite archaeologist opens a dump of memory pack data, their first tasks are to: a) see if all the values are "FF", which would indicate a completely unwritten memory pack; and b) compare the values between multiple dumps of the same cartridge to check for consistency.

Figure 5.32. A photograph of the Residual Media Depot as I was dumping my Satellaview memory packs.

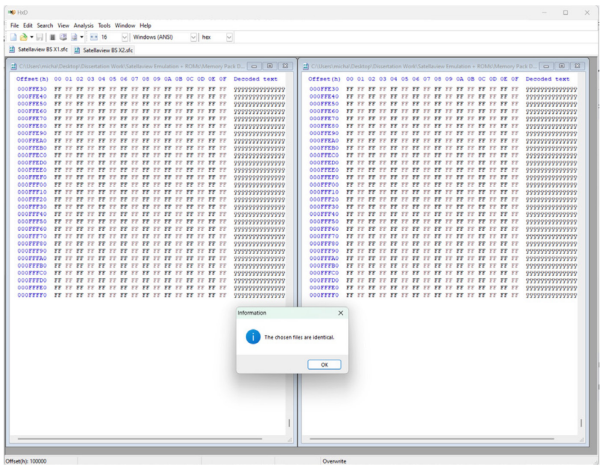


Figure 5.33. A comparison of two blank (but successful) 8M Memory Pack dumps in HxD.

Quenneville directed me to HxD (Hörz, 2022)—a freeware hex editor, disk editor, and memory editor developed by Maël Hörz—in order to dissect my memory pack dump. One of the main benefits of HxD is that it allows users to open two ROM images simultaneously and compare their data. After loading both of my dumps into HxD, I was greeted with a mix of good and bad news. The good news was that the dumps matched, meaning that I had completed the process successfully. The bad news was that they matched because they were entirely blank, and simply contained line after line of "FF"s (Figure 5.33). If buying memory packs is playing the lottery, I did not even win a free ticket.[56]

However, like so many other satellite archaeologists, I was hooked, and I immediately went back online in search of more memory packs. I made a purchase from the same seller, despite the previously disappointing results, and in 2-3 weeks time a package appeared at my front door. Working through the steps that Quenneville taught me again, I created two separate dumps of the memory pack data and opened them in HxD and, this time, I was rewarded with actual data rather than just endless lines of "FF"s. While finding data on a memory pack is exciting, hexadecimal code is impossible to parse at a glance, and satellite archaeologists must use other tools to identify and access game content. While an emulator is ostensibly the most direct way to boot memory pack data, after I booted my content into bsnes -plus I was faced with a common problem facing satellite archaeologists: while HxD clearly identified that there is memory pack data present, *BS-X: Sore wa Namae o Nusumareta Machi no Monogatari* does not

[56] Quenneville was kind enough to lend me data from one of his own memory packs in order to walk me through the rest of the process.

acknowledge it. There are numerous possible causes for this issue. Content may only be compatible with a particular type of slotted cartridge, such as save files for *RPG Tsukūru 2* and bonus content for *SD Gundam G-Next*, or may simply be corrupted or incomplete. However, quite commonly, the game content has simply expired due to the user exhausting their limited number of plays (as imposed by Nintendo's DRM).

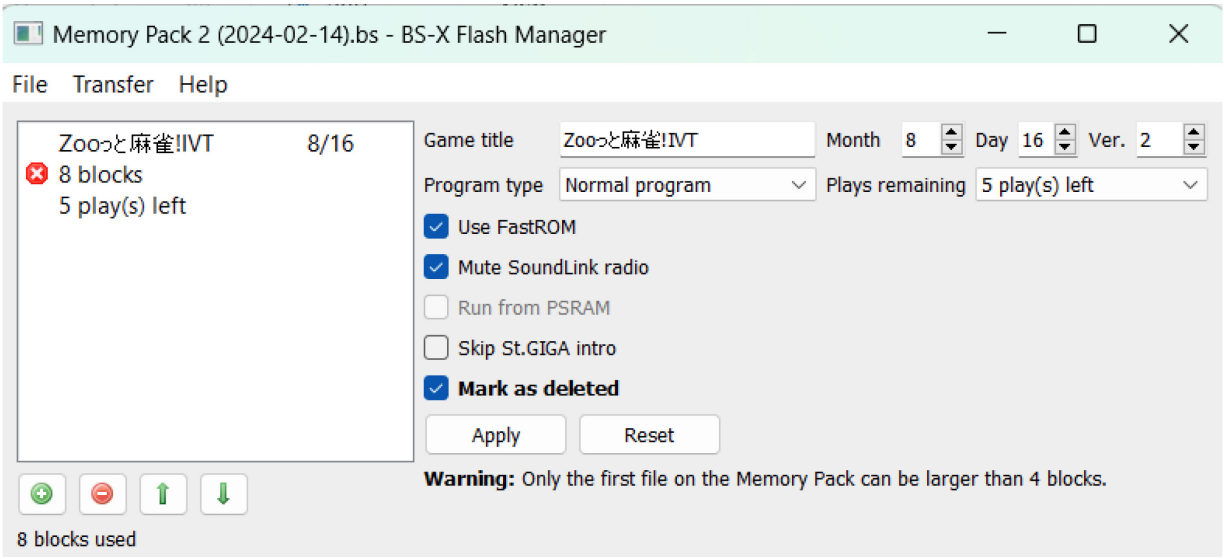


Figure 5.34. My memory pack dump in BS-X Flash Manager, displaying information about the data.

When we initially dissected my blank memory pack dump, Quenneville urged me to install BS-X Flash Manager (Acker, 2019/2023), a specialised application created by Devin Acker (known online as Revenant) that can identify and manage memory pack data. The application shows what content is present, how much space it takes up on the memory pack, and when it was initially broadcast (Figure 5.34). Especially useful for emulator compatibility are the 'plays remaining' and 'mark as deleted' options, which are embedded in the ROM header and dictate whether a game has expired or is still valid for play. BS-X Flash Manager provides an easy, informal method of reading these values and editing them, effectively nullifying Nintendo's DRM by tweaking values in a ROM image. In the case of my memory pack data, BS-X Flash Manager provided a few important pieces of information. First, the application alerted me to the existence of one game on the memory pack, *Zooっと麻雀!IVT* (translated loosely into *Zootte Mahjong !IVT*), which is a version of a mahjong game released for the Satellaview in 1998. Second, it confirmed that the reason I could not see the game was due to Nintendo's DRM, which limited users to five plays (that had long been depleted). And, finally, in addition to other metadata, the application displayed a broadcast date of 8/16, pinpointing when in 1998 the game was available. As it was common for Satellaview games to be broadcast multiple times, in slightly different configurations, the broadcast date is vital in determining whether or not my version of *Zooっと麻雀!IVT* was a unique find.

Figure 5.35. *BS-X: Sore wa Namae o Nusumareta Machi no Monogatari*'s interface for loading stored data, displaying the presence of *Zooっと麻雀!IVT*.

Figure 5.36. The title screen for *Zooっと麻雀!IVT*.

With this information in hand, I unclicked the 'mark as deleted option' and saved the memory pack data, re-activating *Zooっと麻雀!IVT* and rendering it visible in *BS-X: Sore wa Namae o Nusumareta Machi no Monogatari*. As a final step, I booted up the game to test it out… and was treated to a fairly boring mahjong simulator (Figure 5.35 and Figure 5.36). While not the most exciting game, whether content meets some arbitrary standard of 'fun' is secondary to Satellaview recovery efforts. The more important question is: "was I the first person to find this content?"

Satellablogging: Archiving Satellaview Content

To answer this question, I turn toward the Satellablog, a website maintained by Cabbusses and hosted by Callis that features contributions from many folks involved in Satellaview recovery (Figure 5.37). With the pool of Satellaview content growing steadily over the past decade, a shared repository that reviews and archives new finds has become increasingly important. Despite its centrality as a record of Satellaview information, the Satellablog is an unassuming website. Its layout is sparse, featuring a blue-and-white two column design reminiscent of the early Internet, and it lacks a mission statement, contact page, or even an explanatory 'about' section. In addition to the main blog, the links on its top menu are '8M Memory Pack Dump' and two social media websites (one of which, as of 2024, is defunct). Despite its sparseness, the Satellablog is one of the more reliable archives of memory pack data on the Internet. If information or data is posted to the website, it means it has been reviewed, verified, and packaged by Satellaview experts.

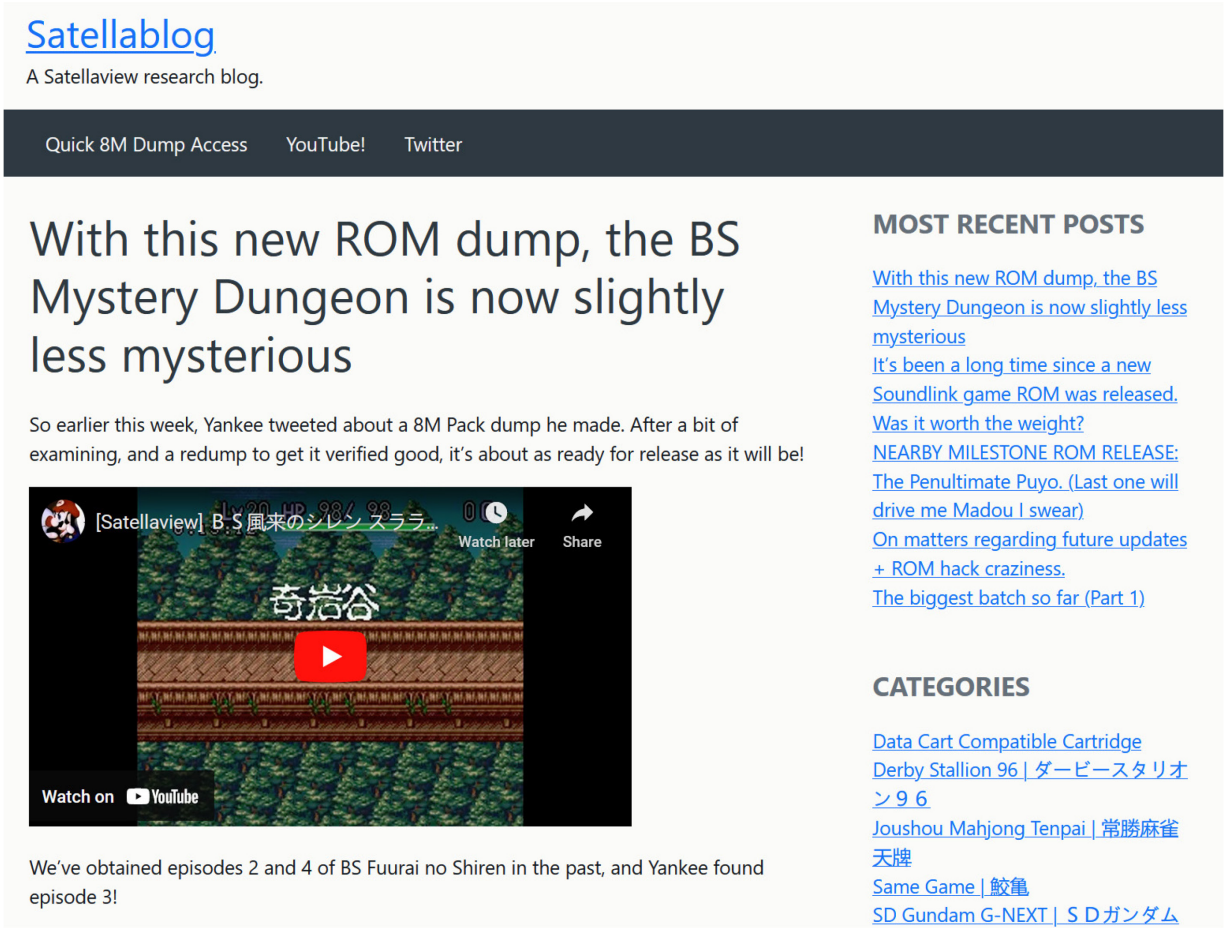


Figure 5.37. The main page of the Satellablog (or at least the top section of it), as of June 4 2024

The Satellablog was created by Cabbusses in 2008 as a "general purpose Satellaview research blog" and he recounts that his early blogging style was a "lax, sometimes irreverent style of writing for things I either archived, experienced, or learned in regard to Satellaview discoveries." This casual approach is reflected in blog posts titled *To put it short – What is the Satellaview and the BS-X?* (Cabbusses, 2008a) and *What is this I don't even* (Cabbusses, 2008b), which both speculate on the Satellaview's functionality and content at a point in time when the device was still somewhat mysterious to non-Japanese audiences. Cabbusses notes that, over the years, the tone of the blog posts has significantly shifted due to the addition of contributors and a greater emphasis on formally documenting new memory pack finds.

> Since now there's more writers and more ROM dumps from many sources, lately it feels like it's become a bit more of a dry of a dump update source.

Compared to the personal style of earlier posts, recent updates are more akin to a 'new to the collection' blurb for a library or archive. *The biggest batch so far (Part 1)* (LuigiBlood, 2023) reflects this shift, with LuigiBlood describing the contents of 40 recently unearthed memory packs that resulted in about 25 new finds.

There is a pattern to this type of blog post: an introduction, acknowledgements for those who submitted memory pack data (or donated money toward a memory pack's acquisition), followed by a summary of the recovered content. As Satellaview games were commonly limited versions of full retail releases, or standalone games that were subtly changed between broadcasts, blog authors often describe why a new find differs from a seemingly identical pre-existing one. This type of descriptive work can be seen in the blurb for a broadcast version of *Soreyuke Ebisumaru Karakuri Meiro – Kieta Goemon no Nazo!!*

> This one is identical to the retail release except for 2 bytes. This is *Soreyuke Ebisumaru Karakuri Meiro – Kieta Goemon no Nazo!!*, a spinoff game of the Goemon series from Konami, where you guide Goemon's sidekick, Ebisumaru, to the goal, through a 3D isometric labyrinth by changing the arrow panels as he walks through them. (LuigiBlood, 2023)

The final bits of information in most blog posts are links to a game's ROM image, from the 'Quick 8M Dump Access' page, alongside paratextual information, such as magazine scans and television commercials (often hosted externally).

In comparison to the blog posts, the 'Quick 8M Dump Access' page is a no-frills affair that claims to provide access to "every Satellaview ROM dump that has been released, along with any misc. items that were placed on the blog" (Cabbusses, 2013). The page consists of a long list of ROM images that are identified by name, compressed into .zip files, and sorted under simple headings such as 'Sound Programs and Download Games,' 'Magazines,' and 'Data Pack Data' (Figure 5.38). While the absence of any contextual data is notable—similar informal archives provide screenshots, release dates, and developer info alongside downloads—there is some simple metadata included as part of file names. Many of them begin with square brackets that list the name of the person who initially dumped the memory pack (e.g., *[Ikari] Kouryaku Casino Bar Double Pack BS*), effectively giving credit to whomever made the find. Others end with a broadcast date (e.g., *Tamori no Picross 6/26*), allowing for quick differentiation between multiple versions of the same game.

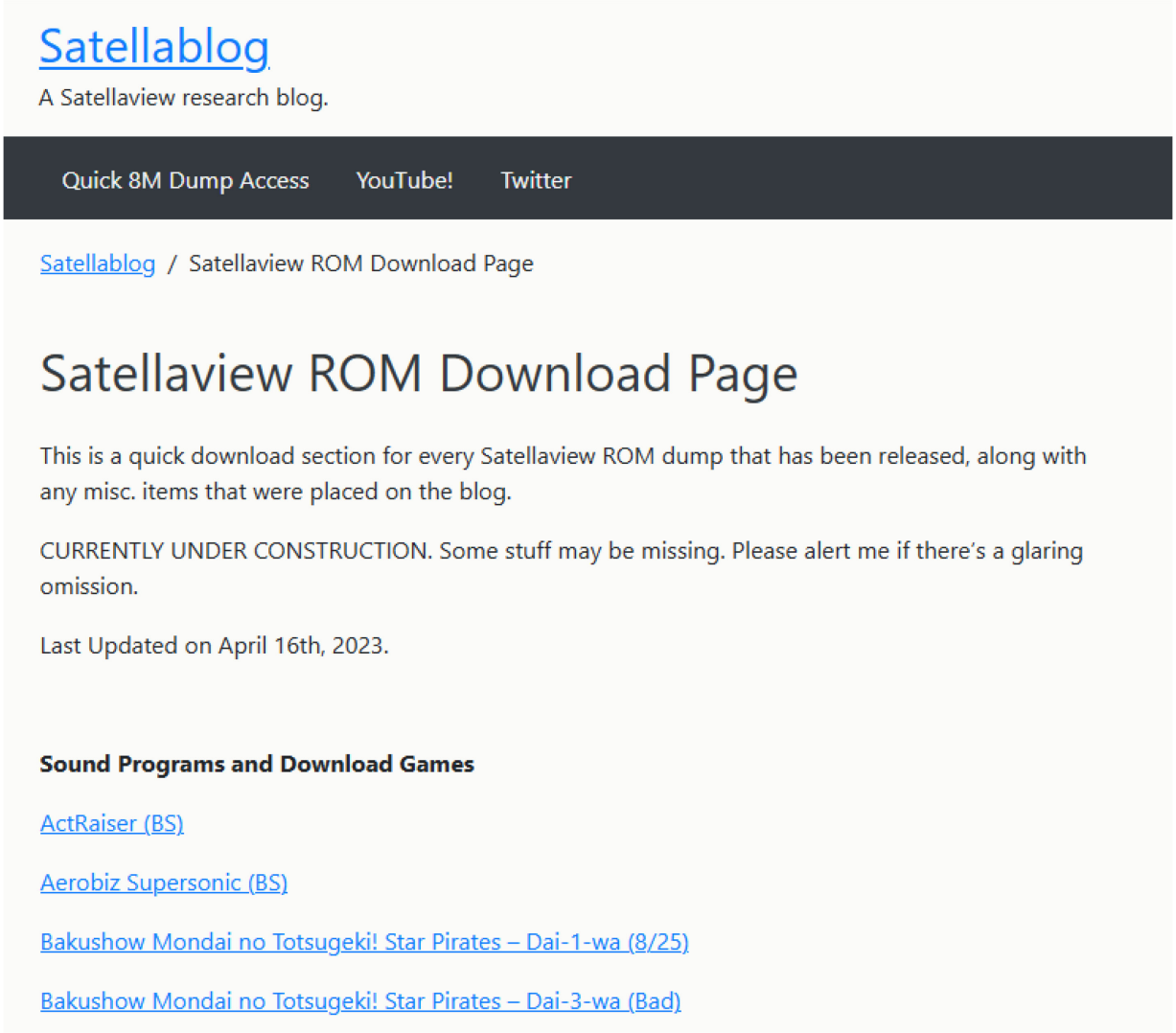


Figure 5.38. A very short excerpt from the Satellablog's "Quick 8M Dump Access" Page

Openly listing ROM files may seem like a folly, especially in the wake of high profile lawsuits by Nintendo (O. S. Good, 2018), but Cabbusses does not appear to be overly concerned with the Satellablog's legal status. He believes that the website's lack of monetisation efforts, paired with the Satellablog's tendency to feature games that Nintendo is not actively developing, gives the developer little reason to take legal action. Interestingly, he also notes that the Satellaview is effectively a forgotten console at this point, which may make Nintendo reluctant to bring any attention to it.

> If Nintendo took down a site that only distributed Satellaview game data, they'd be drawing attention to a platform they no longer support, potentially giving their fanbase expectations they couldn't deliver on and upsetting them.

It is likely impossible to determine whether Nintendo knows or cares about the Satellablog, but at this time they have put forth no legal protests. Other archives, such as a 2018 collection of memory pack data on The Internet Archive, have also remained active despite Nintendo's aggressive efforts to remove similar types of copyrighted content (Kamen, 2016). It appears that the Satellaview currently resides in a blind spot, of sorts, where its content is being shared informally but clamping down on this distribution is likely not worth Nintendo's time.

Cabbusses' simple approach to archiving memory pack data emphasises an underlying motivation of satellite archaeologists: to make the Satellaview and its content playable to as many people as possible with as few barriers as possible. Navarro-Remesal notes that fan archives are often "an act of resistance against the industry and its control over production and history" (2017, p. 140) and push back against intellectual property regimes and corporate (re)release strategies. I would add that these actions embody what Salvador (2024) has discussed in regard to citizen archivists, as they are also an act of resistance against institutions of memory. Whereas museums and archives often work within formal structures, such as intellectual property law and institutional access processes, most Satellaview websites are fully open to the public. When speaking to his Satellaview preservation philosophy, LuigiBlood puts forth a slightly anarchic philosophy.

> I admit I'm one of the people who loves to release data on the Internet, completely bypassing any legality… and I tend to dislike the whole idea of having things stuck to "researchers" like what legal organisations and museums might do. I could be considered a "researcher" but in my head I'm more like a regular person who shouldn't really be more privileged than others about this stuff.

On one hand, this informality has allowed satellite archaeologists to accomplish something that game history organisations have been struggling with for years: providing easy access to digital content. Even after years of lobbying by the Video Game History Foundation and other institutional stakeholders, it is unclear if there will ever be copyright exceptions that allow for the preservation of digital games (O. Good, 2024), effectively keeping born-digital content out of most formal collections. On the other hand, while informal groups of game preservationists are much more nimble than formal institutions, they can also be more precarious. While Taylor argues that informal archivists lack commitment, expertise, and veracity (2010, p. 14), I would instead pose that satellite archaeologists embody these traits but that their practices may be fragile as they rely on a small number of passionate volunteers. Legal action (Kohler, 2021) or personal tragedy (K. Bailey, 2021) can set back efforts significantly and perhaps even end projects entirely. Even LuigiBlood, who is viewed as one of the most tireless satellite archaeologists, recently stepped back from contributing to the Satellablog due to his experiences with burnout (LuigiBlood, 2024).

Curiously, although the Satellablog attempts to host all discovered Satellaview content, it does not give users instructions for adding new memory pack data they find. When I asked Quenneville and the Video Game History Foundation Discord where to submit my data, I was directed to LuigiBlood, who commonly reviews new submissions to determine if they are

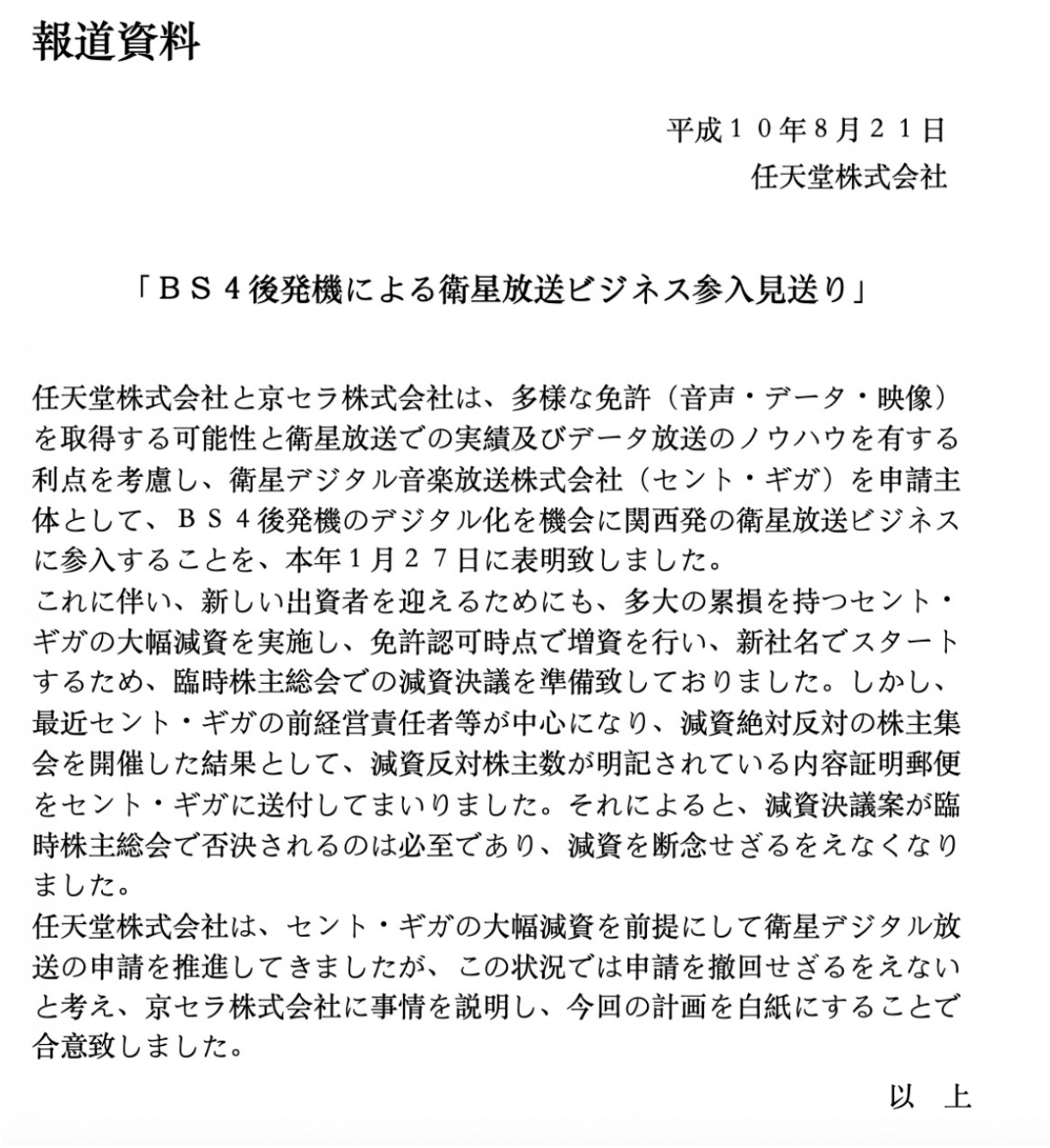
unique.[57] Following up with him a few months after our initial interview, I passed along my memory pack dumps alongside some screenshots I had taken and, after some deliberation, he confirmed that I had found a new variant of *Zooっと麻雀!IVT*. While the game shared the same name as a prior broadcast, it featured a few code differences that distinguished it from previously discovered copies, meaning it would be archived as a separate entity. While not yet listed on the Satellablog, *[Michael Iantorno] Zooっと麻雀!IVT* is currently in queue to be processed and added to the '8M Memory Dump Access' page.[58] And, while my current research funding does not allow for repeated memory pack purchase, the itch to recover more content remains. There is so much unrecovered Satellaview content potentially lurking within memory packs, providing an irresistible challenge for satellite archaeologists.

Closing Discussion

In his chronicling of the denouement of the Satellaview's commercial lifespan, Yarwood discusses the bitter breakup that manifested between Nintendo and St.GIGA in the late nineties. Using a Japanese press release for reference (Nintendo of Japan, 1998), he recounts that St.GIGA's "[failure] to apply for a government digital satellite broadcasting license" and its shareholders' refusal to "approve Nintendo's plan to reduce the firm's capital to wipe out its accumulated debts" had created irreconcilable tension between the two corporate entities (Yarwood, 2023). Nintendo had plans to continue game distribution over a soon-to-launch BS4-11 digital satellite in 2000, but St.GIGA's refusal to play by their rules turned out to be a death knell for the Satellaview. In August 1998, Nintendo announced the end of their relationship with St.GIGA (Figure 5.39). By March 1999, Nintendo had stopped providing new Satellaview content to St.GIGA, forcing the broadcaster to rebroadcast existing media. And on June 30 2000, St.GIGA ended the service entirely, marking the end of its five year run (Yarwood, 2023).

[57] LuigiBlood also checks memory pack dumps for hidden, corrupt, or impartial data.

[58] While I had hoped to have my content up on the Satellablog by the time I finished writing my dissertation, there is currently a blog-backlog that needs to be attended to.



報道資料

平成１０年８月２１日
任天堂株式会社

「ＢＳ４後発機による衛星放送ビジネス参入見送り」

任天堂株式会社と京セラ株式会社は、多様な免許（音声・データ・映像）を取得する可能性と衛星放送での実績及びデータ放送のノウハウを有する利点を考慮し、衛星デジタル音楽放送株式会社（セント・ギガ）を申請主体として、ＢＳ４後発機のデジタル化を機会に関西発の衛星放送ビジネスに参入することを、本年１月２７日に表明致しました。
これに伴い、新しい出資者を迎えるためにも、多大の累損を持つセント・ギガの大幅減資を実施し、免許認可時点で増資を行い、新社名でスタートするため、臨時株主総会での減資決議を準備致しておりました。しかし、最近セント・ギガの前経営責任者等が中心になり、減資絶対反対の株主集会を開催した結果として、減資反対株主数が明記されている内容証明郵便をセント・ギガに送付してまいりました。それによると、減資決議案が臨時株主総会で否決されるのは必至であり、減資を断念せざるをえなくなりました。
任天堂株式会社は、セント・ギガの大幅減資を前提にして衛星デジタル放送の申請を推進してきましたが、この状況では申請を撤回せざるをえないと考え、京セラ株式会社に事情を説明し、今回の計画を白紙にすることで合意致しました。

以　上

Figure 5.39. A press release that Nintendo of Japan posted on their website on August 21 1998, marking the beginning of the end for the Satellaview.

The slow death of the Satellaview—and later St.GIGA, who merged with radio station provider WireBee in 2003—was fairly mundane by corporate standards but is notable for the way it exposes the precarity of videogame ecosystems, particularly ones that do not deliver game content using physical media. Not only did shareholder desires stymie a formal continuation of Nintendo's broadcast service, but the ensuing repetition of programming and discontinuation of

formal paratexts have created immense challenges for those who informally reconstruct the device during its afterlife.

One of the reasons that I am drawn to the Satellaview is because the terms that it poses to scholars pull at the seams of material-focused histories and media archaeologies. In my theoretical overview, I mentioned Wershler's variation on a famous William Gibson quote: "the past is still here; it's just unevenly distributed" (2016). My argument was that videogames do not *poof* out of existence when their so-called successors hit the market but, instead, persist in numerous contexts. Similarly, Guins cautions against scholarship that frames media as being "hermetically sealed, time-capsuled for our rediscovery and reliving" (Guins, 2014, p. 3), for fear of glorifying a so-called act of revival. Videogame objects move through the world regardless of our affinity for them (Guins, 2014, p. 4) and, if we choose to encounter them, we often must do so on their own terms. However, these perspectives are mostly focused on the physical remains of videogame history—arcade cabinets, videogame consoles, and mass-produced game cartridges—which are durable objects that persist long after the end of their designed commodity lifespans. As demonstrated by the Satellaview's broadcast-based delivery, not all videogames generate extensive material remains as they drift into their afterlives. The console's content essentially did *poof* out of existence after it was initially broadcasted, and this transience was further encouraged by Nintendo through restrictive DRM and an ever-changing churn of programming. While Guins warns against treating videogames as time capsules, the Satellaview's memory packs both reinforce and oppose this viewpoint. On one hand, each memory pack offers a fleeting snapshot of the Satellaview's content (games, magazines, bonus content) and day-to-day use. On the other hand, satellite archaeologists have openly acknowledged that these time capsules will never constitute a complete record. Reflecting on the archival process during our interview, Callus noted that "each individual piece [of the Satellaview] doesn't really stand alone but starts to paint a picture of the whole." The device's past is extremely unevenly distributed to the point that it is unknown just how much is left to recover and much insight its remaining residual fragments will provide.

Still, while I have highlighted numerous techniques and technologies developed by satellite archaeologists throughout this chapter, it is important not to fetishize their restoration efforts. Framing emulator development as some sort of heroic preservation campaign, or the search for memory pack data as an exciting scavenger hunt akin to excavating the Alamogordo dump (Chappell, 2014), is tempting but misleading. In many ways, the Satellaview and its recovery efforts are both rooted in the mundane. The console was neither a resounding success nor a compelling failure, it was contemporaneous with several similar services (e.g. the Sega Channel), and it had widespread adoption across Japan. Even the informal technologies that satellite archaeologists leverage in their work, such as emulators and hex editors, have become rather commonplace in both formal and informal contexts (even if Satellaview compatibility is a relatively novel feature). If anything, what the Satellaview teaches us is that the absence of corporate stewardship over a videogame ecosystem can have drastically different outcomes based on its material realities. The Satellaview is undeniably resistant to common historical and media archaeological processes and the recovery efforts undertaken by satellite archaeologists

offer a glimpse into the challenges involved in restoring access to ephemeral and abandoned videogame ecosystems.

I close this chapter with a simple question: what comes next for satellite archaeologists? The continued development of sound- and speed-accurate Satellaview emulation, the ongoing search for memory pack data, and the endless task of finding and translating paratexts are the most evident paths forward, but there are other threads to follow. Several of my interviewees still hold out hope that there is a formal collection of Satellaview content tucked away somewhere within the walls of Nintendo of Japan or elsewhere, waiting to be discovered. While this belief may seem far-fetched, especially considering that Nintendo has outright denied the existence of such an archive, the existence of hidden stashes of game data is not without precedent. The Nintendo Gigaleak that emerged between 2018 and 2020 has become a treasure trove of lost prototypes and internal development materials and even includes sprites for what many presume to be an incomplete Satellaview remake of *Zelda 2* (Skrebels, 2020). And sometimes rare videogame artefacts show up in unassuming venues, such as the Super NES CD-ROM prototype that was initially purchased at a corporate liquidation auction for $75 (Machkovech, 2020). Whether new discoveries manifest through the continued efforts of satellite archaeologists or a serendipitous discovery of a corporate archive, there is assuredly much more to be learned about the Satellaview.

6. Pixels and Plastic

Figure 6.1. A lime green *HyperBound* cartridge.

Chapter Introduction

In the autumn of 2020, I made a startling discovery while browsing eBay for deals on game cartridges. *HyperBound* (2007), my first Super NES/Super Famicom (SNES/SFC) hacking project based on the role-playing game *EarthBound* (1994), had been transformed into a physical game cartridge without my knowledge or permission. Sold by a store called the-game-paradise, the cartridge featured a number of questionable design decisions: it was housed in a gaudy semi-transparent green shell, programmed to be compatible with PAL consoles (despite my original hack being an NTSC ROM), and featured label art that did not accurately reflect the hack's content or unlicensed status (Figure 6.1). The cartridge proved to be a strange chimaera, drawing upon the iconic form factor of a SNES/SFC cartridge while, simultaneously, creating a distinct variation that could have never been produced during the console's initial release window. Overwhelmed with curiosity, I suspended the discomfort of seeing my gameplay hack surreptitiously monetised and purchased a copy (Figure 6.2) to take a closer look.

Figure 6.2. A *HyperBound* listing from the-game-paradise on eBay. For some reason, after selling me a lime green game cartridge, the store switched the shell colour to black.

It would be easy to dismiss this physical manifestation of *HyperBound* as a simple counterfeit, albeit a multilayered one. It reproduces the work of Ape Inc. and HAL Laboratory, *EarthBound*'s original developers, with no apparent attempt at formal licensing; it masquerades as an official game cartridge by commandeering Nintendo's trademarks, despite its clear material deviations; and it unscrupulously absorbs my creative labour while monetising it in ways I would have never authorised. However, beyond these legalistic and moral objections, this *HyperBound* cartridge is a fascinating manifestation of informal game manufacturing and distribution practices. It points toward a much larger phenomenon that has arisen during the afterlife of the SNES/SFC and many other so-called 'retro' game consoles: the persistent desire to return to materiality. Reproduction cartridges circulate freely across digital storefronts, auction websites, brick-and-mortar shops, flea markets, and numerous other venues. Sellers may attempt to pass them off as originals, to trick buyers into paying a steep price for particularly rare and expensive titles, or directly acknowledge the artifice of their products, framing them as limited edition runs of orphaned games or creative remixes of *Mario*s, *Metroid*s, and *Zelda*s. In any case, *HyperBound* is not an anomaly but, rather, a single facet of a thriving (in)formal ecosystem of videogame reproductions.

In this chapter, I use *HyperBound* as an entry point for studying the broader phenomenon of SNES/SFC cartridge reproduction. These practices and technologies, which rely upon expertise developed by material communities, range from licensed products created by corporate entries, perhaps most famously Limited Run Games, to unauthorised facsimiles circulated on eBay and AliExpress. I begin by applying theories of informal media distribution to reproduction cartridges, comparing their production and distribution to Lobato's shadow economies of film (2012) and aligning them with Vanderhoef's discussions of authentic physical objects and ephemera (2017). Next, I discuss the continued user desire to engage in SNES/SFC development practices and how this is both enabled and complicated by intellectual property law—specifically copyright, patents, and trademarks. After a brief methodological interlude, I turn my attention to four online storefronts that sell reproduction cartridges and scrutinise what games they carry, to establish a loose typology of reproduction cartridges to discern patterns in their production and distribution. For the remainder of the chapter, I delve into three common foundations for creating reproduction SNES/SFC cartridges—template boards, donor boards, and bootlegs—while documenting my own experiments in creating bespoke versions of *HyperBound*. I then close by reflecting on the materiality of nostalgia, from mass-produced collector's editions to experimental cartridges.

Informality, Materiality, and Nostalgia

Although I was shocked by the appearance of a *HyperBound* cartridge on eBay, the circulation of copies, facsimiles, and variations is a widespread aspect of the informal media economy. From mix-tapes to fansubs, audiences have long copied and iterated upon their favourite media and distributed it in physical formats (Jenkins, 2004; Sterne, 2006). In fact, one of the key points that Lobato and Taylor discuss when teasing out the informal-formal media spectrum is the everyday nature of informal distribution: "anyone who has ever downloaded *Breaking Bad*, purchased a smart card from a stranger or leeched off a neighbour's cable connection has, wittingly or not, encountered the informal TV economy" (2018, p. 44). Similar to how I leveraged a filmic lens in prior chapters to discuss orphan works and auteurship, I find the circulation of theatrical films-as-DVDs to be an interesting parallel to the global flow of videogame reproductions. As Lobato has discussed in relation to the shadow economies of cinema, informal film releases can be defined through their disruption of media flows, high level of textual variation, and tendency to be consumed in non-standard ways (2012, p. 45). As a key example, he characterises bootleg DVDs through their availability ahead of official release windows, their textual variation due to video compression and shaky camera work, and their tendency to be viewed outside of theatrical venues.

SNES/SFC reproduction videogame cartridges similarly disrupt the formal flow of games: they are created and distributed long after a game console's designed lifespan has ended[59]; they vary textually in both game content and packaging aesthetics; and they may be played on reproduction consoles, modern televisions sets, or displayed as tchotchkes as part of carefully arranged game collections. Much as with film, informal variations of videogames

[59] The SNES/SFC was officially discontinued in 1999 in America and 2003 in Japan.

increasingly find themselves competing with re-releases on digital platforms. Most media companies have now incorporated their back catalogues into paid online services—such as the Nintendo Switch's eShop or Paramount Global's Paramount+ streaming service—and condemn informal media distribution as piracy.[60] However, as I will elaborate upon later in this chapter, the conflict between informal and formal distribution is not simply predicated on legality but also is influenced by availability and textual variation. Informal production and distribution render media malleable and allow it to travel in unintended ways.

The material configuration and proprietary design of SNES/SFC cartridges, however, is seemingly at odds with this alleged malleability. Unlike DVDs, CDs, VHS tapes, audio cassettes, and other common home media types, videogame cartridges are complex hardware/software hybrids that are difficult to reproduce or modify. The impermeability of cartridges is, of course, not fully predicated on material affordances. Nintendo inserted technical protection measures, predominantly the CIC lockout chip, into cartridges to prevent unauthorised users and companies from developing games (Altice, 2015, pp. 90–91; Arsenault, 2017, p. 37). This tight control of manufacturing was brought into focus in a lawsuit in which Atari claimed that Nintendo was engaging in anti-competitive practices (*Atari Games Corp. v. Nintendo of America, Inc.*, 1992) for essentially monopolising game production.[61] As a result, even with three decades to accumulate reverse-engineering expertise, creating videogame cartridges remains one of the more challenging ways for users to distribute SNES/SFC games. From a pragmatic perspective, it is much easier to circulate SNES/SFC titles digitally as ROM images—all of which are less than 6 MB in size and can be played on modern computers or smartphones using free emulators.[62] This begs the admittedly instigative question: why bother with cartridges at all?

In his study of NES emulation and reproduction communities, Vanderhoef asserts that digital-centric game discourses under-recognise the user desire to create and distribute physical objects (2017, p. 115). He interrogates how videogames have been predominantly framed by scholars as shared digital resources, overlooking the persistent user desire to "create continuity with older games" and contribute to canonical game libraries with their own cartridges, box art, and ephemera (Vanderhoef, 2017, p. 115). The material compulsion blends aspects of Boym's restorative and reflective nostalgia. Through a restorative lens, which favours reconstructing the past in a manner that ostensibly invokes truth and tradition (Boym, 2007, p. 13), reproduction cartridges can be framed as means to engage with games in the format that they were meant to be played. Through a reflective lens, which dwells upon the contradictions

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[60] Nintendo has a section on their support page that condemns reproductions as "counterfeit copies of authentic Nintendo game software" that are "offered by unscrupulous traders" (Nintendo, 2021).

[61] Atari lost this lawsuit, but not because they reverse-engineered Nintendo's technology. Rather, it was determined that they had acquired Nintendo's source code illicitly (*Atari Games Corp. v. Nintendo of America, Inc.*, 1992). A later lawsuit (*Sega Enterprises Ltd. v. Accolade, Inc.*, 1992) established that reverse-engineering proprietary game technologies can be legal but, as I will elaborate later on, the Digital Millennium Copyright Act (DMCA) throws these prior precedents into doubt.

[62] I could contrast this practice to downloading MP3s from Napster and burning them to a CD, which did require some specialised equipment (namely a CD burner and software) but was a straightforward enough practice for countless high school and university students to participate in.

of historical reconstruction and nostalgic longing (Boym, 2007, p. 13), reproduction cartridges are sites of remix, subversion, and disruption, altering the SNES/SFC game library in previously unseen ways. In either case, reproduction cartridges represent a push toward compatibility, of sorts, in which games are made functional with residual hardware to be validated within broader retro-gaming discourses. Mimicking the form of a cartridge down to its shell colour, box art, and even trademarks is a co-option of Nintendo's corporate author-function that aligns new-old software with the oeuvre of the SNES/SFC without prior authorisation from the venerable game company.

Vanderhoef notes that this nostalgia is certainly not limited to a single group of stakeholders and has been co-opted by groups ranging from large media companies to hobbyist communities. The retro-gaming industry "exploits peoples' intimate memories of older gaming technology, transforming it into a continual stream of revenue derived from nostalgic consumer products" (2017, p. 113)—a strategy that can be clearly observed through Nintendo's line of mini/classic reproduction consoles and the endless churn of digital re-releases through their digital storefront. Retro-gaming enthusiasts tend to use vintage games to "explore their own histories and form communities with like-minded folks" (Vanderhoef, 2017, p. 115)—a theme I have previously explored through user emulation, preservation, and hacking practices. Of course, the boundary between Vanderhoef's categorisations is porous as users often transform their hobbies into formal enterprises and, conversely, businesses tend to look to informal practices for inspiration. Formal and informal economies are similarly "connected by exchanges of personnel, ideas, content and capital" (Lobato & Thomas, 2018, p. 45), regardless of the underlying ethos of their practices.

Perhaps what unites these different types of reproduction makers is the recognition that the legacy of the SNES/SFC is deeply entwined with its software library and that game cartridges are a key aspect of the console's cultural cachet. Through the most pragmatic lens, it makes the most sense to play games from the SNES/SFC library by purchasing them from a virtual storefront or downloading ROM images to play on an emulator or a flash cartridge.[63] Yet despite these more approachable and inexpensive options, convincingly produced cartridges have remained remarkably persistent consumer goods.

I would also posit that reproduction cartridges, which are entangled with a bevy of hacking and homebrew projects, are part of a broader movement to render malleable the highly formalised manufacturing and distribution processes that Nintendo established throughout the eighties and nineties. As Keogh notes, "smaller teams and hobbyist creators were priced out of the dominant development and distribution platforms through the 1990s" (2019, p. 22), severely limiting who was able to develop games for home videogame consoles. Nintendo's publishing philosophy—which Arsenault has appropriately described as the actions of "an autocratic conqueror who did everything in its economic and legal power to control the chaotic multitude

[63] A flash cartridge (also known as a flashcart) is a videogame cartridge that uses flash memory to store multiple games and applications. SNES/SFC flashcarts allow users to house hundreds of ROM images in a single cartridge, allowing folks to easily play them on original or reproduction hardware. Redditors may be familiar with pro-flashcart rhetoric on r/snes, as it is often framed as the most practical option for playing rare/expensive games on original hardware (flapperultra23, 2023).

that characterized the video game industry" (2017, p. 30)—made it incredibly difficult for informal software projects to gain a foothold.[64] Reproduction makers push back against Nintendo's desired production ecosystem (i.e., who gets to make games for the console) and release windows (i.e., when software support should be dissolved), by endlessly expanding the SNES/SFC's physical videogame library decades into the console's afterlife. As I will describe later, this has resulted in an enormous range of textual variation as countless stakeholders are now able to remix, revive, and reproduce videogame cartridges. Paralleling Swalwell's study of vernacular microcomputer development, these cartridges range from complex homebrew games to small modding experiments, all of which allow non-expert users to bring different perspectives to a home computing device (2021, p. 6). The proliferation of SNES/SFC cartridge reproductions has effectively enabled informal users to experiment with highly formalised hardware/software configurations, for both fun and profit, albeit displaced from the console's initial release window.

Now You're Playing With (Legal) Power

With so many stakeholders creating reproduction SNES/SFC cartridges, it is worth shifting gears for a moment to discuss the practice through a legal lens. There are a few layers to this intellectual property rights puzzle: cartridges as patented technologies, game data as copyrighted creative works, and game packaging as trademarked branding. I will briefly summarise these legal configurations using prior precedents to better ground my ensuing analysis of marketplaces, games, and production processes. While I am a Canadian scholar, I am basing my analysis in American law due to the abundance of scholarship focused that jurisdiction, the prevalence of American reproduction storefronts (or storefronts that appeal to American consumers), and the fact that American legislation is often the harbinger for intellectual property policies in Western regions (for better or for worse).

SNES/SFC patents are relatively easy to access and understand as they are filed publicly, have fixed terms, and are often celebrated by informal stakeholders upon their expiration. Browsing through legal repositories reveals that the patents for the SNES/SFC console (Barr, 1999), its game controller (Inoue & Ashida, 1993), and game cartridges (Ashida, 1991) were all filed in the early nineties and expired twenty years later. Nintendo's expired patents are commonly pounced upon by retro-gaming companies, such as the console-makers Analogue (*Super Nt*, n.d.) and Hyperkin who remix the technical and aesthetic qualities of antiquated consoles in new, profitable ways (Figure 6.3 Figure 6.4).

[64] There are some exceptions, of course, including Wisdom Tree's infamous unlicensed Super NES title *Super 3D Noah's Ark* (1994). A biblically-themed variation on *Wolfenstein 3D* (1992), the game was loaded onto a pass-through cartridge to circumvent the console's technical production measures (Matulef, 2014).

Figure 6.3. An Analogue Super NT promotional image, showing off several variations.

Figure 6.4. A Retron 5, which is compatible with the SNES/SFC and numerous other consoles

While the patents for SNES/SFC cartridges are similarly expired, companies that produce and distribute reproduction cartridges typically do so with less fanfare. I suspect this low public profile is for a few reasons. First, original game cartridges are still functional and can be purchased (albeit often at a steep cost) online, lessening the customer desire for reproductions. Second, while SNES/SFC cartridge patents have expired, the CIC lockout chip may give pause to reproduction-makers. The CIC chip serves as a lock-and-key mechanism that prevents unauthorised cartridges from being compatible with the console, as part of Nintendo's efforts to exert full control over licensing and production (Arsenault, 2017, p. 171). While the patent on the CIC chip has expired and there is precedent for reverse-engineering console technologies (*Sega Enterprises Ltd. v. Accolade, Inc.*, 1992), many legal experts have argued that the Digital Millennium Copyright Act has made the circumvention of lock-and-key mechanisms illicit due to their classification as a technical protection measure (Linhoff, 2004; Zieminski, 2008). While it is impossible to fully establish whether reverse-engineering, recreating, or reconfiguring CIC chips is illegal without a precedent-setting lawsuit, the spectre of legal action from a powerful media corporation is likely enough to slow formalised reproduction sales.

The status of game data under intellectual property is much less murky, at least in North America: fully reproducing games is illicit under the central tenet of copyright law (i.e. the right to reproduce). This was dramatically demonstrated in the context of software circulation by Nintendo of America's high-profile lawsuit against Christian Mathias, owner of the popular ROM-sharing websites LoveROMS and LoveRETRO. Mathias was ordered to pay $12 million for sharing countless ROM images across the two websites, in what Nintendo of America characterised as "brazen and mass-scale infringement of Nintendo's intellectual property rights" (*Nintendo of America Incorporated v. Mathias et al*, 2018). And while it is possible to

homebrew[65] SNES/SFC games without using any copyrighted assets—such Goldlocke's *Dottie Flowers* (2023) that they created from scratch and produced a run of 100 physical game cartridges for (Goldlocke, 2023)—this is extremely out of the ordinary. SNES/SFC homebrew is challenging due to the console's complex technical underpinnings and, as will become evident in my analysis of storefronts and cartridges (and as I will touch upon in *Final Fantasies*), there is potentially more demand for original or remixed versions of existing games rather than wholly new entries in the SNES/SFC library. Thus, it is fair to say that most reproduction cartridges use a copied or modified version of a SNES/SFC ROM image that contains copyrighted data, placing the practice in dubious legal standing.[66]

Figure 6.5. The label for *Super Mario World*, as archived on SNES Central (Gowan, n.d.-e)

The final piece[67] of the intellectual property landscape is trademark law, which is occasionally conflated with copyright law, but adds numerous wrinkles to how games (formal or informal) are branded and accessed. The purpose of trademark law is to prevent "consumer confusion by protecting logos, brand names, and other identifiers used in the course of trade" (Murray & Trosow, 2013, p. 55), and game packaging typically includes a bevy of trademarks to signal its veracity to potential consumers. *Super Mario World* (1990), pictured in Figure 6.5, is a veritable treasure trove of trademarks. The game's title (Nintendo of America Inc, 1990), the

[65] Homebrew is most commonly defined as software that is produced by hobbyists for proprietary videogame consoles that are not designed to be user-programmed.

[66] In recent years, Nintendo has also attempted to patent game mechanics, but there has yet to be a precedent-setting case in this regard (Hoskins, 2024; Shepard, 2023).

[67] Admittedly, I am overlooking the fourth pillar of North American intellectual property law, trade secrets (business information that derives its value from secrecy), as I feel it is less relevant to discussions of videogame reproductions.

Super Nintendo Entertainment System logo (Nintendo of America Inc, 1991), the Official Nintendo Licensed Product seal (Nintendo of America Inc, 2012), and the Nintendo logo (Nintendo of America Inc, 1985) are all active trademarks. Additionally, Mario himself has been trademarked in various ways since his introduction in 1981, such as a 2022 filing which prohibits the unauthorised use of "a male figure with a mustache that is in a jumping posture and wearing overalls, shoes, gloves, and a hat with a stylized 'M'" (Nintendo of America Inc, 2022) in electronic games, clothing, tea, pet supplies, and numerous other contexts.

Trademarks occupy an interesting position in Nintendo's technological and legal history, as the company often uses them in conjunction with other aspects of intellectual property law to prevent and punish unwanted activities. Kaze Emanuar, a prolific *Super Mario 64* (1996) hacker, was careful not to share his modified ROM images publicly to evade direct copyright litigation (such as what befell Mathias at LoveROMs/LoveRETRO). Nonetheless, his Patreon was temporarily shuttered after Nintendo claimed that he had infringed upon their trademarks by displaying images of trademarked game characters (Iantorno, 2019b, p. 110). Building on their previous technical protection measures, Nintendo created a multi-layered lock-and-key mechanism for the Game Boy Advance that combined various facets of intellectual property law. By requiring the inclusion of the Nintendo logo in the header of Game Boy Advance ROM images as part of a technological handshake with the console, the company effectively "conflated patent, trademark, and copyright infringement" in order to make the creation of unlicensed games legally treacherous (Custodio, 2020, p. 54). As trademarks have hypothetically unlimited terms, Nintendo's strategy has created a Sword of Damocles hanging over efforts to circumvent their technical protection measures, even when the associated patents have expired.

The complex consolidation of intellectual property law, combined with the litigious tendencies of Nintendo and other media companies, appears to be a strong deterrent for potential reproduction cartridge makers. After all, who would want to risk tangling with a legal department with deep coffers and decades of experience? However, while I am hesitant to frame SNES/SFC reproduction cartridges as a particularly hot commodity, informal actors ranging from hobbyists to small businesses have undoubtedly carved out a thriving informal market for them. The siren's song of videogame materiality is irresistible, even with several technical and legal barriers standing in the way.

Methodological Interlude: We Don't Talk About Repros (No, No, No)

So far, I have discussed videogame reproductions at a high level, referring to past literature and legal precedents to frame them in discussions of nostalgia and formality. For the remainder of this chapter, I will study the production and distribution of SNES/SFC reproductions more concretely. My goal is to better understand what types of reproduction cartridges exist, how and where they are sold, and what technologies and techniques have allowed them to flourish during the console's afterlife.

Unlike in the prior two chapters, where I relied on direct conversations with those engaged in preservation and hacking practices, I found it tremendously difficult to speak with anyone involved with the manufacturing, distribution, or sale of reproduction videogame

cartridges. My attempted participant recruitment involved: travelling to local flea markets to speak with the operators of retro-game kiosks; messaging numerous eBay sellers and AliExpress storefronts that sold reproduction cartridges; emailing three dedicated online reproduction shops based in North America; and reaching out to two hobbyist websites that specialise in creating aftermarket parts for SNES/SFC cartridges. Very few of these folks responded to my initial requests and any who did withdrew shortly after learning about the project details (or simply ceased communications). I cannot blame any of these potential participants for their reluctance. After all, I just dedicated a thousand words to describing the potential legal pitfalls associated with reproduction cartridges. Much like the emulator developers I discussed in *The Super Nintendo Emulation System*, who were deterred by corporate chilling effects (Ribaudo, 2017), it is likely that both hobbyist and professional reproduction makers have serious concerns about me rigorously documenting their activities.

Thus, as I entered this case study, I found myself contemplating how I could learn from material communities that resist direct interaction. As emphasised by Emerson, it is vital not to "banish, sideline, or transcend the human to get at the machine" (2022), and interviewing users about their technologies and practices has been vital to my research thus far. To add another wrinkle, reproduction-makers (particularly those who operate storefronts) are less inclined to publicly inscribe their processes and motivations. Unlike emulator developers who leave detailed GitHub repositories or write sprawling manifestos about their increasingly formalised efforts, the reproduction manufacturers do not share their protocols, techniques, and opinions freely. However, I did find two useful venues for studying their underlying discourses. Larger reproduction sellers maintain vast digital storefronts to sell their wares, accompanied with promotional text and images, providing insight into their manufacturing and distribution processes. And a small number of hobbyists have put together tutorials and related resources that describe the technical underpinnings of SNES/SFC cartridges. Taking apart and studying computing technologies often "requires a community of highly specialized knowledge workers that is rare, especially in the university setting" (Emerson, 2022), and in the absence of direct engagements with these communities and their central texts, I can still make do.

As a result, I have adopted three central methods for studying the proliferation of SNES/SFC reproduction cartridges. First, I have compiled the listings of four popular reproduction sellers who sell SNES/SFC reproduction cartridges. The purpose of this documentation is to establish a baseline understanding of how SNES/SFC reproductions proliferate: what types of cartridges are most prevalent; how much they are sold for; what regions are most represented; and how they are presented in terms of both listing descriptions and packaging. Second, instead of simply documenting seller listings, I also ordered half a dozen SNES/SFC reproductions to dissect them and see how they were created. This reverse-engineering resulted in the discovery of three types of PCBs used for creating SNES/SFC reproductions—which I loosely characterise as template boards, donor boards, and bootlegs—each of which possess different technical configurations and affordances. Finally, and perhaps most arduously, I embarked on a quest to create my own *HyperBound* cartridges. Using a series of tutorials and hobby kits created by Bucket Mouse at Mouse Bite Labs, and ordering residual and aftermarket parts from sellers such as Muramasa Entertainment, I was successful in

creating two cartridges: one using a template board and another using a donor board. My hope with these methods is to come full circle, from being bewildered by the appearance of a *HyperBound* cartridge online, to learning enough about its production and distribution chains to participate in them myself.[68]

Repro Depots

In the summer of 2024, while I was awaiting the final electrical components for my bespoke *HyperBound* cartridges to arrive in the mail, I set out to analyse five online storefronts that sold SNES/SFC reproduction cartridges: OCD Reproductions, the eBay vendors endpro86 and the-game-paradise, AliExpress vendor future Store, and Limited Run Games. While there are countless shops that include reproduction cartridges in their inventory—eBay and AliExpress are particularly vast in this regard—I specifically sought out sellers that specialise in reproduction cartridges, feature collections of SNES/SFC titles, and have demonstrated a certain level of stability (i.e. they have been in business for at least a couple of years). I believe it would have been advantageous to include brick-and-mortar stores in this sample, but my attempts to communicate with these sellers were strongly rebuffed. And while I may have been able to quietly count stock at flea market stalls or retro-game shops, I feel that the proprietors of these establishments would not appreciate a grad student lurking in their aisles with a notepad.

My analysis primarily involved sifting through vendor listings by category—all of whom had dedicated SNES/SFC sections or clearly tagged their listings to make parsing through them straightforward—while documenting details about the presentation and configurations of their stock. During this process, I coded each cartridge listing by seller, title, price, region, and date accessed, while adding comments to home in on outliers, trends, and potential areas of confusion. Once I had finished this analysis, I made the decision to remove Limited Run Game's listings from my main corpus as they only carried 23 SNES/SFC games (many of which were different versions of the same game), none were currently available for sale on their website, and I felt that their licence-driven paradigm was quite different than my other sellers. I will return to them later, however, as I discuss the role of paratexts in cartridge reproduction. In total, I ended up with a corpus of 1316 reproduction cartridge listings across four sellers, as seen in Figure 6.6.

[68] I will discuss the intersection of legal precarity and academic research in the conclusion of my dissertation. For now, I will posit that my copyright of ROM images falls under fair dealing, as it was completed for "the purpose of research, private study, [or] education" and therefore does not infringe upon Canadian copyright law (*Canadian Copyright Act*, n.d.).

	A	B	C	D	E	F	G	H	I	J
1	Seller	Title	Price (US	Price (CA	Price (GE	Region	Comments	Primary Type	Base Game	Date Coded
2	OCD Reproductions	240p Test Suite SNES	$34.99			NTSC	Homebrew toolset for calibrating CRTs.	Homebrew		2024-08-08
3	future Store (AliExpress)	3 Ninjas Kick Back	$22.00			NTSC		Copy		2024-08-11
4	future Store (AliExpress)	35 IN 1 Shooting Collection Multigames cartridge!!	$50.00			JP		Multicart		2024-08-12
5	OCD Reproductions	3x3 Eyes Juuma Houkan	$39.99			NTSC		Hack (Localisa ...		2024-08-08
6	endpro86 (eBay)	3x3 Eyes: Beast Restoration		$55.00		NTSC	3x3 Eyes: Juuma Houkan	Hack (Localisa ...		2024-08-08
7	future Store (AliExpress)	46 Okunen Monogatari - Harukanaru Eden he	$22.00			JP	E.V.O.	Copy		2024-08-12
8	OCD Reproductions	7th Saga Easier	$39.99			NTSC		Hack (Gamepli ...	7th Saga	2024-08-08
9	endpro86 (eBay)	A Plumber for All Seasons		$90.00		NTSC		Hack (Gamepli ...	Super Mario World	2024-08-09
10	the-game-paradise (eBay)	A Super Mario Adventure			$24.99	PAL		Hack (Gamepli ...	Super Mario World	2024-08-09
11	OCD Reproductions	A Very Super Mario World	$39.99			NTSC		Hack (Gamepli ...	Super Mario World	2024-08-08
12	endpro86 (eBay)	A Very Super Mario World		$55.00		NTSC		Hack (Gamepli ...	Super Mario World	2024-08-09
13	OCD Reproductions	Ace Wo Nerae	$39.99			NTSC	Tennis game localisation by RPGOne	Hack (Localisa ...		2024-08-08
14	future Store (AliExpress)	Acrobat Missions	$22.00			JP		Copy		2024-08-12
15	future Store (AliExpress)	ActRaiser	$25.00			NTSC		Copy		2024-08-11
16	OCD Reproductions	Adventures of Hourai High School	$39.99			NTSC	Hourai Gakuen no Bouken!	Hack (Localisa ...		2024-08-08
17	future Store (AliExpress)	Aero Fighters	$22.00			NTSC		Copy		2024-08-11
18	future Store (AliExpress)	Aero Fighters	$40.00			NTSC	Full box set	Copy		2024-08-12
19	the-game-paradise (eBay)	Aero Fighters			$24.99	PAL	Rare and expensive	Copy		2024-08-09
20	future Store (AliExpress)	Aero the Acro-Bat 2	$22.00			PAL		Copy		2024-08-11
21	future Store (AliExpress)	Aero the Acro-Bat 2	$40.00			NTSC	Full box set	Copy		2024-08-12
22	future Store (AliExpress)	Aero the Acro-Bat 2 French	$40.00			PAL	Full box set	Hack (Localisa ...		2024-08-12
23	future Store (AliExpress)	Akumajo Dracula Castlevania IV	$22.00			JP		Copy		2024-08-12
24	future Store (AliExpress)	Akumajo Dracula XX	$22.00			JP		Copy		2024-08-12
25	future Store (AliExpress)	Akumajo Dracula XX	$40.00			JP	Full box set	Copy		2024-08-12
26	future Store (AliExpress)	Alcahest	$22.00			NTSC		Hack (Localisa ...		2024-08-11
27	future Store (AliExpress)	Alcahest	$22.00			PAL		Hack (Localisa ...		2024-08-11
28	OCD Reproductions	Alcahest	$39.99			NTSC		Hack (Localisa ...		2024-08-08
29	the-game-paradise (eBay)	Alcahest			$24.99	PAL	Previously JP only	Hack (Localisa ...		2024-08-09
30	future Store (AliExpress)	Alcahest Portugese	$22.00			PAL		Hack (Localisa ...		2024-08-11
31	future Store (AliExpress)	Alcahest Portugese	$22.00			NTSC		Hack (Localisa ...		2024-08-11
32	future Store (AliExpress)	Alien 3 French	$40.00			PAL	Full box set	Hack (Localisa ...		2024-08-12
33	future Store (AliExpress)	Aliens vs Predator	$22.00			JP		Copy		2024-08-12
34	OCD Reproductions	Amazing Spiderman Lethal Foes	$39.99			NTSC		Hack (Localisa ...		2024-08-08
35	OCD Reproductions	Ancient Magic	$39.99			NTSC	Ancient Magic: Bazoel Mahou Sekai	Hack (Localisa ...		2024-08-08
36	future Store (AliExpress)	Ancient Stone Tablet 1,2,3,4 in 1	$40.00			PAL	Satellaview; French Translation	Prototype/Beta ...		2024-08-11
37	future Store (AliExpress)	Angelique	$22.00			PAL		Hack (Localisa		2024-08-11

Figure 6.6. An excerpt from my tracking spreadsheet, in which listings are grouped by vendor then sorted alphabetically.

Rather than immediately dissecting the results of my analysis, I feel it is more useful to bring up these findings, as needed, throughout this chapter.[69] These consolidated listings are valuable as they offer a baseline for what SNES/SFC reproduction cartridges are currently being produced and distributed and I heavily lean into them to inform my typologies and synthesis. But before relegating these listings to a singular corpus, I will briefly describe each storefront and what type of products and services they sell.

OCD Reproductions

Figure 6.7. The banner image for OCDReproductions, as featured on their website: https://www.ocdreproductions.com

OCDReproductions (Figure 6.7) is one of the few dedicated game reproduction storefronts in North America (located in Lancaster Ohio) that is not hosted on a large shopping platform such as AliExpress or eBay. Seemingly operated by a single person, the store carries

[69] While I wanted to include the spreadsheet as an appendix, it cannot be displayed properly as a PDF.

reproduction cartridges for nineties-era Nintendo and Sega consoles but also sells a limited number of modded consoles and several types of merchandise (t-shirts and keychains) featuring videogame imagery. In addition to sales, OCDReproductions offers a few services that are typically available at brick-and-mortar videogame stores. Users can trade in their old games, upgrade their cartridges with new batteries, order replacement parts such as labels, and even customise their orders. While a small number of the store's titles are prior North American releases, the store's FAQ claims their focus is on games "never released in the United States" (*FAQ*, n.d.). This is reflected in their stock, which is overwhelmingly composed of NTSC-region gameplay hacks (41.9%) and informal localisations (49.4%)—categories I will explain shortly but are essentially user modified or localised versions of formal game releases.

endpro86 (eBay)

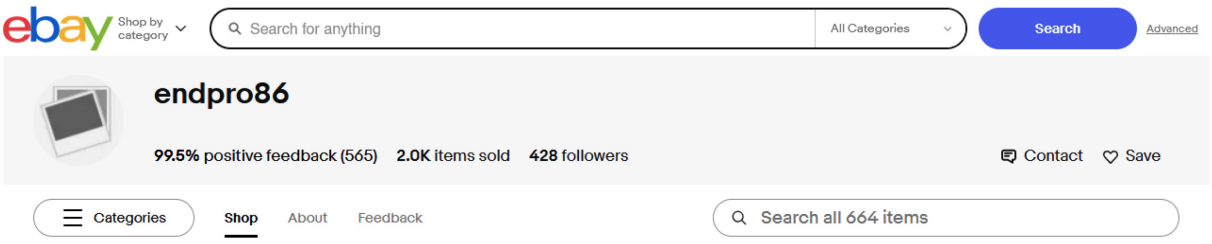

Figure 6.8. The rather nondescript banner image for endpro86's shop, as featured on their eBay page: https://www.ebay.ca/usr/endpro86

endpro86 (Figure 6.8) is one of many videogame reproduction stores found on eBay and, outside of a handful of Genesis and Game Gear titles, primarily sells NTSC-region reproduction cartridges for Nintendo consoles: the SNES/SFC, Game Boy, N64, and Game Boy Advance. endpro86 stood out from the deluge of other eBay sellers for two key reasons. First, they were one of the few users I could find that were explicitly situated in Canada, with their location listed as Montreal, Quebec.[70] Second, while many shops signal to their customers that their cartridges are reproductions, endpro86 embraces the materiality of reproduction cartridges in uncommon ways. They replace most Nintendo trademarks with modified versions, includes warnings about console compatibility, and offer customisation options (such as brightly coloured shells) for buyers as they place their order. This seems to indicate a made-to-order approach that is absent in shops on eBay and AliExpress. Much like OCDReproductions, most of the store's stock is made up of gameplay hacks (48.3%) and informal localisations (46.9%), demonstrating a clear focus on never-before-available games for the SNES/SFC.

[70] I had hoped this local connection would make the seller more open to an interview, but this was not the case.

the-game-paradise (eBay)

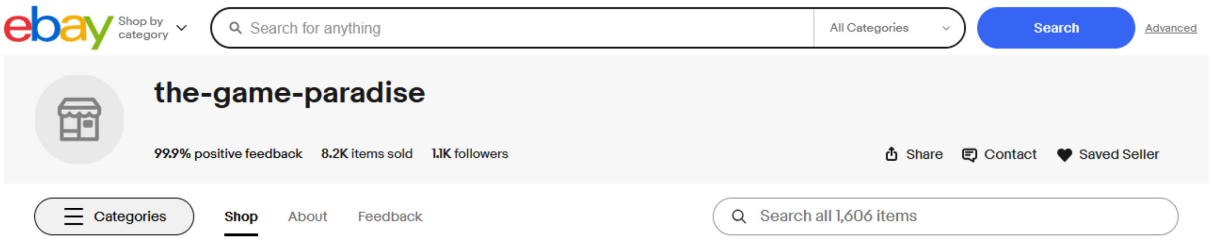

Figure 6.9. The banner image for the-game-paradise's eBay shop: https://www.ebay.ca/str/thegameparadise

the-game-paradise (Figure 6.9) is an eBay seller based in China that focuses on reproduction cartridges, predominantly for the SNES/SFC and N64. I chose to include the shop in my sample due to its vast selection, but also because it is where I initially discovered and purchased my lime green *HyperBound* cartridge. While their stock is primarily made up of reproductions, they also carry a number of original cartridges, labelled as "*authentic*" in the listing title (the-game-paradise, n.d.) and sold at considerably higher prices. In addition to cartridges, the-game-paradise also sells a few outlier items such as music CDs, toys, and non-game related baubles, evoking somewhat of a flea market vibe. While gameplay hacks (50.3%) and informal localisations (26.1%) make up the majority of the-game-paradise's listings, the storefront features notably more variety than my previously described North American sellers. Multicarts (13.6%), which contain several games on a single cartridge, are particularly common, and are featured alongside a small collection of oddities such as leaked prototypes and homebrew titles. 80% of the shop's stock has been manufactured for PAL-region SNES/SFCs, indicating that they are catering more toward a European audience than a North American one.

future Store (AliExpress)

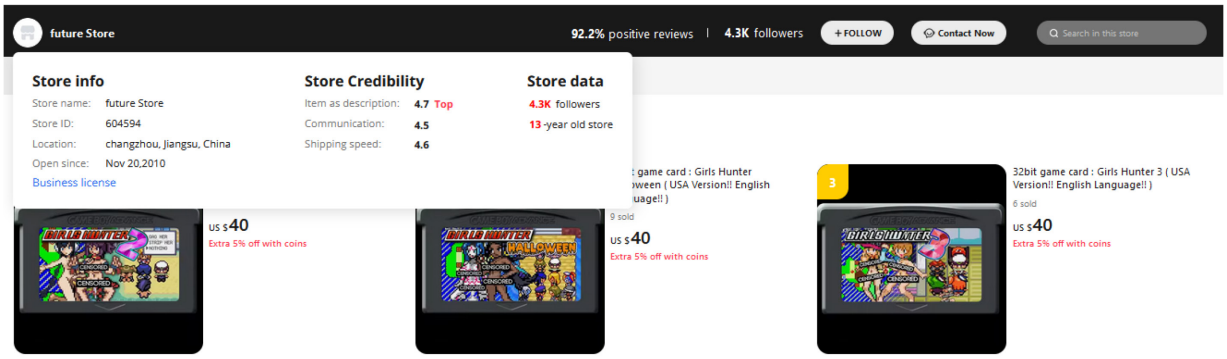

Figure 6.10. The store info and 'hot deals section for future Store' AliExpress shop: https://yaogang.aliexpress.com/store/604594

future Store (Figure 6.10) is a Chinese AliExpress seller that focuses on nineties-era videogame reproductions and features the largest selection out of all my sellers—they have 584 listings for the SNES/SFC alone. While many of the most popular retro consoles are present, from the Game Boy to the N64, SNES/SFC reproduction cartridges are by far the most represented, with cartridges commonly released in three regional variations for NTSC, NTSC-J, and PAL. Interestingly, the seller is one of very few I have encountered that carries reproductions for less-prominent consoles, such as the Bandai WonderSwan Color, the SNK Neo-Geo, and the NEC PC Engine. In another point of divergence, future Store heavily focuses on facsimiles (54.9%), reproductions meant to mimic formal game releases, as well as informal localisations (35.4%). The authenticity of these games is somewhat ambiguously indicated in listing titles but, delving in the description reveals the persistent disclaimer "please note this game pak is a reproduction, not original, stupid buyer don't buy!" in large red text.[71] This is likely to abide by AliExpress's platform governance, which also seems to encourage the blurring of certain trademarks and titles in reproduction cartridge listings.

A Typology of Reproduction Cartridges

As I have hinted at in my storefront descriptions, one of the outcomes of my analysis was establishing a basic typology for SNES/SFC reproduction content. This categorisation is primarily based on what content is stored on the game's ROM chip—ranging from direct copies of formal releases to heavily edited remixes and subversions—and how it is presented to potential buyers. I revised this categorisation numerous times as I put together my corpus, and I ended up landing on six basic categories—facsimiles, gameplay hacks, informal localisations, homebrew games, lost threads, and multicarts—which I will describe below. This typology is not meant to be overly prescriptive but, rather, I use it to provide insight into what reproduction

[71] I am not certain why the seller decided to use such aggressive wording, but I imagine it is in reaction to buyers unintentionally buying a reproduction cartridge then flagging the seller's account as fraudulent.

cartridges are available to users while contextualising their traits in relation to other discussions of games and informal media.

Facsimiles

Perhaps the most straightforward of all my categories, *facsimiles* are reproduction cartridges that closely mimic the appearance and functionality of a formal release (Figure 6.11 and Figure 6.12). Artwork, accompanying verbiage, and even trademarks are replicated faithfully and, short of a complex forensic investigation, the game's data is indistinguishable from the original. While the intention of facsimiles is not necessarily to trick a buyer into buying a counterfeit—as seen in eBay and AliExpress listings, their provenance is often signalled in product descriptions and through subtle packaging alterations—the overarching goal seems to be to present the cartridge as if it were part of the SNES/SFC's game library.

Figure 6.11. A facsimile box set of *Chrono Trigger* (1995), as listed on future Store.

Figure 6.12. A facsimile cartridge of *Final Fantasy VI* (1994) as listed on the-game-paradise

Facsimiles hold a contested place within retro-gaming discourse and have spurred endless debates about the value of materiality authenticity. Collectors who favour original technological configurations (a particularly prevalent perspective on Reddit) are quick to point out the illegality of the practice (rodbor, 2021), the alleged cheapness of packaging materials (flapperultra23, 2023), and the use of new electrical components that differ from what would be present in the original commercial release (CollisionAttractor, 2021). Conversely, those less concerned with mimicking the materiality of the SNES/SFC often question the need for a convincing facade at all. It has become somewhat of a meme on the r/snes subreddit to respond to reproduction recommendations with a variation of "just get an everdrive" (ATR_WRL, 2022); if users are not interested in buying an 'original' that they may as well embrace piracy in the most convenient way possible.

Regardless of this debate, facsimiles provide an opportunity for users to purchase new versions of old SNES/SFC games at prices that are well below the market value of the original. A full boxed set of the NTSC release of *Chrono Trigger* sells for approximately $780 USD (*Chrono*

Trigger Prices, 2024), whereas future Store's facsimile is listed for $60 USD (2024c). Given this dramatic price disparity, perhaps the argument is less 'is this game authentic?' and more 'is this game authentic *enough* for the price?'. With Vanderhoef noting that much of the allure of retro-game collecting is rooted in the desire for "ephemera" and "feelies" (Vanderhoef, 2017, p. 116), purchasing a convincing (albeit illicit) facsimile of a SNES/SFC game may satisfy those who wish to embrace the material qualities of the console without breaking their piggy banks.[72]

Gameplay Hacks

The first of two categories involving modified SNES/SFC games, *gameplay hacks* are reproduction cartridges that contain informal, variant versions of commercially released titles (Figure 6.13 and Figure 6.14). *HyperBound* falls under this category, as it is a modified version of *EarthBound*, but is not the most indicative of the form due to its experimental nature and niche appeal. I found that most listings for gameplay hacks were modifications of universally lauded action and/or adventure titles such as *Super Mario World* (37.6%), *The Legend of Zelda: A Link to the Past* (11.6%), or *Super Metroid* (9.9%) that feature map redesigns, graphical alterations, or new narratives.

Figure 6.13. *The Legend of Zelda: Parallel Worlds*, a gameplay hack of *The Legend of Zelda: A Link to the Past* sold by OCD Reproductions.

Figure 6.14. *Yoshi Saves Summer Vacation*, a gameplay hack of *Super Mario World* sold by endpro86.

Unlike facsimiles, which more-or-less replicate existing releases, gameplay hacks are an interesting blend of old and new—recalling Lobato's emphasis on textual variation as a central pillar of the informal media economy (2012, p. 45). In terms of presentation, they include many elements adopted from the original SNES/SFC cartridge, from the glossy black label to the blocky plastic shell but also try to establish themselves as new products. While there is no standard method to present these cartridges, sellers commonly mix game concept- or fan-art

[72] This balancing act between authenticity and affordability is present in numerous other industries, from the circulation of counterfeit handbags (Orscheln, 2014) to the global flow of "oriental carpets" that brings into question objective notions of material authenticity (Spooner, 2013, p. 226).

with modified logos to create visually intriguing packaging. This is demonstrated in the two examples above, *The Legend of Zelda: Parallel Worlds* and *Yoshi Saves Summer Vacation*, in which altered wordmarks are carefully positioned atop cropped illustrations.

Gameplay hacks exist in a questionable moral space as they violate the intellectual property rights of the original developer while also appropriating user-made content. After I found the listing for *HyperBound* online, I checked-in with several *EarthBound* hackers I knew and learned that this unauthorised co-option of ROM hacks is common practice with few avenues of recourse. While some aspects of hacker-made content could theoretically be protected under copyright law[73]—such as text, graphics, audio, or characters introduced in a modified version of a game—mounting a legal challenge is expensive, time-consuming, and would likely require the (often anonymous) hacker to publicly discuss their practice. This sort of re-commercialisation derails hacker discourse that commonly elevates the free sharing of copyrighted content (Coleman & Golub, 2008, p. 268; Levy, 2010, p. 29). As Postigo has discussed in his study of computer game modders, users often feel that copyright law does not serve their interests and that they should be able to freely tinker with games and software (2008, p. 67). Many hacker techniques and technologies aim to further this goal, from online ROM-patchers, which allow for the distribution of hacks without the need to host copyright content (Iantorno, 2019b, p. 46), to carefully organised fan archives.

While this re-commercialisation could be seen as an extension of the hacker drive to share software freely, it also marks a return to capitalist logics, potentially violating aspects of user-developed moral economies—"a sense of mutual obligations and shared expectations about what constitutes good citizenship within a knowledge community" (Jenkins, 2006, p. 255). Lobato and Thomas have noted that even pirate technologies, such as hacked soccer games for the Sony PlayStation, may be "ripped off by other entrepreneurs", triggering information campaigns to "teach consumers about the 'authentic' versions" (2018, p. 306). Just because a hacker wants their creative works to travel does not mean they want them commandeered for commercial ends.

Informal Localisations

The second of two categories involving modified SNES/SFC games, *informal localisations* are reproduction cartridges that contain user-localised versions of SNES/SFC games (Figure 6.15 and Figure 6.16). These range from relatively simple technical modifications, such as reconfiguring a NTSC title into a PAL cartridge so it can be played in European regions, to complete informal translations of games. One of the earliest examples of the latter is *Bahamut Lagoon* (FantasyAnime, 2023), which was informally localised from Japanese to English by the DeJap team in 2002, and can now be purchased as a reproduction

[73] Copyright protections apply to any "original works of authorship fixed in any tangible medium of expression" (United States Copyright Office Library of Congress, 2022, p. 8), regardless of the work's legal status. In the United States, this has been litigated with street art, such as H&M's recent settlement with American street artist Revok. H&M had used photographs of Revok's graffiti (which he had painted illegally) in an ad campaign without first receiving his permission (Neuendorf, 2018).

through numerous vendors. While this sort of informal east-to-west translation is extremely common—for reasons I will discuss extensively in *Final Fantasies* and Consalvo has investigated in relation to *Mother 3* (2006) translators (2016, p. 41)—I also found a number of French, Spanish, German, and Italian translations in my sample.

Figure 6.15. An English localisation of *Bahamut Lagoon*, as sold by OCDReproductions.

Figure 6.16. An excerpt from the listing *Secret of Mana Italian* from future Store, which includes a screenshot of the translated script.

Informal localisations share much in common with gameplay hacks: they are modified versions of games created by one or more ROM hackers; they are usually distributed through fan websites and other informal archives before being surreptitiously turned into cartridges; and they require many of the same tools and techniques to create. However, I have chosen to separate these two categories in my typology as their end purposes are different. Whereas gameplay hacks create new content and challenges within the framework of an existing game, informal localisations attempt to translate a title faithfully with as few extraneous changes as possible. They are also closely related to facsimiles in the sense that they are user-imagined formal releases of games.

The legal and moral issues surrounding informal localisations mirror those of gameplay hacks, so I will not dwell on them too deeply, but I would like to highlight their disruption of standard media flows (Lobato, 2012, p. 44). Much like fansubbers—anime fans who create subtitles for media that were never translated into their language (Jenkins, 2004, p. 33; Pérez-González & Susam-Saraeva, 2012, p. 144)—informal videogame localisers reject corporate strategies that exclude their regions, languages, and cultures. Lobato notes that "there is a special kind of mobility at the informal end of the scale which relies not on the muscle of vertically integrated conglomerates but on the movements of large numbers of small actors"

(2012, p. 44), but he also recognises the bleed between informal and formal practices (Lobato & Thomas, 2018, p. 46). By blending corporate localisation workflows with hacker tools and distribution methods, informal actors create professional-quality localisations of games that travel well beyond the boundaries imagined by the original distributor. Their return to physical form, although unauthorised, seems like a natural progression due to their continued compatibility with the SNES/SFC's hardware and software.

Homebrew Games

Homebrew games are titles produced by hobbyists for proprietary consoles that are not designed to be user-programmed (Figure 6.17 and Figure 6.18). I have touched upon homebrew games already in this chapter, so I will simply restate they are fully original creations and that there are very few of them that have been developed for the SNES/SFC. I only found seven across my entire sample: *Classic Kong Complete*, *Super Boss Gaiden*, *Dottie Flowers*, *Dottie Dreads Nought*, *New Super Mario Land*, *N-Warp Daisakusen*, and *240p Test Suite SNES*. Of these seven, two still utilise Nintendo intellectual property and one is a multi-system diagnostic tool for calibrating CRTs.

Figure 6.17. *Dottie Flowers*, a homebrew platformer created by Goldlocke and sold by the-gamer-paradise.

Figure 6.18. A limited release of *Dottie Flowers* created by the original developer, Goldlocke, and featuring custom box and label art.

Upon discovering homebrew cartridges in online storefronts, I briefly considered that sellers may be working in tandem with homebrew developers to bring their games to market. However, after pinging the makers of *Super Boss Gaiden* on social media, it appears that this is likely not the case. ChronoMoogle noted that "anyone is free to flash or build their own cartridges with the homebrews, but otherwise they are strictly non-commercial and are not allowed to be sold" (ChronoMoogle [@sfc_moogle], 2024). While user-approved runs of homebrew cartridges do exist, the listings in my sample are probably unauthorised.

Since the ROM images for these titles are easily downloaded—*Dottie Flowers* creator Goldlocke provides free access to the file on their itch.io page—and are often accompanied with promotional artwork, they are easily absorbed into the reproduction-making ecosystem. Sellers will often combine homebrew art assets with official Nintendo trademarks, such as the Official Nintendo Licensed Product seal, to create packaging that replicates a formal SNES/SFC release. *Dottie Flowers* is an intriguing example in this regard as Goldlocke created their own run of PAL-region SNES/SFC cartridges for the game, whose packaging was designed to evoke games of that era without infringing upon Nintendo's trademarks. However, unauthorised listings of *Dottie Flowers* on OCDReproductions and other websites re-integrate registered logos and wordmarks. While this may simply be because reproduction sellers use stock templates for their labels, it is intriguing that branding a reproduction cartridge with Nintendo's logos is of higher priority than seeking permission from the original homebrewer.

Lost Threads

Perhaps the strangest of my categories, *lost threads* are reproduction cartridges that contain content that was never meant to be produced and distributed in a fixed form. This includes unfinished and prototype versions of games such as *Bobby's World*, recovered and repackaged Satellaview downloads such as *BS Zelda Map 1 & 2*, infamous vapourware such as *Star Fox 2*, and other unusual finds. Many of these games have unusual provenances and have only become available through happenstance or dedicated recovery efforts.

Figure 6.19. A SNES/SFC cartridge for *Bobby's World*, as listed on OCDReproductions.

Figure 6.20. A prototype version of *Bobby's World*, as sold on eBay by Bob Prater in 2013.

Bobby's World, for example, is an unreleased game based on the popular children's animated series that was produced by HiTech Entertainment. Despite the lack of a formal release, a ROM image of the game was first leaked online in 1994 and, nearly a decade later, a prototype board was listed on eBay by Bob Prater. Prater claims he received the prototype version of *Bobby's World* while producing a television program called *The Home Tech Show* (Gowan, n.d.-a) and it appears to be one of the few physical versions of the game ever created (Figure 6.19 and Figure 6.20).

My definition of lost threads shares much with Navarro-Remesal's theorisation of unreleased games: titles that were "never released or even finished – games that failed before officially existing" (2017, p. 137). However, I have expanded it to also include formal game releases that never received a cartridge release. These lost threads hold value in the hearts of hobbyists as they contain information about the development history of the SNES/SFC's software library—they may have heard of these games by way of magazine previews or online rumours but never had the chance to directly engage with them. Much like *Sonic X-treme* fans (Nicoll, 2019, p. 133) or the amateur media archaeologists I discussed in *Satellite Archaeologies*, some recovery and restoration is required to render these lost threads playable. Perhaps most famously, *Star Fox 2* was mostly completed yet never released during the SNES/SFC's formal lifespan, but incomplete versions were leaked to the public in 1999 and 2002, well ahead of its eventual formal release as part of the SNES Classic in 2017 (*Star Fox 2*, 2024). *Star Fox 2* was recovered, analysed, and shared across online archives, before being turned into a cartridge by reproduction sellers. All of these practices reinforce Navarro-Remesal's claim that user activities can be "an act of resistance against the industry and its control over production and history" (2017, p. 140) yet, simultaneously, mark a return to capitalist logic.

Multicarts

My final category, *multicarts*, is precisely what it sounds like: reproduction cartridges that hold more than one SNES/SFC game (Figure 6.21 and Figure 6.22). These are the least represented type of reproduction in my sample, with only 33 listings across all vendors. While formally released compilations do exist for the SNES/SFC—such as *Super Mario All-Stars* (1994) and *Dragon Quest I & II* (1993)—multicarts represent a slightly different paradigm. They generally contain a combination of 3-8 formal and informal games, grouped together under an overarching theme. One cartridge may feature every official *Final Fantasy* release for the SNES/SFC, unaltered in any way, while another may curate a collection of similarly themed gameplay hacks for *Super Mario World*. As an example of the latter, *Kaizo Mario World Collection* (alternatively titled *Super Mario World 8 in 1)* features eight different hard-mode *Super Mario World* hacks on a single game cartridge.

Figure 6.21. A multicart titled *Final Fantasy Collection*, sold by the-game-paradise, featuring four different *Final Fantasy* games.

Figure 6.22. A multicart titled *Kaizo Mario World Collection* and sold by the-game-paradise, featuring eight different kaizo-style Super Mario World hacks.

Much like gameplay hacks and informal localisations, multicart packaging is a pastiche of old and new. The label for *Kaizo Mario World Collection* features a collage of Mario artwork, including the key graphic and font style of *Super Mario World*, accompanied by a bland ordered list of game hacks. Rather than trying to establish the multicart as a brand-new entry in the SNES/SFC library, sellers seem more inclined to impart the feeling of an anthology or collector's set. And while there is definitely a value argument for buying multicarts—eight games for the price of one, many of them never-before-available for the console—the veneer of authenticity fades a bit with each added game. Multicarts are awkwardly situated between the materiality provided by singular releases and the convenience and affordability of flashcarts or emulators, coming full circle to debates I initially posed when describing facsimiles. Additionally, by far surpassing the capacity of any SNES/SFC cartridge, they begin to raise questions about just what is going on within the plastic shell.

What Are Reproductions Made Of?

So far, I have discussed cartridges primarily in terms of content (i.e. what games they hold) and packaging (i.e. how sellers present them using labels and other materials). However, to build a better understanding of reproduction cartridge manufacturing processes it is necessary to crack open their black box, document their innards, and reverse-engineer their PCBs. As Emerson has noted (2022), being able to fully understand a technology through observation and tinkering falls beyond the reach of most scholars. While much can be learned about SNES/SFC cartridges by studying PCB configurations and poking around their electronics, they are complex technologies that were designed to be inscrutable. It is difficult, perhaps impossible, to understand them without referring to technical resources, consulting with experts, and adopting user-made tools. Wershler describes this process as unravelling a variantological puzzle involving "textual research, a forensic examination of the circuitry,

consultation with a community expert, and the operation of the device with several different configurations of equipment" (2022, p. 108). I previously followed this trajectory in *Satellite Archaeologies*, even touching on the shape and form of game data, but here I am more concerned with the physical assembly of reproduction cartridges.

My cartridge investigations build heavily on Arsenault's platform analysis of the SNES/SFC (2017), particularly his discussions of Nintendo's marketing discourse and the technological underpinnings of the console and its cartridges. Of import is his description of the SNES/SFC as a refinement of its predecessor's modularity. While the console's base hardware is, in some ways, quite limited, its cartridges allowed for a gradual expansion of its capabilities.

> Masayuki Uemura's expandable and flexible engineering solution was repeated and taken to a new level with the Super Famicom, as the number of cartridge chips and the impact they had in shaping their games really pushed beyond the limits of the platform. (Arsenault, 2017, p. 132)

This effectively made the SNES/SFC less of a standalone console and more of "a box to house the real brains behind the game: the chip nested in the cartridge" (Arsenault, 2017, p. 133). The DSP-1 (Digital Signal Processor 1) and the SA-1 (Super Accelerator 1) are much-lauded examples of chips that were implemented in SNES/SFC cartridges that greatly expanded the processing capabilities of the base hardware in various ways. While these chips increased the power and longevity of the SNES/SFC, Arsenault highlights that the "high number of different units and processors that handled specific tasks" made programming games an extremely complex task (2017, p. 91). Other sorts of game media, such as CD-ROMs and diskettes, certainly feature their own quirks and affordances, but are more akin to empty buckets that deliver compatible game content to a console. Each SNES/SFC cartridge, on the other hand, is effectively a hybrid of console and game. The implications of this for reproduction-makers is obvious: there is no singular type of game cartridge but, rather, a collection of chips, boards, and ROM images that can be endlessly reconfigured. Even two cartridges of the same game may house slightly different PCBs, as parts and materials were changed during the SNES/SFC's lifespan. Recalling Newman's analysis of *Sonic the Hedgehog*, it is evident that cartridge-based games are unstable objects that exist in multiplicities (2012a, p. 124), as demonstrated in Figure 6.23 and Figure 6.24, with two versions of *Super Mario World* from different points in its production run.

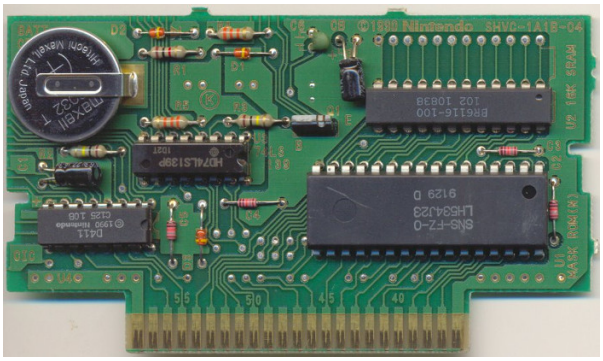

Figure 6.23. A PCB used for the initial NTSC production run of *Super Mario World*, as scanned by SNESCentral (Gowan, n.d.-e).

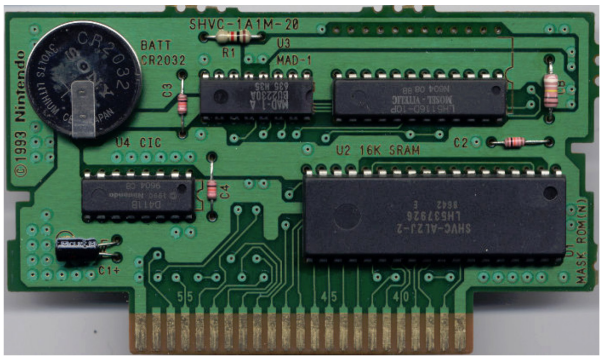

Figure 6.24. A PCB used for a later NTSC production run of *Super Mario World*, as scanned by SNESCentral (Gowan, n.d.-e).

While storefronts were uninclined to speak to me about their production and development processes, there is luckily a vibrant material community of hobbyists who provide the prerequisite parts and expertise to engage in reproduction-making. I will be referring to a few of these communities throughout this section, perhaps most prominently Mouse Bite Labs, a website run by Bucket Mouse that sells blank SNES/SFC hobby boards, hosts detailed cartridge-making tutorials, and fosters an active Discord community. I will also return to SNESCentral, which I discussed in *The Super Nintendo Emulation System*, which is the largest repository of PCB scans and documentation on the Internet. Of course, reproduction cartridges themselves are also an important resource for my reverse-engineering experiments. Throughout 2022 and 2023, I ordered half a dozen of them from online sellers with the intent of acquiring variations to document, compare, and contrast. With such a vast number of reproduction cartridges in circulation, I cannot claim that the cartridges I purchased are 'typical', but they serve as useful provocations. Each one is a manifestation of technologies and techniques involved in reproduction cartridge production chains.

For the remainder of this chapter, I combine information I gleaned from storefront analysis, material communities, purchased cartridges, and my own experimentation to discuss the creation of reproduction cartridges. I have chosen to frame this analysis through the type of boards that I encountered in my research: template boards, donor boards, and bootlegs. This is less of an attempt to create a typology, as I did earlier, and more of a heuristic to guide my analysis of SNES/SFC reproduction cartridges and what goes into making them.

Template Boards (Making Reproductions for Fun and Profit)

Template board is a catch-all term I use for PCBs that are predominantly created by hobbyists and small businesses for their projects or production workflows. These boards begin blank but can be transformed into a variety of different games by soldering electrical components to them in different configurations. Mouse Bite Lab's detailed SNES/SFC hobbyist board—which I used for my initial reproduction experiments—is perhaps the best-documented board of this type that is currently available for purchase. Tinted purple to match the aesthetic

of the North American release of the SNES/SFC, each component placement is clearly marked with white text and accompanied with brief instructions (Figure 6.25). Unlike many other storefronts, who sell parts with little contextual information, Bucket Mouse has created detailed tutorials that help users program[74] game data onto a ROM chip, determine which components they will need to solder onto their board, and troubleshoot potential errors (2020). In effect, each template board represents a crystallisation of user expertise that has been accumulated over decades of reverse engineering the SNES/SFC console and its cartridges.

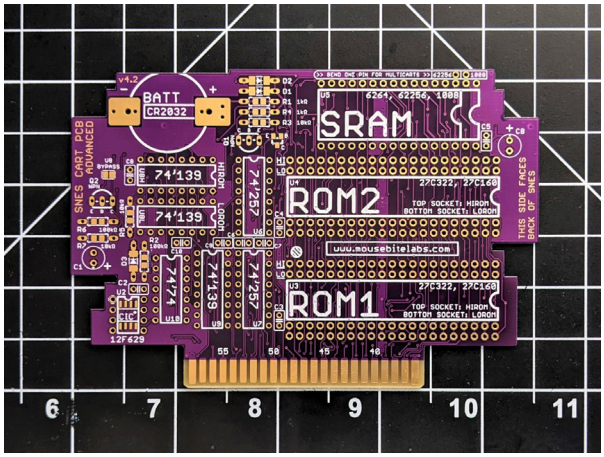

Figure 6.25. A blank template board from Mouse Bite Labs, which shows how different elements may be arranged on a SNES/SFC PCB (Bucket Mouse, 2020).

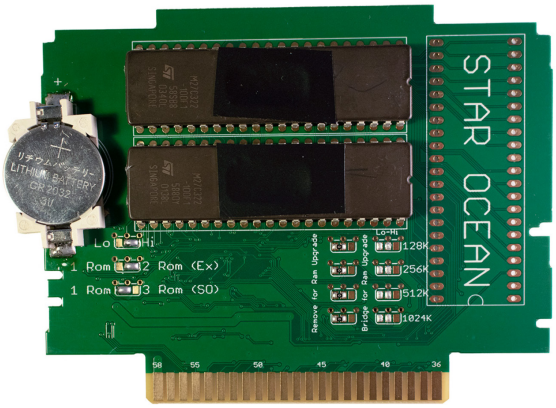

Figure 6.26. The PCB used for *EarthBound Halloween Hack*, a gameplay hack I ordered from endpro86 on eBay (tape added by me, post-purchase, to protect the data on the EPROMs).

While Mouse Bite gears his PCBs toward the hobbyist market, selling them in the same manner as educational soldering kits, this style of board has also been developed by some reproduction cartridge sellers for internal use. The *EarthBound Halloween Hack* gameplay hack I ordered from endpro86, for example, is more than likely a modified version of a template board from the now-defunct North American reproduction-maker Retro Circuits (Figure 6.26).[75] Based on posts and pictures featured on their Facebook page, Retro Circuits created numerous custom PCBs for use in the SNES/SFC cartridges that they sold on their website and at conventions (*Retro Circuits*, 2022). Template boards such as these facilitate the easy creation of different reproduction types, from simple facsimiles to complex multicarts, as the creator can swap in whatever components are needed for the specific game they are making. endpro86's repurposing of a Retro Circuit's game speaks to the underlying modularity of SNES/SFC cartridges, where original and aftermarket parts can mingle to create endless variations.

[74] I have heard this process referred to as 'flashing' or 'burning' as well, so I will use these terms alongside 'programming' when discussing how game data is put on the ROM chip.

[75] I identified the board with assistance from folks on the Mouse Bite Labs Discord and later found similar boards on Retro Circuit's residual Facebook page.

			Normal no save	Normal saving	Extended saving	Multicart no save	Multicart saving
Ref	Part	Value	ROM Size: ≤32 Mbit SRAM: No	ROM Size: ≤32 Mbit SRAM: Yes	ROM Size: >32 Mbit SRAM: Yes	ROM Size: 2x ≤32 Mbit SRAM: No	ROM Size: 2x ≤32 Mbit SRAM: Yes
U2	CIC	PIC12F629	Yes	Yes	Yes	Yes	Yes
U3	ROM1	27C322, 27C160	Yes	Yes	Yes	Yes	Yes
U4	ROM2	27C322, 27C160	No	No	Yes	Yes	Yes
U5	SRAM	6264, 62256, 1008	No	Yes	Yes	No	Yes
U6	Multiplexer	74'257	Yes	Yes	Yes	Yes	Yes
U7	Multiplexer	74'257	Yes	Yes	Yes	Yes	Yes
U8	Decoder	74'139	No	Yes	Yes	No	Yes
U9	Decoder	74'139	Yes	Yes	Yes	Yes	Yes
U10	Flip Flop	74'74	No	No	No	Yes	Yes
C1	Electrolytic cap	22 uF	Yes	Yes	Yes	Yes	Yes
CB	Electrolytic cap	22 uF	No	Yes	Yes	No	Yes
C2	Ceramic cap	100 nF	Yes	Yes	Yes	Yes	Yes
C3	Ceramic cap	100 nF	Yes	Yes	Yes	Yes	Yes
C4	Ceramic cap	100 nF	No	No	Yes	Yes	Yes
C5	Ceramic cap	100 nF	No	Yes	Yes	No	Yes
C6	Ceramic cap	100 nF	Yes	Yes	Yes	Yes	Yes
C7	Ceramic cap	100 nF	Yes	Yes	Yes	Yes	Yes
C8	Ceramic cap	100 nF	No	Yes	Yes	No	Yes
C9	Ceramic cap	100 nF	Yes	Yes	Yes	Yes	Yes
C10	Ceramic cap	100 nF	No	No	No	Yes	Yes
D1	Diode	BAT85	No	Yes	Yes	No	Yes
D2	Diode	BAT85	No	Yes	Yes	No	Yes
D3	Diode	BAT85	No	Yes	Yes	No	Yes
R1	Resistor	1kΩ	No	Yes	Yes	No	Yes
R2	Resistor	100kΩ	No	Yes	Yes	No	Yes
R3	Resistor	10kΩ	No	Yes	Yes	No	Yes
R4	Resistor	1kΩ	No	Yes	Yes	No	Yes
R5	Resistor	10kΩ	No	Yes	Yes	No	Yes
R6	Resistor	100kΩ	No	Only w/ 1008 SRAM	Only w/ 1008 SRAM	No	Only w/ 1008 SRAM
R7	Resistor	10kΩ	No	Only w/ 1008 SRAM	Only w/ 1008 SRAM	No	Only w/ 1008 SRAM
Q1	Transistor, NPN	2N3904	No	Yes	Yes	No	Yes
Q2	Transistor, NPN	2N3904	No	Only w/ 1008 SRAM	Only w/ 1008 SRAM	No	Only w/ 1008 SRAM
B1	Battery	CR2032	No	Yes	Yes	No	Yes

Figure 6.27. A compatibility chart created by Mouse Bite Labs, which shows what parts are needed for each type of game (and where they should be soldered on the template board).

While they are generally not capable of creating every type of SNES/SFC game—Bucket Mouse's boards, for example, are not compatible with games that rely on the SuperFX, SuperFX2, DSP, SA-1, C4, S-DD1, or SPC7110 enhancement chips (2020)—these PCBs are still quite flexible. As seen in Figure 6.27, users can create several different game types, with or without save data, depending on the components they have on-hand. It is worth taking a moment to discuss what each of these elements do (save for common electrical parts such as diodes, resistors, and transistors) as they are the building blocks of SNES/SFC cartridges.

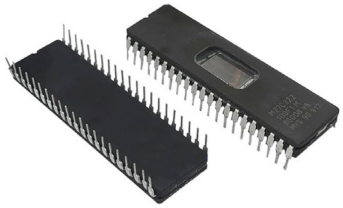

Figure 6.28. A 4MB 27c322 ROM chip.

Read-Only Memory (ROM) Chips (Figure 6.28) store game data. There are many different types of ROM chips that are compatible with the SNES/SFC, and they vary in their storage capacity and number of pins. ROM chips are programmed using a specialised device, and some variations (such as EPROMS like the 27C322) are capable of being erased and rewritten through exposure to ultraviolet light. SNES/SFC cartridges typically contain one ROM chip, although Ex-mode games and multicarts contain two.

Figure 6.29. An AS6C1008 SRAM chip.

Static Random Access Memory (SRAM) (Figure 6.29) are chips that hold save data for games. Like ROM chips, they vary in storage capacity and their number of pins. However, unlike ROM chips, their memory is volatile and requires persistent power to maintain. In SNES/SFC cartridges, this power is provided using a CR2032 battery, and dead batteries are a common cause of lost save data.

Figure 6.30. An official Nintendo CIC chip, embedded on a PCB.

Regional Lock-out Chips (Figure 6.30) are a type of technical protection measure that signal to the console if a cartridge is authorised by Nintendo and, therefore, compatible. The formal version shipped with SNES/SFC cartridges is the Checking Integrated Circuit (CIC) chip while replacements such as the PIC12F629 are commonly used in reproduction cartridges.

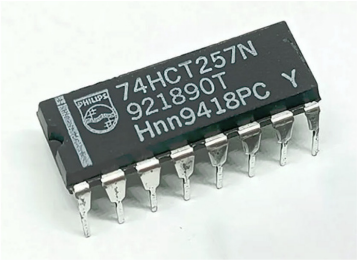

Figure 6.31. A 74HCT257N multiplexer, one of many compatible with the SNES/SFC.

Multiplexers (Figure 6.31) map data from the ROM chip (which uses a 16-bit bus) to the SNES/SFC console (which uses an 8-bit bus). Effectively, this is an intermediary component needed for the cartridge to operate with the console.

Figure 6.32. A 74HC139 decoder, one of many compatible with the SNES/SFC.

Decoders (Figure 6.32) have a few different uses within a SNES/SFC cartridge. They tell the multiplexers when to output data, activate the ROM/RAM depending on the memory address being accessed, and switch between the two ROM chips for Ex-mode games or multicarts.

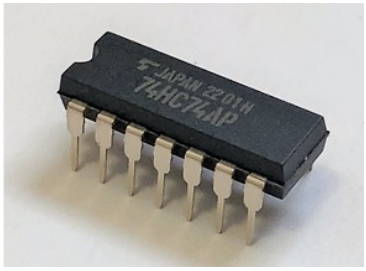

Figure 6.33. A 74HC74AP flip-flop chip.

Flip-Flop Chips (Figure 6.33) are used exclusively for multicart boards. They switch between the cartridge's two ROM chips whenever the console is reset, allowing the user to easily cycle through two different games.

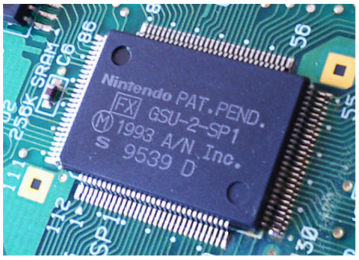 Figure 6.34. The Super FX chip, embedded on a PCB.	**Enhancement Chips** expand the capabilities of the SNES/SFC beyond the console's original affordances. The most common is the DSP-1, which is a math coprocessor that allows for more advanced Mode 7[76] scaling and rotation. Perhaps the most famous of these enhancement chips is the Super FX (Figure 6.34), a graphics accelerator that draws polygons and advanced 2D effects in games such as *Star Fox* (1993) and *Stunt Race FX* (1994).

Table 6.1. SNES/SFC cartridge components.

Luckily, it is not necessary to have a full understanding of electrical engineering to create a reproduction cartridge. Thanks to Bucket Mouse's tutorial, building a SNES/SFC cartridge is more akin to following a flowchart:

> **First**, you select a ROM chip that is large enough for the game you want to make and write your game data to it using a specialised programming device.
>
> **Second**, you gather all the chips necessary for your selected game (such as an SRAM chip for those that require save data) and the supporting electrical components required to make those chips function properly.
>
> **Finally**, you solder all these elements onto a board to create a functional game.

Obviously, the actual process is more challenging than I described, but template boards allow users to build an understanding of the underlying architecture of the SNES/SFC in a low stakes manner. As mentioned in this chapter's introduction, my core objective for this case study was to create a reproduction cartridge of *HyperBound*, and Bucket Mouse's hobbyist board provided a perfect venue to do so. *EarthBound* (and, by extension, *HyperBound*) features a relatively simple technical configuration—only requiring a ROM chip, SRAM, and a battery, with no enhancement chips—meaning the advanced-style SNES/SFC board provided by Mouse Bite Labs would be more than sufficient.

However, I may be putting the cart before the horse. The first step for any reproduction-maker involves analysing a ROM image, preparing it for a cartridge, and burning it onto a ROM chip. In fact, it was not until I ran my ROM image through uCON64 (dbjh & noisyb, 2024)—an application used to backup, restore, and analyse games—that I was fully aware of *HyperBound*'s technical configuration (Figure 6.35).

[76] As Arseneault has noted, Mode 7 allowed the SNES/SFC to create "pseudo–3-D experiences through an impressive perspective effect" (2017, p. 121).

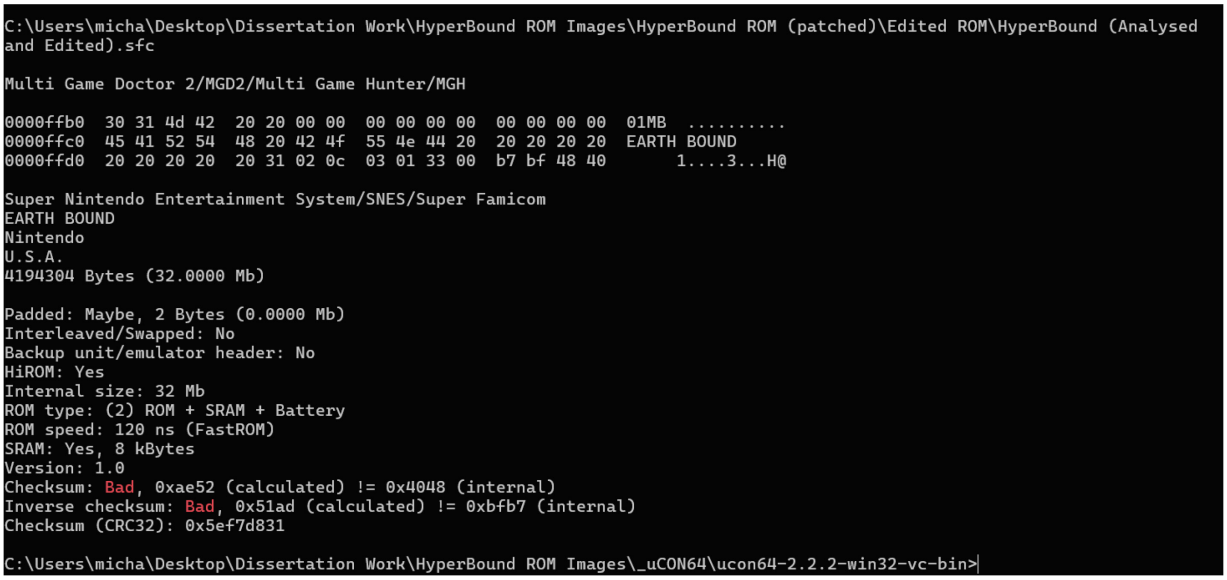

Figure 6.35. A screenshot from UCON64, run through Windows command prompt, displaying vital information about *HyperBound*'s ROM image.

uCON64 reveals many of the persnickety details that reproduction makers must be aware of when creating a cartridge. For example, you cannot solder just any ROM chip or SRAM chip onto a template board; these components and their placement will vary slightly depending on how much space the game needs for save data and game data, as well as how the ROM is mapped (which I elaborate upon in *Final Fantasies*). In the case of *HyperBound*, this led me to select chips that were equal or larger than the sizes I needed: a 32Mbit 27C322 ROM chip and a 64k HM6264 SRAM chip. In addition to indicating precisely which components were required to fill out a template PCB, uCON64 also signals if the checksum[77] for a ROM was 'good' or 'bad.' If the checksum is bad, the cartridge will not properly load in a SNES/SFC console.

While ROM images of formal releases typically have good checksums, bad checksums are extremely common with gameplay hacks. Hackers, including myself, make numerous changes to a game's data, potentially rendering the code unrecognisable to the SNES/SFC.[78] In order to make a ROM image compatible with original hardware the checksum must be changed

[77] The checksum is a 16-bit sum of all of the bytes in the ROM, potentially with some portions repeated. It is always computed as if the ROM is a power of 2 in size, as given by the ROM header. All that being said, the checksum is a mathematical way for the SNES/SFC to verify if a game is legitimate (*SNES ROM Header*, 2020).

[78] As mentioned in *The Super Nintendo Emulation System*, these bad checksum games may not be playable in accuracy-driven emulators without enabling certain settings.

from bad to good. I used another hacker utility, Bongo's IpsAndSum (Bongo, 2002), which accomplishes this task with a push of a button.[79]

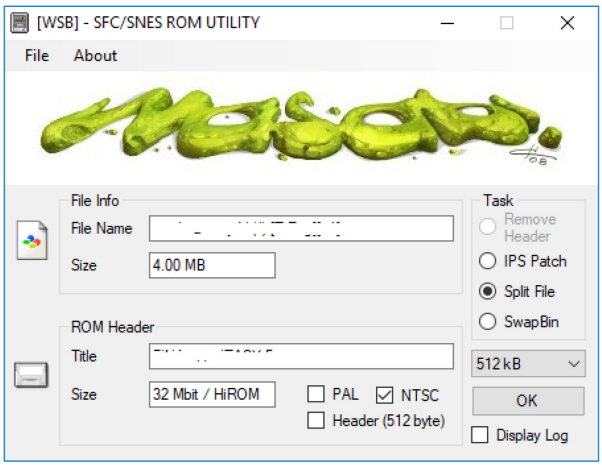

Figure 6.36. SFC/SNES ROM Utility, demonstrating its ability to split a ROM image into multiple files for programming.

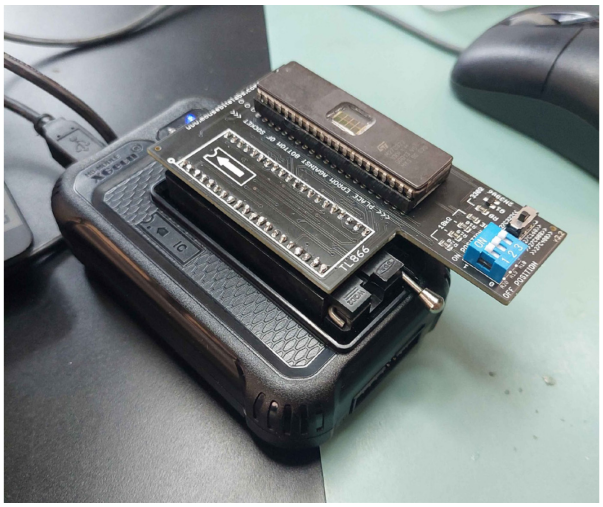

Figure 6.37. A T48 ROM programmer, with an adapter that allows it to burn 27C322 ROM chips.

Finalising the ROM image for programming, however, can be a bit more of an involved process. It is necessary to remove a ROM's header before programming it to a chip, but occasionally additional finagling is necessary. With *HyperBound*, the 42 pins on my ROM chip did not match the 40 slots on my ROM programmer and, as an additional roadblock, my programmer was also not compatible with larger EPROMs such as the 27C322.[80] The solution to this incompatibility is to trick the programmer into thinking it is working with a different type of ROM chip than the one provided by using an intermediary adapter and flashing it as eight smaller files instead of a single one. In addition to allowing 42-pin ROM chips to interface with a 40-pin programmer, the adapter features a series of switches that select which banks (i.e. areas) within the ROM chip are being written during programming. This meant I had to use yet another hacker tool—SFC/SNES ROM Utility (takashi, 2009)—to remove *HyperBound*'s header and split its ROM image into eight files, before flashing the ROM image one section at a time (Figure 6.36 and Figure 6.37). Although time consuming, this turned out to be a relatively straightforward process.

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[79] Like many hacker applications, IpsAndSum is a bit glitchy. The GUI does not always display the correct data and it may take a few tries to actually fix a checksum, for no predictable reason. A single review for the application, written in 2019, appropriately reads "Works most of the time" (Bongo, 2002).

[80] At this point you may be wondering "why did Michael use this ROM programmer if it is not capable of programming his SNES/SFC ROM chips out of the box?" The two main reasons are: a) this is one of the most affordable and widely available ROM programmers available; and b) because of this availability, there is a great deal of documentation on how to use it in conjunction with SNES/SFC cartridges. Sometimes the best tool is the one you can easily acquire and understand.

By now it should be obvious that the expertise and technologies that support hobbyist cartridge reproduction production are extremely ad-hoc. Material communities develop around SNES/SFC cartridges, developing specialised technologies and techniques to tinker with them, but the stewarding of these elements is inconsistent at best. The tools recommended by online tutorials are often abandoned side projects created by lone developers, archived on fan websites such as ROMHacking.net. Template boards and other cartridge accoutrements, such as the PCBs and adapters I ordered from Mouse Bite Labs, are similarly produced by solo hobbyists. And many electrical components, specifically ROM chips, are often only available through unreliable sellers[81] on AliExpress. That is all to say that, while a template board represents a crystallisation of expertise, the ability for users to activate this expertise is limited by a network of informal and formal resources, each of which could disappear at any moment. In a poignant example, ROMHacking.net shifted into read-only mode as I was writing this chapter, marking the end for one of the largest resources for ROM hacks and hacking tools on the Internet (McWhertor, 2024). While the website will likely stay online as a static resource, its denouement highlights the precarity of numerous links in the reproduction-making chain.

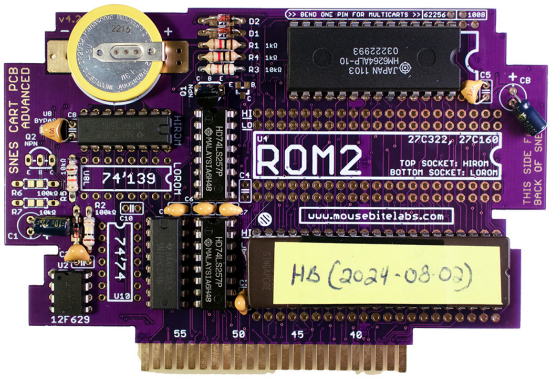

Figure 6.38. The front of my *HyperBound* reproduction PCB, in its final form.

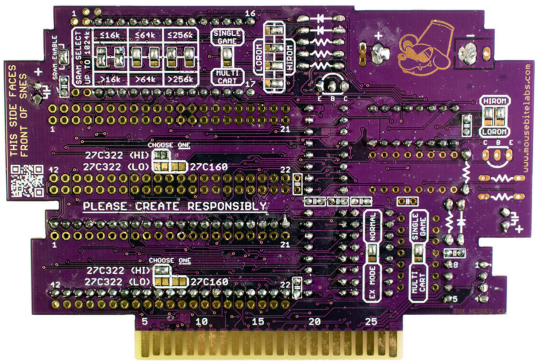

Figure 6.39. The back of my HyperBound reproduction PCB, in its final form.

Luckily for me, all the resources I needed for *HyperBound* were still in circulation and the physical assembly of the cartridge was a relatively straightforward procedure. With my completed ROM chip in hand,[82] I gathered the rest of the necessary components—multiplexers, decoders, SRAM, and a handful of other elements—and prepared myself to transform *HyperBound* into a functional game PCB. Soldering these components to the template board was a mostly uneventful paint-by-numbers affair, thanks to Bucket Mouse's clear instructions, and mainly consisted of affixing components to their designated locations. This also involved

[81] Sourcing reliable ROM chips was a huge hurdle to clear for this research project, as roughly 60% of the ones I ordered would appear to program correctly but were actually non-functional.

[82] I am simplifying this process slightly, as I also created a prototyping board (a template board that allows for the simple hot-swapping of ROM chips) in order to test the ROM chip before soldering it permanently onto a PCB.

bridging a few solder pads to configure the cartridge in a way that was congruent with the ROM's requirements (mapping type, SRAM size, etc.). Once the assembly was complete, I tested the PCB by inserting it into both an Analogue SuperNT and an original console and it worked perfectly, although it did feel a bit naked without a proper cartridge shell or label (Figure 6.38 and Figure 6.39). However, before I went about encasing the guts of my *HyperBound* cartridge in a manner befitting a formal SNES/SFC release, I decided to take a quick diversion into the world of donor boards.

Donor Boards (Repurposing the Past)

Donor boards are PCBs from existing SNES/SFC cartridges that users modify to play games other than the ones they were originally programmed with. Rather than creating a reproduction cartridge from scratch, as I did with a template board, reproduction makers instead solder a new ROM chip (and, if necessary, a few supporting components) onto a PCB sourced from a different game. In many ways, this repurposing can be seen as an extension of Nintendo's formal manufacturing processes. As I learned through my discussions with Evan Gowan at SNESCentral, the videogame company created dozens of stock PCBs with different configurations, many of which were compatible with multiple SNES/SFC titles.

SNESCentral has thoroughly documented these PCBs on their website (Gowan, n.d.-c), revealing a few interesting facts. First, as I touched upon earlier, there is no standard PCB for most SNES/SFC games. *Super Mario World,* for example, used at least ten different PCB variations for different regions and production runs. Second, many SNES/SFC cartridges only deviate from one another in terms of the data stored on their ROM chips. In many scenarios, swapping out this game data is all that is needed to fully change one game to another. Finally, the more specialised a game cartridge is (due to the presence of enhancement chips, for example) the fewer games its PCB was used for during formal production runs. This is evident with later SNES/SFC releases, such as *Super Mario RPG: The Legend of the Seven Stars* (1996), which features the Super Accelerator (SA1) chip, and *Star Ocean* (1996), which is 48Mb in size and relies upon the SDD-1 chip for graphics compression.

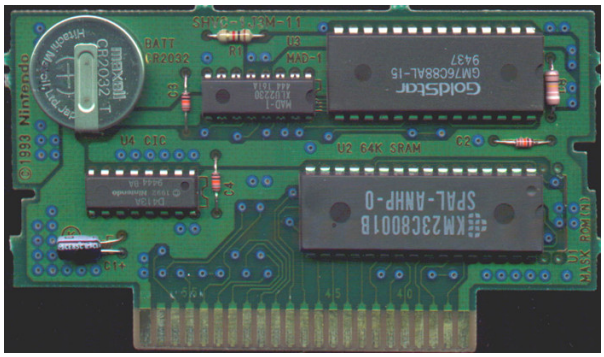

Figure 6.40. A PCB scan of the SHVC-1J3M-11 PCB, used in several SNES/SFC games. This board was used for *NHL 95*.

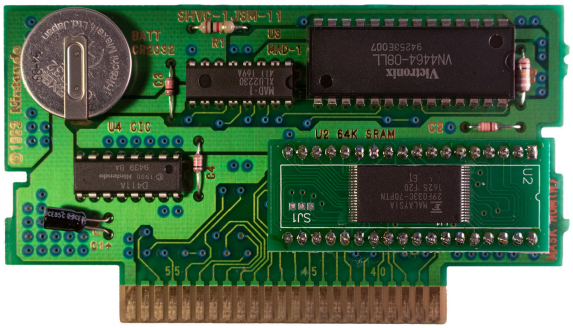

Figure 6.41. A photograph of the SHVC-1J3M-11 PCB found inside of *Final Fantasy III: Brave New World*.

The first donor cartridge I encountered was the gameplay hack *Final Fantasy III: Brave New World*, which I ordered through OCDReproductions. After I cracked the cartridge open, I immediately noticed that the seller had soldered a new ROM chip onto a PCB labelled SHVC-1J3M-11. The use of this particular board was peculiar as formal releases of *Final Fantasy III*—the game that *Brave New World* is based upon—utilised entirely different models of PCBs: either a SHVC-3J3M-01, SHVC-BJ3M-10, and SHVC-BJ3M-20, depending on the production run (Gowan, n.d.-b). The SHVC-1J3M-11 in *Brave New World* (Figure 6.40 and Figure 6.41), on the other hand, was exclusively used in North American production runs of *Secret of Mana* (1993), *Madden NFL '95* (1994), *NHL '95* (1994), *World Cup Striker* (1994), and *Illusion of Gaia* (1993) (Gowan, n.d.-d).

While I was unable to ask OCDReproductions why they decided to use this model of PCB instead of the original, I can posit that it is due to cost. While the most obvious choice for a donor board for *Brave New World* would presumably be *Final Fantasy III*, a used copy of the game sells for about $65 (USD)[83] and no other NTSC-region SNES/SFC release uses the same type of PCB. In stark contrast, *Madden NFL '95* sells for $6.55 (USD), *NHL '95* for $4.65 (USD), and *World Cup Striker* for $4.75 (USD), and it turns out that their SHVC-1J3M-11 PCBs feature the same component configurations as *Final Fantasy III* and, by extension, its gameplay hacks. All it takes is the addition of a relatively inexpensive ROM chip with the proper game data written onto it—in this case a surface mounted MBM29F033C (Fujitsu Limited, n.d.) with an adapter (*Fujitsu MBM29F033C TSOP Adapter IV*, 2024)—to completely reconfigure the cartridge. While this process is not without its parts and labour costs, the use of a donor board suddenly makes the $39.99 (USD) price point that OCDReproductions sells *Brave New World* for much more understandable.

[83] Throughout this section, I will be referencing prices listed by PriceCharting.com. Rather than citing them individually, I will cite the main search page here (*PriceCharting*, 2024) and note that these prices were pulled on 2024-09-09.

This technique of transforming less expensive SNES/SFC titles into more expensive ones is a longstanding practice amongst reproduction sellers. In response to one of the many PCB photos I posted on the Video Game History Foundation's Discord server, Frank Cifaldi mentioned that, before the production of template boards and the proliferation of aftermarket parts, this was one of only a few ways to create SNES/SFC reproduction cartridges (Cifaldi, 2024). Retro Circuits, who were known for producing template boards for use in their own products, would often critique shoddily crafted donor boards to promote their own reproduction cartridges. These early donor boards lacked the polish of more modern efforts, such as the Lovecraftian tangles of wire seen in Figure 6.42 and Figure 6.43.

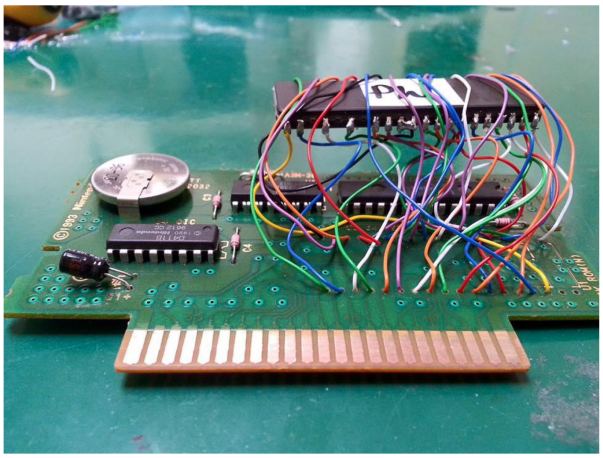

Figure 6.42. A photograph from Retro Circuits' Facebook page, in which they identify and shame lesser-quality reproduction boards (Retro Circuits, 2016).

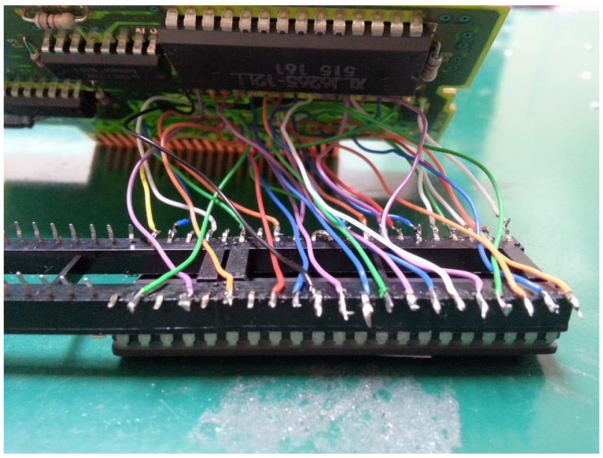

Figure 6.43. A photograph from Retro Circuits' Facebook page, in which they identify and shame lesser-quality reproduction boards (Retro Circuits, 2016).

While donor boards do have more of a hobbyist DIY vibe, there are still many benefits to using one over a template board or, as I will discuss later, a mass-produced bootleg. In addition to enabling the transformation of cheap SNES/SFC games into more lucrative ones, donor boards allow users to produce games that require enhancement chips to function. While many of the components needed for a reproduction cartridge are generic or easily replaceable—I ordered most of the parts for my experiments from AliExpress, eBay, or dedicated sellers such as Muramasa Entertainment—enhancement chips are much more difficult to acquire. This is likely why across my sample of reproduction cartridge listings, Super FX chip games such as *Yoshi's Island* (1995) and *Star Fox* (1993) were entirely unavailable through sellers who did not use donor boards. I suspect it simply is not cost effective for them to reverse engineer and mass produce bootlegs that mimic the capabilities of most enhancement chips. Through donor boards, hobbyists and businesses who have access to large game collections are effectively given an opportunity to transform easily replaceable SNES/SFC cartridges into different titles, simply by treating them as collections of parts rather than indivisible objects.

After I had completed my *HyperBound* cartridge, I decided that I wanted to attempt this process myself with another *EarthBound* gameplay hack I had created titled *Unearthed*. I do not

feel it is necessary to fully explain what *Unearthed* entails beyond the fact it is a demo version of an unfinished gameplay hack that I created in 2017. However, for brevity's sake, I do want to establish that it has the same technical requirements as *HyperBound* in terms of components and configuration. Thus, rather than belabouring the process of ROM programming and soldering, I will instead discuss the nuances of working with donor boards.

The first step of creating a reproduction cartridge using a donor board is finding a game cartridge that houses a compatible PCB. Bucket Mouse, drawing information from a public SNES ROM header database (jensma, 2021), has thankfully compiled a detailed spreadsheet that contains information about "most available ROMs for SNES/Super Famicom, including foreign games, and even some ROM hacks" (2017). By ticking categories on the spreadsheet based on the configuration details provided by uCON64—ranging from SRAM size to chip configuration—the vast list of games begins to dwindle until only those with compatible donor boards remain. In the case of *Unearthed*, this list encompassed a gamut of games that used the SHVC-1J3M-20 PCB, including *Chrono Trigger* and *Breath of Fire 2* (1994). However, there was one game that stood out to me due to its availability and affordability: *Ken Griffey Jr's Winning Run* (1996). Retailing for about $7.00 (USD), and already a part of my game collection, it was the perfect candidate for this project.

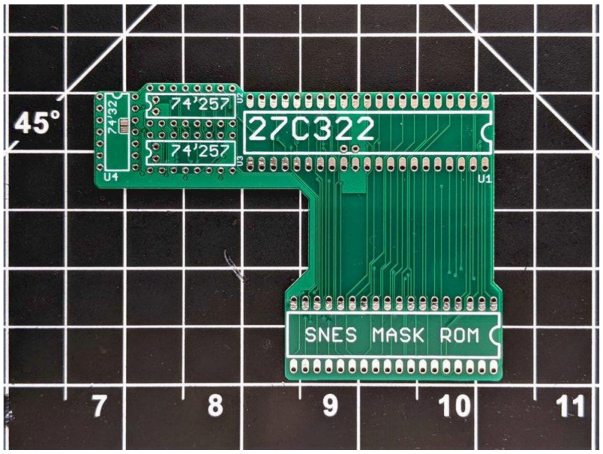

Figure 6.44. A SNES to 27C322 Extended Adapter Board, which allows a new ROM chip to be added to an existing cartridge PCB.

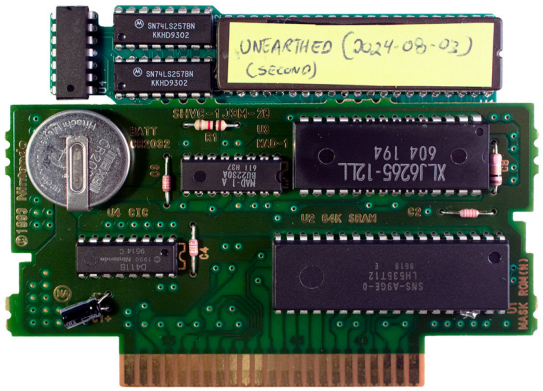

Figure 6.45. My modified version of *Ken Griffey Jr's Winning Run*, which plays the gameplay hack *Unearthed*.

There are a few different ways to replace a ROM chip on a donor board. Some types of ROM chips can be swapped in simply by removing the old one, as can be seen in the *EarthBound Halloween Hack* reproduction I discussed earlier. However, most others require an adapter of some sort. For my own reproductions, I used a SNES to 27C322 Extended Adapter Board to make it possible for a 42-pin ROM chip to work with the standard 36-pin holes on the SNES/SFC PCB, effectively allowing me to put a square peg to fit into a round hole (Figure 6.44). Although somewhat clunky—I joked with my colleague Alex that I was giving the cartridge PCB a dapper hat—the adapter fits perfectly atop the donor board. And even with the extra inch of plastic, it still nestles snugly within a standard SNES/SFC cartridge shell.

With the adapter in hand, and plenty of spare parts from my prior experiments, assembling my *Unearthed* cartridge proved to be relatively simple. After configuring my ROM image and programming it to a ROM chip in the same manner as I did with *HyperBound*, I simply soldered it to the adapter along with a few supporting components (two multiplexers and an optional 74HC32 gate). Mounting this assemblage to the cartridge PCB was a slightly more challenging endeavour—instead of removing the old ROM chip, I essentially had to hijack it by soldering over the existing pins and bridging two of them together—but otherwise proved to be relatively painless. In under two hours, I had a fully functional version of *Unearthed* that could be played on original or reproduction hardware (Figure 6.45). However, as I packed away my growing collection of electrical components and cleaned up the tools I borrowed from Concordia University's makerspace, I did find myself wondering if there was an even more streamlined method of creating reproduction cartridges.

Bootlegs

Bootlegs are mass-produced PCBs that are typically used by large-scale reproduction vendors. I use the term 'bootleg' reluctantly, since it is a denigrative descriptor, but the term was frequently invoked by hobbyists when I searched for information about the origins of this type of PCB. Additionally, I believe that the term is useful in highlighting the clash in expert discourse between different types of material communities. While bootlegs and template boards are similar in many ways, their differences highlight points of contention. As Marvin and Jenkins have both documented, expertise often demands demarcation between technologies and techniques, even when groups are working toward similar ends (Jenkins, 2006, p. 38; Marvin, 1988, p. 49).

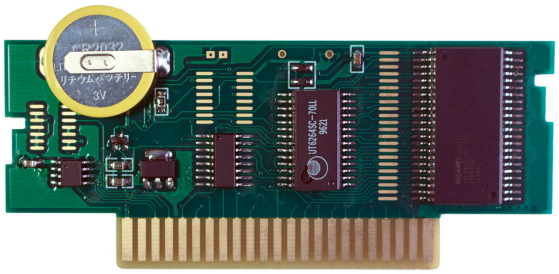

Figure 6.46. The PCB for *HyperBound*, as purchased through the eBay store the-game-paradise.

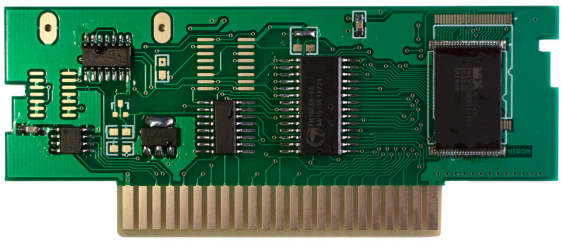

Figure 6.47. The PCB for *HyperBound*, as ordered through the AliExpress vendor future Store.

In many ways, bootlegs are effectively shrunk down versions of template boards designed for mass production, as can be seen in two versions of *HyperBound* that I ordered from the-game-paradise (Figure 6.46) and future Store (Figure 6.47). By using surface mount (SMT) chips instead of through-hole ones, greatly condensing the board design, and shirking unusual components entirely, these boards end up being roughly half the size as reproductions using template boards and donor boards. As a trade-off for their compactness, the soldering

expertise required to create them is much higher. Unlike template boards, which use spaced-out and well-labelled component slots to help guide users, bootleg boards feature tightly clustered SMT chips with limited identification. Soldering these components requires a high level of expertise that most hobbyists do not possess, seemingly limiting them to specialists and more formalised reproduction-making operations.

Assembly challenges aside, why do hobbyists choose to identify these types of SNES/SFC reproductions as bootlegs? Apart from the additional expertise needed to assemble them, they appear to be constituted of the same sorts of parts. For example, the lime green *HyperBound* cartridge I ordered uses a ROM chip (MX29LV320ETMI70G), SRAM (UT6264SC-70LL), a standard save battery (CR2032), a lock-out chip clone, and numerous other generic components that mirror what I used in my own reproduction cartridges. However, dipping into conversations on hobbyist Discord servers reveals some deviations that may cause consternation among technically minded users. Several folks on the Mouse Bite Labs Discord server noted that PCBs of this type: use "3V parts on a 5V databus," making them more prone to electrical issues[84] (Bucket Mouse, 2024); lack a bevelled edge on the side of their pins, which may cause a SNES/SFC's cartridge slot to wear out more quickly (Valanduin, 2024); and, as seen in the future Store's version of *HyperBound*, often drop SRAM in favour of allegedly less reliable FRAM[85] (ednauseum, 2024). While I doubt that there have been extended studies on the veracity of these claims, there is clearly some belief that these creators have cut corners. There is also a pronounced dissonance in terms of best practices, as while the Mouse Bite Labs community is critical of FRAM chips, future Store advertises them as a value-add that "means you no need worry about losing your game record any more when battery has no electric power!!" (future Store, 2024b).

In addition to disagreements over technical configurations, I suspect that the bootleg label is commonly applied due to the high rate of facsimiles that use this type of board. As a point of comparison, OCDReproductions, which uses donor boards for their games,[86] overwhelmingly focuses on gameplay hacks (41.9%) and informal localisations (49.4%), with only a handful of facsimiles (1.6%) mixed into their listings. In contrast, the future Store predominantly sells facsimiles (54.9%) or informal localisations (35.4%) of those same titles, most of which are clearly identified as bootleg boards in their AliExpress listings. While gameplay hacks do carry a great deal of moral baggage, as I mentioned in my typology discussion, they tend to be viewed less as counterfeits and more as creative variations or remixes. Facsimiles, on the other hand, trigger more strident debates of material authenticity as they are direct stand-ins for formally released titles.

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[84] In 2025, Limited Run Games recalled two of their products due to a similar voltage misconfiguration that turned them into "ticking time bombs" capable of frying an entire game console (Nightingale, 2025b).
[85] Ferroelectric Random Access Memory (FRAM) is a type of non-volatile memory. In a SNES/SFC cartridge, it serves the same role as SRAM but does not require a battery to maintain save data.
[86] Admittedly, I am making some assumptions about the types of boards these vendors use, especially considering that I only purchased a handful of games from them. However, folks on Reddit have reported that OCDReproductions predominantly uses donor boards (Donny740, 2022; landonbarton, 2018).

Figure 6.48. A box set of *Mighty Morphin' Power Rangers*, as listed in the future Store's AliExpress storefront, with several key trademarks blurred out.

The presentation of these games on AliExpress does little to counter claims of inauthenticity as, presumably to abide by platform governance, sellers commonly blur out trademarks and other identifying information. In a comical example, future Store sells a full box set of *Mighty Morphin' Power Rangers* (1994) but has hastily painted over the game's name and several other trademarks with block colours and lists it as "PR" instead of its actual title (future Store, 2024a) (Figure 6.48). While these elements are not blurred in the physical products themselves, as can be verified in review photographs posted by buyers, their absence in photographs does much to foster scepticism toward their material authenticity.

Unfortunately, unlike what I did with template and donor boards, I cannot offer a detailed chronicling of how to assemble a bootleg reproduction cartridge. Even with several years of videogame tinkering experience under my belt, soldering SMT chips on such a confined PCB is beyond my capabilities. Furthermore, simply sourcing the prerequisite parts proved to be untenable. I was unable to find an online storefront that sold a comparable PCB and, while I had a rough idea of which components were used in my purchased *HyperBound* cartridges from eBay and AliExpress, many components lacked part numbers or other identifiers. In many ways, the process has been re-formalised to a point to make it impenetrable, in the same manner as

Nintendo's original production runs. While still malleable technologies, the configuration of these bootlegs is clearly designed for more formalised workflows.

Closing Discussion

As I was winding down my research for this chapter, a strange email appeared in my inbox. Sent by someone going by the pseudonym of AP, the topic line read "Hyperbound and hello" and its body text included a heartfelt message about my gameplay hack alongside a request to transform it into a short run of reproduction cartridges.

> One of my favorite things to do is create short run, unofficial physical boxsets of romhacks, fan-translations for the SNES. I almost always do no more than 20, but sometimes I do 25. I wanted to reach out to 1. get your blessing / ask your permission if I could create 20 boxsets of Hyperbound to then sell privately to friends. I would of course send you a copy or two (of the 20), for free.

In addition to asking for my blessing, AP was curious if I could provide him with any of *HyperBound*'s development materials to solidify his reproduction's status as a collector's item. I happily agreed to both requests and sifted through my old hard drives for old ideation materials—maps, project summaries, and a few pieces of concept art—to pass along. A few days later, AP responded with a polished mock-up for my approval (Figure 6.49).

Figure 6.49. AP's *HyperBound* mock-up, featuring a black cartridge and a custom SNES/SFC-styled box.

This bespoke version of *HyperBound*, complete with box art and a (thankfully not lime green) aftermarket cartridge shell, is a potent reminder of two aspects of reproduction cartridges. First, while I have framed reproduction-making as predominantly a commercial enterprise, not all this type of labour is done in service of capital. As Swalwell highlights in her study of homebrew game development for microcomputers, the "creativity of popular culture lies not in the production of commodities so much as in the productive use of industrial commodities" (Swalwell, 2021, p. 21). Much like early Apple II mods such as *Dino Smurf* and *Castle Smurfenstein*, which were created with playful subversion rather than commercial

viability in mind (Johnson, n.d.), neither myself nor AP have money-making aspirations for our work.[87] Second, returning to Vanderhoef for a moment, reproduction cartridges allow users to "create cohesion and continuity" with an imagined or actual past by replicating its material qualities (2017, p. 117). As I observed in my storefront analysis, each reproduction cartridge is a pastiche of old and new technologies and ephemera. Makers simultaneously evoke the past while incorporating their own creative flourishes and branding, as can be seen in AP's combination of Nintendo trademarks, game screenshots, and personalised labels and branding.

However, alongside the bootlegs I ordered from eBay and AliExpress, AP's *HyperBound* also serves as a reminder that reproductions can manifest at various points along the informal-formal media spectrum. If AP's hobby project tends toward the informal due to his custom design and highly local distribution methods, then I can turn to Limited Run Games as a highly formalised counterexample. Describing itself as a "premium publisher of physical games" (*About Limited Run Games*, n.d.), Limited Run Games is perhaps the most well known officially-licensed videogame reproduction storefront. Unlike previous sellers I have discussed, Limited Run Games explicitly secures licensing agreements to produce their products, which range from plug-and-play arcade consoles to collector's editions of modern titles. Their collection of SNES/SFC games consists predominantly of prior formal releases, such as *Zombies Ate My Neighbours* (1993), that are packaged in a way that evokes the feeling of the original release while cautiously avoiding direct trademark infringement. The company often includes game cartridges, maps, figurines, and other ephemera in these sets to better align themself with capitalist logics of collection and to further build connections to past gaming eras. As made evident in the company's title, all their releases are produced in limited quantities, meaning that it is very difficult to procure their games if you miss the original release window.

[87] While AP sold copies of *HyperBound* to his friends, he mentioned in follow-up conversations this was strictly to cover his production costs and that he had no plans for a wider distribution.

Figure 6.50. A splash image from Limited Run Games, advertising their preorder of *The Mummy Demastered*.

Curiously, Limited Run Games also leverages this nostalgic SNES/SFC branding in games that were never a part of the console's software library. Their 2020 release of *The Mummy Demastered Collector's Edition* (Figure 6.50), a Nintendo Switch title created by WayForward Technologies, is sold in a "authentically sized retro SNES box" and includes a "commemorative (non-functioning) SNES cartridge" (*Switch Limited Run #86*, 2020). While this anachronistic ephemera may seem odd, it is an extension of what Juul describes as "authenticity work" that is commonly undertaken by indie developers (2019, p. 41). *The Mummy Demastered* is a 16-bit-inspired game that transparently appropriates the aesthetic of the SNES/SFC, using "contemporary technology to emulate low-tech" (Juul, 2019, p. 46) in order to align itself with a style and authenticity associated with past gaming eras. Limited Run has effectively allowed WayForward to materialise their digital homage, appropriately associating a game about undeath with a console that has long passed its formal commercial lifespan.

Figure 6.51. My completed version of *HyperBound*, featuring a custom-made label and an aftermarket blue cartridge shell.

Figure 6.52. My packaged version of *Unearthed*, featuring a custom-made label and a cartridge formerly occupied by *Super Castlevania IV*.

After I had wrapped up assembly for my *HyperBound* and *Unearthed* PCBs, I found myself following the same path of material-driven nostalgia as both AP and Limited Run Games. For *HyperBound*, I ordered a blue aftermarket cartridge shell from Muramasa Entertainment, and for *Unearthed*, I repurposed a residual cartridge shell from an extremely worn-out version of *Super Castlevania IV* (1991). I will not elaborate too much on the process of creating cartridge labels—I simply used one of many existing Photoshop templates and printed them at the Concordia University print shop—but the results felt somewhat surreal. While I had certainly not created the most convincing game artwork, both cartridges could, at least at a glance, pass as formal SNES/SFC releases (Figure 6.51 and Figure 6.52). And somewhat unexpectedly, after spending months tinkering with ROM chips and circuit boards, it felt strange to insert my finished PCBs inside a cartridge shell that obscured them completely. The underlying technical architecture is, quite literally, relegated to darkness in favour of colourful labels and recognisable cartridge shells.

I cannot help but think back to Boym's writing on *Jurassic Park* (2001, p. 35) when reflecting on my reproduction cartridge research, particularly her musings on the film's pivotal amber fossil. The entombed prehistoric mosquito is presented as a perfectly preserved time capsule, and the secrets it holds—the genetic architecture of long-extinct creatures—facilitate the mass revival of a lost era. However, once this revival has been achieved, the fossil takes on another role: that of a tchotchke atop John Hammond's cane (Figure 6.53). Symbolising his singular obsession with reanimating the past, the fossil reminds us of interplay between form and function, as well as passion and profit. After all, even Jurassic Park has a gift shop.

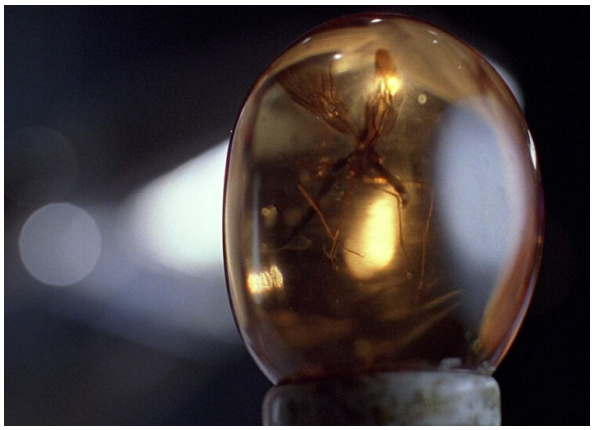

Figure 6.53. The top of John Hammond's cane in the film *Jurassic Park*, showcasing the mosquito encased in amber.

Figure 6.54. Limited Run Game's re-release of Jurassic Park for the SNES/SFC, featuring a semi-opaque amber shell.

The material communities that reverse-engineer, produce, and sell reproduction cartridges have diverse motivations—from hobbyists creating box sets for their friends to businesses looking to cash-in on retro-gaming nostalgia. But despite distinct conflicts in best practices and moral philosophies, they share many of the same technologies and techniques. After all, due to the diligent reverse-engineering and documentation efforts that have arisen during the SNES/SFC's afterlife, the expertise needed to create cartridges for the system is no longer an industry secret. As seen with AP's *HyperBound* box set or Limited Run Game's cheeky, amber-encased *Jurassic Park* cartridge (Figure 6.54), stakeholders from all along the informal-formal media spectrum can pick and choose the technologies and ephemera that best serve their needs. As Boym aptly notes, the "artifacts of civilisation are made both available and disposable through mass reproduction" (2001, p. 38), and SNES/SFC cartridges are no exception.

7. Final Fantasies

Figure 7.1. A screen capture of several translations of *Final Fantasy VI* being played in Wanderbar.

Chapter Introduction

Very few SNES/SFC games have received as much attention from fan translators and ROM hackers as *Final Fantasy VI* (Square Enix 1994). ROMhacking.net—one of the Internet's largest hubs for videogame hacking—currently hosts over 200 different projects for the game (*Final Fantasy III*, n.d.), ranking it among the console's most extensively modified titles. A common trend among these projects is the desire to return *Final Fantasy VI* into an allegedly more authentic state, with many users claiming to have repaired, uncensored, or restored the game in various ways. While the thrust behind early projects was to 'fix' dialogue changes that occurred when the game was localised[88] for North American audiences—with fans bemoaning Nintendo of America's strict censorship policies and an uneven translation by Square Enix[89] employee Ted Woolsey—they have since led to chimeric efforts that sample elements from formal and informal versions of the game (Figure 7.1). Each one of these *Final Fantasies* is a

[88] As defined by O'Hagan and Mangiron, localisation refers to the "many and varied processes involved in transforming game software developed in one country into a form suitable for sale in target territories" by considering linguistic, cultural, and technical implications (2013, p. 19).

[89] Square Enix was called SquareSoft the time of *Final Fantasy VI*'s development, but I choose to use the company's current title throughout this chapter for consistency.

crystallisation of corporate strategies, user expertise, and technical innovation, revealing much about the SNES/SFC's hardware and software afterlives.

But how central can a single game really be to a videogame console? In the modern era of re-releases, ports, and remakes, it may seem a bit quaint to tether *Final Fantasy VI* to the SNES/SFC when it is now playable on Game Boys, personal computers, and even mobile phones. However, platform-exclusivity was a major selling point during the so-called 'console wars' and software libraries are integral to establishing what a console means to its audience, both presently and retroactively (Arsenault, 2017, p. 49). This is especially pronounced when considering the SNES/SFC and its competitors as, due to competing technical configurations and censorship policies (Arsenault, 2017, p. 158), even the same title could differ greatly from console-to-console. As I discussed in *Pixels and Plastic*, every SNES/SFC cartridge is essentially a technological extension that builds upon the affordances of the SNES/SFC. And every game, from *Super Mario World* (1990) to *Chrono Trigger* (1995), is a crystallisation of hardware, software, creativity, and policy that offers insight into the SNES/SFC's development and legacy.

Building upon my prior discussions of game reproductions and informal archival efforts, in this chapter I analyse how users disassemble, reassemble, and recirculate the popular SNES/SFC title *Final Fantasy VI* (1994) following its initial commercial release. Consalvo has thoroughly discussed how ROM hackers and fan translators fully localise Japanese games that were never intended to make their way to North American audiences (2016, p. 42), but I take a slightly different angle into the same phenomenon. Unlike the *Mother 3* (2006) translators that Consalvo documents (2016, p. 58), who rallied to localise a game that was never released outside of Japan, *Final Fantasy VI* was officially localised for North American audiences quite early on in its commercial lifespan. Despite this, formal (e.g., Square Enix) and informal (e.g., ROM hackers) actors have endlessly tinkered with the game, ostensibly in search of a definitive version. Guins notes that a game's afterlife is an imprecise moment when it "slips from its prime to find itself in another state" and may be "revalued for new uses and assigned new functions" as part of historical, hobbyist, or commercial processes (Guins, 2014, p. 11). Studying *Final Fantasy VI*, thus, is an opportunity to answer Guins's call, studying both a console, and one of its most popular titles, "in a different situation and understanding of meaning-making" (2014, p. 11). While it has never truly left its commercial lifespan, its weaving path through formal and informal venues is still revealing.

I begin my analysis by taking up Newman's call to question the notion that games, particularly cartridge-based ones, are "static objects or text" (2012b, p. 135). By summarising its numerous official versions, localisations, and re-releases, I argue that *Final Fantasy VI* was fragmented well before users learned how to disassemble and reassemble its code. I then turn my attention toward early informal re-localisation efforts of the game—taking place on message boards and fan websites—which reveal fan motivations to create a 'better' or 'more authentic' version of *Final Fantasy VI*. Before analysing my chosen game hacks, I embark on a tangent to discuss how all versions of *Final Fantasy VI* are shaped by technological factors (e.g. cartridge space restrictions) in addition to cultural ones (e.g. rendering a text legible to a specific jurisdiction) (O'Hagan & Mangiron, 2013, p. 94). I use the hex editor WindHex to dissect the game's dialogue system to explain how SNES/SFC's cartridge affordances have shaped years

of (re)localisations and remixes. Next, I take a methodological turn by jury-rigging Clyde Mandelin's translation-comparison application Wanderbar (2020) to play five different localisations of the game simultaneously. Referring to my game logging documentation and fan paratexts, I then synthesise a few of the key themes that are contested between formal and informal translations of the game. Finally, I reflect upon the cyclical nature of game localisations, the centrality of technical affordances to the afterlives of SNES/SFC, and the impossibility of finding a truly "authentic" version of *Final Fantasy VI*.

Final Fantasies

Final Fantasy VI was released on April 2 1994 in Japan for the Super Famicom and, on October 11 of the same year, was made available to North American audiences as *Final Fantasy III*[90] for the Super Nintendo Entertainment System. The sixth entry in the mainline *Final Fantasy* series, *Final Fantasy VI* represents a liminal point in the franchise's history: it was the first entry to be directed by someone other than series creator Hironubu Sakaguchi (Yosinori Kitase and Hiroyuki Ito), the last to feature 2D graphics, and the final instalment released on a Nintendo console. Set in a world with technology resembling the Second Industrial Revolution—albeit with fantastical elements such as magic, ghosts, and gods—the game's narrative focuses on a rebellion against an immoral Empire that has enslaved mystic creatures, known as Espers, to bolster their military strength and take over the world. *Final Fantasy VI*'s gameplay is typical of nineties JRPGs, featuring labyrinthian dungeons, turn-based combat sequences, level-based character progression, and dialogue-driven story segments (Figure 7.2 and Figure 7.3). A commercial and critical success, the fantasy role-playing game is fondly remembered for its expansive narrative and memorable cast of characters.

[90] Throughout this chapter, I will refer to the game as *Final Fantasy VI* as this is the naming convention that has been adopted for all official versions of the game, save for the original North American release. However, many of the ROM hacks I refer to preserve the *Final Fantasy III* naming convention to signal that they are iterating on the North American release.

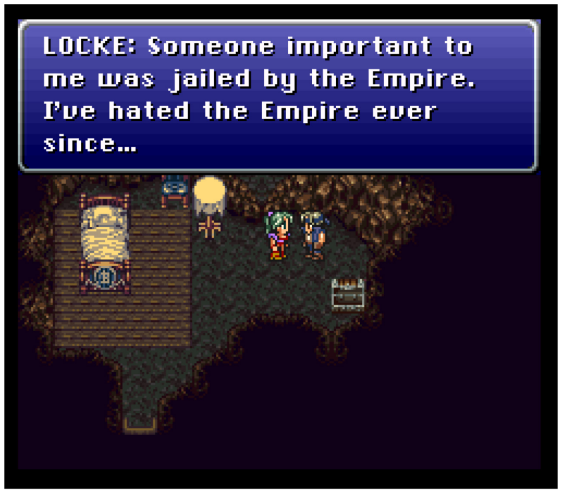

Figure 7.2. An example of dialogue between two characters in *Final Fantasy VI*.

Figure 7.3. The party, amid a fight with Ultros the octopus-monster, in *Final Fantasy VI*.

While *Final Fantasy VI* is often referred to as a singular game—especially during its initial release window when audiences were less aware of regional flows (Consalvo, 2016, p. 4) and had not yet developed the expertise needed to study its code (Newman, 2012b, p. 131)—it can be more accurately characterised a collection of *Final Fantasies*. When reflecting on the early days of its existence—perhaps best defined by the duality of Japanese and English releases—it is important to remember that even formal game localisations incorporate changes that extend well beyond translation. One obvious example of this is the duplicitous nature of the series' numbering: up until *Final Fantasy VII* (1997) the *Final Fantasy* series utilised region-specific naming conventions due to the inconsistency of North American releases. Only *Final Fantasy*, *Final Fantasy IV*, and *Final Fantasy VI* were localised for North American audiences and were retitled, respectively, as *Final Fantasy, Final Fantasy II*, and *Final Fantasy III* to (presumably) reduce audience confusion. Additionally, as censorship is integral to the localisation process—and is predicated on both corporate desires and cultural norms (O'Hagan & Mangiron, 2013, p. 175)—a great deal of alterations were made to the game's graphics (sprites, maps, and more) to remove sexual content, drug references, and religious themes. I will be taking a more nuanced look at localisation changes later in this chapter, but for now I simply wish to establish that any claim that the North American and Japanese versions of the game are 'the same but in a different language' is shaky from the onset. Even if a direct one-to-one text translation between Japanese and English was possible, marketing strategies and cultural differences would render it insufficient for localisation purposes.

The instability of *Final Fantasy VI* extends beyond localisation. While constant software updates have become standard practice in the age of digital marketplaces that allow developers to remotely install patches and bugfixes, cartridge-based games were also quietly iterated upon, albeit at a much slower pace. As Newman documents in his study of *Sonic the Hedgehog* (1991), applying changes to videogames in-between cartridge runs was a fairly standard industry practice before digital game patching became viable (2012a, p. 124). He highlights the

existence of a mechanical quirk in the initial MegaDrive release of *Sonic the Hedgehog*, where spike hazards can bypass Sonic's default period of invincibility (triggered when he collides with an enemy), resulting in instantaneous death. This interaction was removed in subsequent production runs, leading many to believe that it was an unintended mechanic or 'glitch' that Sega decided to address (Newman, 2012a, p. 130). This update was not communicated by Sega at the time and was only made well-known through player observation and, eventually, forensic analysis by ROM hackers (Newman, 2012a, p. 130).

The North American version of *Final Fantasy VI* also featured an update between cartridge manufacturing runs, within the first year of its release, which hackers often refer to as "REV A" or "Revision 1.1" (*Final Fantasy VI Version Differences*, 2023). The only perceptible change this revision implements is the removal of the "Sketch Glitch" (named after the character ability that triggered it) that is capable of creating graphical errors, freezing the game, or even fully erasing save file data (Master Zed, 2005). Unlike *Sonic the Hedgehog*'s cartridge update—which is easily observed due to the frequency in which the titular speedster is skewered during a standard playthrough—*Final Fantasy VI*'s Sketch Glitch is rarely triggered, and its removal likely went unnoticed by most players.

Version/Title	Platform	Notable Differences	Date
Final Fantasy VI	SNES/SFC (JP)	Original Release	1994
Final Fantasy III (1.0)	SNES/SFC (USA)	English localisation by Ted Woolsey	1994
Final Fantasy III (1.1)	SNES/SFC (USA)	Sketch bugfix. Sometimes called Revision A.	1994
Final Fantasy Collection	PSX (JP)	Includes extra features	1999
Final Fantasy Anthology	PSX (USA)	Includes extra features and was packaged with Final Fantasy IV	1999
Final Fantasy VI	PSX (PAL)	Includes extra features, and marks the first PAL release of the game	2002
Final Fantasy VI	GBA (JP)	Minor tweaks to script	2006
Final Fantasy VI	GBA (US)	Full re-localisation by translator Tom Slattery, new game content added (bonus dungeons, equipment, etc.)	2006
Final Fantasy VI	GBA (PAL)	New language support, new game content added (bonus dungeons, equipment, etc.)	2007
Final Fantasy III	Wii Virtual Console (JP)	Original SNES/SFC version, ported	2011

Final Fantasy III	Wii Virtual Console (US)	Original SNES/SFC version, ported	2011
Final Fantasy III	Wii Virtual Console (PAL)	Original PSX version, ported	2011
Final Fantasy III	PlayStation Network PS3/PSP (JP)	Original SNES/SFC version, ported	2011
Final Fantasy III	PlayStation Network PS3/PSP (US)	Original SNES/SFC version, ported	2011
Final Fantasy VI	PlayStation Network PS3/PSP (PAL)	Original PSX version, ported	2011
Final Fantasy VI	Wii U Virtual Console (JP)	Unknown details	2013
Final Fantasy VI	iOS	HD remake, using GBA version as base, with added controls for touch screens	2014
Final Fantasy VI	Android	HD remake, using GBA version as base, with added controls for touch screens	2014
Final Fantasy VI	iOS	HD remake, using GBA version as base, with added controls for touch screens	2014
Final Fantasy VI	Steam (Windows)	HD remake, using GBA version as base, with compatibility changes implemented	2015
Final Fantasy VI	3DS Virtual Console (JP)	Unknown details	2017
Final Fantasy VI	SNES Classic (JP)	Super Famicom version, but with changes made to graphics due to epilepsy concerns	2017
Final Fantasy III	SNES Classic (USA/PAL)	SNES version, but with changes made to graphics due to epilepsy concerns	2017
Final Fantasy VI: Pixel Remaster	Steam	Huge aesthetic overhaul that uses a tweaked version of the GBA script and includes many bug fixes	2022
Final Fantasy VI: Pixel Remaster	Mobile	Huge aesthetic overhaul that uses a tweaked version of the GBA script and includes many	2022

		bug fixes	
Final Fantasy VI: Pixel Remaster	PS4	Huge aesthetic overhaul that uses a tweaked version of the GBA script and includes many bug fixes	2023
Final Fantasy VI: Pixel Remaster	Switch	Huge aesthetic overhaul that uses a tweaked version of the GBA script and includes many bug fixes	2023
Note: All versions of the Pixel Remaster appear to be patched regularly.			

Table 7.1. All known releases of *Final Fantasy VI*, as of 2024.

These three early versions of *Final Fantasy VI* are only the tip of the iterative iceberg. In 1999, Square Enix released *Final Fantasy Collection* in Japan and *Final Fantasy Anthology* in North America for the Sony PlayStation, marking the beginning of a continuous churn of ports, remakes, and enhanced re-releases. I have listed these *Final Fantasies* above but, admittedly, they are difficult to circumscribe due to a lack of comprehensive documentation.[91] Square Enix is always quick to advertise new enhancements and additions, such as bonus content or graphical overhauls, but they are vague about bug fixes, censorship alterations, or localisation updates. This ambiguity is notable in the 2007 Game Boy Advance (GBA) release of *Final Fantasy VI*. In both box art and advertisements (Figure 7.4 and Figure 7.5), Square Enix boasts that the GBA re-release adds "never-before-seen dungeons," a music player and bestiary, and new espers that unlock potent magical abilities. However, players and hackers have since identified a bevy of changes that were introduced without fanfare.

[91] Fan wikis are a useful resource and have been my main reference in identifying version differences (*Final Fantasy VI Version Differences*, 2023).

Figure 7.4. The rear box art for the GBA release of *Final Fantasy VI*.

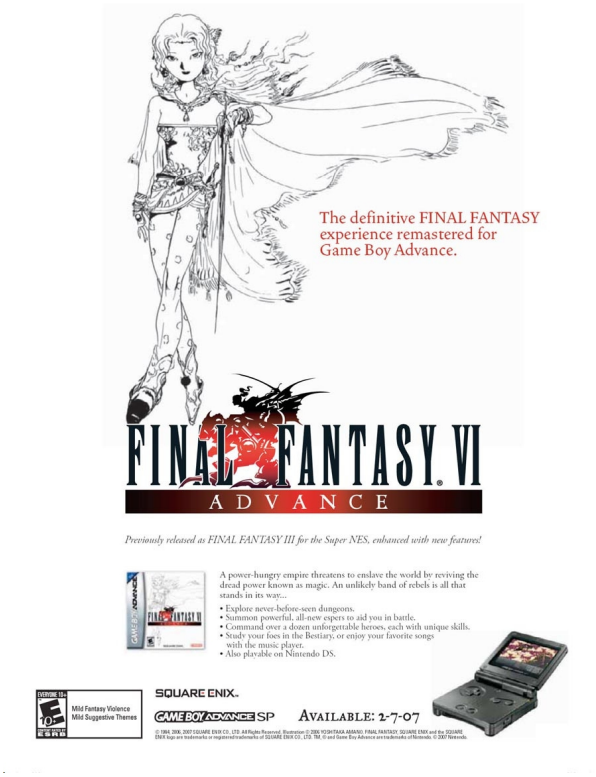

Figure 7.5. A magazine advertisement for the GBA release of *Final Fantasy VI*.

Exhaustively listing these updates and alterations is beyond the scope of this chapter but, to summarise briefly: the game was fully re-localised by translator Tom Slattery to better match the original Japanese script;[92] many, but not all, well-known bugs were fixed; colours, music, and cutscenes were tweaked to match the affordances of the GBA; and several new censorship changes were introduced, including the significant alteration of a scene in which one of the main characters is imprisoned and beaten (Slattery, 2014). Square Enix presented the GBA version as a remastered or definitive edition of the game—one that differs from the initial North American release but only due to improvements and additions—celebrating some changes while leaving many others a mystery.

'Definitive' is perhaps an unfortunate wording choice for a game that Square Enix would re-release more than twenty times in the ensuing decades, but, as *Final Fantasy* is among the longest-running JRPG series in the world, perhaps the developer is unconcerned with the aptness of their adjectives. In any case, the moniker signals a desire to construct (or, at the very least, present) an authentic-yet-improved version of *Final Fantasy VI*. This is a longstanding marketing strategy, not just with games, but across the media industry.

[92] The Japanese re-release of *Final Fantasy VI* for the GBA also featured a number of tweaks to update some terms and references, complicating its status as an urtext.

While Juul mainly works in the milieu of indie game development, he vitally identifies that authenticity is something that game developers "plan, strategize, and design" (2019, p. 9) for, rather than some sort of naturally occurring phenomenon. Authenticity in the indie scene is often constructed and presented through scale (small teams and auteurs that evoke artisanal design practices), aesthetic (bespoke designs that call back to past gaming eras), and innovation (mechanics that buck the trends of AAA blockbusters) (Juul, 2019, p. 17). In the context of remakes and re-releases, Newman suggests that authenticity is instead framed as a superior realisation of vision. Later releases of games can make a reasonable argument for authenticity or originality "if not by virtue of the time of their release, then as a product of their implementation of the original developers' intent" (2012a, p. 130). While the GBA version of *Final Fantasy VI* has no claim to being the original title from a strictly chronological perspective, Square Enix instead states that newly introduced elements are more closely aligned with their original vision. Concessions are always made in development, after all, and second (or perhaps third, fourth, or fifth) chances provide the opportunity to move past prior limitations and correct unintended mistakes.

There are many subjective arguments that could be made regarding the improved status of the GBA version of *Final Fantasy VI*: a more accurate translation, reduced censorship, and the removal of several well-known glitches[93]. Based on these parameters, Square Enix can make a compelling argument that the GBA version of *Final Fantasy VI* was the most 'authentic' version of the game when it hit the market—as counter-intuitive as that may seem—as it changed aspects of the game that they claim were insufficient at release. This type of retroactive authenticity recalls the auteurism of director's cuts in the film industry, where a re-edited version of a motion picture is released years after its initial theatrical run and advertised as a superior realisation of the director's vision. Rosenbaum (2010), in his essay about the artistic and commercial aspects of director's cuts, notes that these edited versions carry weight in two ways. First, there is a mythology at play, where audiences believe that they were initially given an inferior film due to the hinted existence of a version that better matches the director's desires—either in the tangible sense, such as a lost cut or, more ephemerally, as a concept that persists in the mind of the director (Rosenbaum, 2010, p. 14). Second, and perhaps more cynically, Rosenbaum notes that the commercial aspect of this mythology implies that "every film has at least two versions—a correct one and a more correct one" which essentially allow the film's owner to "sell the same product to the same consumer twice" (2010, p. 14). This distinction highlights the tensions between user desires and corporate interests, and how this tension is harnessed for commercial ends. Authenticity is not a universally agreed upon quality, after all, and it is often more productive to consider what motivates a claim of authenticity rather than if authenticity can be a verifiable outcome.

[93] Determining which mechanics are intended or unintended within a game can be challenging as it was not common practice in the 90s for developers to officially acknowledge mistakes. However, some of the code changes implemented in the GBA version of *Final Fantasy VI* appear to correct explicit oversights. For example, in the original Japanese and North American releases of the game, the 'evasion' statistic had no effect on gameplay. Instead, the 'magic evasion' statistic determined 'evasion' in addition to its designed function.

The videogame industry generally does not lean into director auteurism to the same degree as the film industry—the author-function, in the Foucauldian sense (1969, p. 304), more commonly manifests through publisher and developer branding. In fact, one common fan habit is to bestow Nintendo and Square Enix with a uniform agency, as if they were singular creative minds rather than massive corporations consisting of innumerable workers. Still, many formal re-releases of *Final Fantasy VI* nonetheless co-opt the same strategies as a filmic director's cut. The 2014 mobile remake of *Final Fantasy VI*, for example, advertises that Kazuko Shibuya, one of the game's original graphic designers, "personally worked on the main characters and supervised the creation of the game's graphics" (Square Enix, 2014), which were necessarily redesigned for display on mobile devices. The *Pixel Remaster* line of *Final Fantasy* remakes rely upon more ambiguous marketing rhetoric, heralding that these new versions bring "all the magic of the originals combined with quality-of-life upgrades while staying faithful to the retro design of these masterpieces" (Square Enix, 2023). In both these examples, the advertising copy purports a faithful reproduction of the past combined with modern design sensibilities: the game is somehow the same as before yet improved enough to justify an additional purchase.[94] This marketing strategy has proven remarkably effective, with Square Enix having sold over 3 million copies of its *Pixel Remaster* series games (@FinalFantasy, 2023) as of September 2023. Curiously, the production of supposedly improved versions of *Final Fantasy VI* does not render older, unedited versions unsalable. As Jones and Thiruvathukal discuss in their analysis of the Wii's virtual console, publishers will more-or-less directly port old titles to new consoles as a way to profit from the company's expansive back catalogue (2012, p. 104). Square Enix and Nintendo are more than happy to participate in porting *and* remastering, catering to players who prefer the 'original cut' of *Final Fantasy VI* or an old-but-improved version.

Of course, users have agency that exceeds simply choosing their favourite *Final Fantasy VI* from a handful of formal releases. As has been well documented, one of the central impulses of fans is to interrogate their favourite media and how it has been presented to them (Jenkins, 2004; O'Hagan & Mangiron, 2013; Pérez-González & Susam-Saraeva, 2012). With games, their curiosity is often sparked by the discovery of glitches that presumably should not be present in a title; the realisation that a game's narrative may differ between regional releases; and the unearthing of cut or hidden content within a ROM that hints at a lost development history. As Consalvo notes, fans often "recognize something different or foreign in their object of interest, and this difference is often the element that is most compelling" (2016, p. 33). Mysteries are irresistible, after all, especially when they are tethered to a beloved piece of media.

Methodological Interlude: Final Fan-tasies

Throughout this chapter, I will investigate user efforts to analyse, deconstruct, and restore *Final Fantasy VI* to an allegedly more authentic state over the past 25 years. This process is akin to the software recovery efforts I examined in *Satellite Archaeologies*, where

[94] Remasters, remakes, and definitive editions tend to have higher price points than ports. *Final Fantasy VI* for the Wii's virtual console initially sold for $7.99 while the GBA remake sold for between $29.99 and $34.99.

users-built expertise related to a central media object, its paratexts, and its technical underpinnings. The public-facing efforts of informal *Final Fantasy VI* localisers began as predominantly text-based projects—created by fans who regarded the Japanese release of the game as a sort of urtext—but eventually led to technically sophisticated ROM-hacks and investigative livestreams. However, the desire to correct an allegedly faulty localisation has grown increasingly complex with the release of new formal translations, the fan embrace of localisation quirks, and the realisation that nostalgia often trumps correctness in discussions of authenticity. These informal and formal projects muddle *Final Fantasy VI*'s status as a singular game and, simultaneously, expose how the SNES/SFC's hardware and software limitations have shaped its (ongoing) development, localisation, and reception.

Including every (re)localisation of *Final Fantasy VI* in my analysis is an impossible task due to the dizzying number of formal and informal releases. Instead of attempting a comprehensive survey of the field, I have chosen a small number of influential localisations to serve as tent poles. These versions are almost always associated with a single creative mind—from professional localisers to reclusive ROM hackers—whose work influences subsequent localisations of the game. Whether intentionally or not, these localisers have become designated interpreters (Marvin, 1988, p. 12) of *Final Fantasy VI*'s text and their translations have become central to the discourse surrounding the game. By navigating technical, linguistic, and cultural factors, and adding in their own creative flourishes to a localisation as they inscribe it, they engage in what O'Hagan and Mangiron refer to as "transcreation" (2013, p. 196). Each localiser, formal or informal, adapts the Japanese text in a different way, and the "creative addition by the translator breathes new life into the [translated text]" (O'Hagan & Mangiron, 2013, p. 54). Inscription is key to this process, as interpretation can only travel if it has been recorded in a conveyable form. This is especially true among ROM hackers, who collaborate asynchronously through websites, message boards, and shared code repositories.

I use two formal translations, two early fan translations, and three popular ROM hacks to discuss the game's chimeric nature. I picked these projects as my designated tent poles for several reasons. The two North American releases of the game, for the SNES/SFC in 1994 and GBA in 2006, represent the two major formal English-language localisations of the title. The two text-based fan translations serve as a connective tissue, of sorts, representing early efforts to address notions of authenticity that, later, became central to technologically driven efforts. Finally, the three ROM hacks are perhaps the most popular playable re-localisations to emerge from the fan translation community, each which has been downloaded thousands of times and have spawned their own remixes and spin-offs. Notably, I do not use the original Japanese translation as a point of reference. In addition to my lack of Japanese proficiency, which I previously discussed in *Satellite Archaeologies*, I am also less interested in providing a personal interpretation of *Final Fantasy VI*'s Japanese script and more concerned with how users have negotiated informal and formal localisations over the past three decades.

Title	Type	Creator
Final Fantasy III (1994)	Super NES	Square Enix (Ted Woolsey)

The first North American release of *Final Fantasy VI*, whose localisation was completed by Square Enix translator Ted Woolsey.		
Lina Darkstar's Translation (2004-2006)	Text (Forum Posts)	Eli K. Coughlin-Galbraith (AKA Lina Darkstar)
A Japanese script translation, with commentary, created by Lina Darkstar, who was a user on the non defunct Icy Brian Forums and shared the translation through a series of posts. It is commonly referred to as an important influence in later ROM hacks.		
Sky Render or RPG One Translation (2005)	ROM Hack	Sky Render
A very early fan re-translation of the game that has been both praised and criticised for being an extremely literal translation of the original Japanese.		
kWhazit's Translation (2005-2020)	Text (Website)	kWhazit
A series of web pages that compare the Japanese and English versions of Final Fantasy VI, side by side, that is often used as a reference in fan translation efforts.		
Final Fantasy VI (2006)	GBA	Square Enix (Tom Slattery)
The GBA re-release of Final Fantasy VI, featuring numerous code changes and a full re-localisation by Square Enix translator Tom Slattery. This localisation is allegedly closer to the original Japanese text but also pays homage to numerous aspects of Ted Woolsey's localisation.		
Final Fantasy VI: Ted Woolsey Uncensored Edition (2013-present)	ROM Hack	Joe Chiarelli (AKA Rodimus Primal)
A hack that aims to restore censored elements from the original Japanese release while still maintaining the nuance of the original English translation by professional translator Ted Woolsey.		
Final Fantasy VI: Retranslated (2019-present)	ROM Hack	hairy_hen
A large-scale rewrite of the game based on prior fan re-translations and heavily influenced by the official GBA translation, which it deems to be more authentic to the original Japanese release.		

Table 7.2. ROM hacks and research participants for *Final Fantasies*.

Final Fantasy VI is a sprawling JRPG that takes 35+ hours to complete, making comparing different iterations of the game an onerous task. If I were to play each of my five chosen *Final Fantasies*, in sequence, I would be signing up for over 200 hours of gameplay. Furthermore, as many of the differences between game versions are subtle—a changed word here, a restructured sentence there—sequential play makes catching localisation nuances tricky. Fortunately, I am not the only person who has identified this problem. As I will elaborate upon later in this chapter, I facilitated my analysis by modifying an existing hacker-made application called Wanderbar to play five versions of *Final Fantasy VI* simultaneously, to better track

competing localisation discourses. As I set up this application, I also learned a great deal about how *Final Fantasy VI* is programmed and, importantly, how it the storage and execution of game dialogue is shaped by cartridge affordances.

In addition to analysing these iterations of *Final Fantasy VI* textually and technically, I reached out to the creators behind these projects for interviews. As I have discussed in my methodology, tracking down participants can be challenging. Some are understandably reluctant to speak on their projects due to legal concerns, while others simply have not been active on the Internet (at least under their original pseudonyms) for 20+ years. Nonetheless, I managed to secure interviews with three fan translators and hackers. Eli K. Coughlin-Galbraith, also known as Lina Darkstar, who created an extremely influential annotated text translation of the game between 2004 and 2006. kWhazit, who began his own translation of *Final Fantasy VI* in 2005 and continued refining it for almost two decades. And, finally, Joe Chiarelli, the creator of *Final Fantasy VI: Ted Woolsey Uncensored Edition*, who has attempted to craft a version of *Final Fantasy VI* that honours the original North American localisation while incorporating elements from countless other localisation projects.

While fans tend to grant localisers auteur status, they do not go about their efforts alone. Rather, they are part of material communities that proliferate alongside videogames, turning them into convivial technologies (Sterne, 2007) and "socially embedded sites for the ongoing negotiation of meaning" (Gitelman, 2006, p. 6). In the case of fan localisation, countless informal and formal versions of *Final Fantasy VI* serve as central texts, and the ability to parse them at linguistic and technical levels is vital for those who wish to cement their expertise. Of course, even when unified around a shared pursuit, communities quickly fragment and stratify themselves in the process of building authority and establishing common truths (Marvin, 1988, p. 49). Every changed line of dialogue, every so-called 'bug fix,' and every graphical update is weighed against decades of fan discussion and documentation about what *Final Fantasy VI* should be, often manifesting in online documentation. Thus, much as I did in *The Super Nintendo Emulation System*, I also look toward a bevy of informal texts—social media exchanges, manifestos, readme files, websites, and more—to track discourse and build my understanding of community debates.

Like Marvin's electrical engineers, who constantly negotiated expertise and power within their profession (1988, p. 32), an idealised version of *Final Fantasy VI* is forever out of reach. What has emerged, instead, is a vast collection of writers, ROM hackers, and content creators—some who work independently, some who work in groups—who have developed conflicting imaginaries of what the game was and should be. Each one of these stakeholders and groups cultivate expertise about *Final Fantasy VI*, predicated on knowledge of the game's narrative, code structures, and paratexts. And while these practices are now widespread and technically sophisticated, it is worth looking back to its earlier days when informal *Final Fantasy VI* localisations were just beginning to appear on the Internet.

T-Shirt Nagasaki, Brand new Ford trucks

Very few *Final Fantasy VI* fan localisation projects claim to have translated the Japanese version of the game from scratch. Instead, they gesture toward a several key games and/as

texts as points of inspiration. Most cited are the formal releases of the game and a handful of prevalent ROM-hacking projects—fully playable iterations that have circulated widely across digital marketplaces, emulation communities, and livestreams. But, as I sifted through projects and paratexts, I noticed that two text-based translations were mentioned with surprising frequency: a message board thread by Lina Darkstar and a web-based translation by kWhazit. Both projects, which began in the mid-2000s, are among the earliest documented informal localisations of *Final Fantasy VI* and are defined by their heavily annotated style. Their authors present localisation changes with extensive commentary that interprets Japanese and North American scripts, opines on Nintendo of America's censorship practices, and muses on the SNES/SFC's technical quirks. I chatted with both informal localisers to discuss their motivations, their process, and their recollections of early fan communities on the Internet.

Eli K. Coughlin-Galbraith, who once frequented the Icy Brian RPG forums under the pseudonym of Lina Darkstar, is fully aware of the ongoing influence of their work. They quickly responded to my initial interview request with "this day was bound to come!" before agreeing to participate. The timing of the interview coincided with a sombre milestone. As we began the interview, Coughlin-Galbraith lamented that the eponymous Icy Brian had just shut down the website's message boards, making their old stomping grounds accessible only through secondary archives such as The Wayback Machine. Coughlin-Galbraith noted that the message boards had originated as a gathering space for fan-fiction writers, and it was this literary bent that made it an ideal space for discussing the nuances of videogame localisation. After all, who would be more interested in character analyses and narrative deconstructions than a group of writers obsessing over *Final Fantasy VI*'s main cast?

Like many videogame fans in the late nineties and early aughts, Coughlin-Galbraith's interest in *Final Fantasy VI*'s localisation was sparked by a love for the game and enabled by the technological affordances of the rapidly expanding Internet. Icy Brian's forums provided a venue for fans to gather and discuss their favourite games; emulators and ROM files allowed users to freely play digital games from other jurisdictions;[95] and the promiscuous nature of the web facilitated the travel of digitised paratexts, providing glimpses into non-local gaming cultures. Having begun studying Japanese in middle school to better connect with their favourite SNES/SFC games, Coughlin-Galbraith relished these new opportunities.

> I downloaded the Japanese language ROM, I played it, and I found a couple of things in my first three minutes that didn't match the translation that I remembered. By the time I finished two hours, I had written down a bunch of notes about what I thought was interesting. I was already thinking, by then, that I'd tell the guys at the forum about this—where I lived my online life in those years. I wanted to tell all my friends: "Hey, I found all this cool stuff. Let's talk about it."

What began as a sharing of findings gradually evolved into a sprawling localisation analysis that Coughlin-Galbraith completed between 2004 and 2006. Although initially scattered across

[95] As mentioned in *The Super Nintendo Emulation System*, while user-made SNES/SFC emulators were available as early as 1994, it was not until the late nineties that they could run smoothly on the average home computer.

countless message board posts, forum members XStylus and SakujoNoJidai compiled the posts into a PDF well before Icy Brian's website went offline. Dipping into the document reveals the process of discovery, deliberation, and creativity within the message board community, many elements of which would travel to other fan localisation and ROM hacking projects.

One of the more striking elements of Coughlin-Galbraith's work is how thoroughly they explain the game's initial localisation and their own creative choices in rewriting it. They include pronunciation guides, debate the use of certain terms, and even elaborate upon potential subtext to the game's dialogue. When discussing one of *Final Fantasy VI*'s central characters, Tina Branford, they provide phonetic pronunciation (**T**-Shirt **Na**gasaki, **Bran**d new **Ford** trucks), debate whether she should be referred to as a 'sorcerer' or 'magician,' and offer some musings into how these two terms tie into the game's underlying theme of extracting power from living beings. Earlier, I lamented Square Enix's strategy of releasing new versions of *Final Fantasy VI* with few update notes beyond evocative ad copy. Coughlin-Galbraith, however, opted for the inverse approach, and the result is an in-depth chronicling of the game's plot, themes, and characters. While some of their observations would have been well-known at the time—such as the realisation that Nintendo of America removed all references to alcohol as part of their nineties censorship policies—others serve as insightful character studies that flesh out the game's protagonists and villains. For example, one of their earliest lost-in-translation realisations was that Locke Cole, the game's second recruitable character, is more altruistic and less romantic than the North American localisation implies (Figure 7.6).

The rest of the conversation had minor differences.

Lock: Somebody important to me was taken away by the Empire. I've hated the Empire ever since because of that.
If the Empire keeps going on this way, it'll just make more people like me. That's why I joined the Returners.
Tina: But... I don't have an "important person."
Lock: Ah, that's not true. Besides, maybe there are people who think you're important to them. For their sake too...

LOCKE: Someone important to me was jailed by the Empire. I've hated the Empire ever since... I joined the Returners when I realized the Empire was rotten to the core. I wanted to make a difference.
TERRA: But...I have no significant "other" in my life...
LOCKE: That's not entirely true. Besides, I'm sure there are people who feel YOU'RE important to them! They are counting on you...

Heh. So Lock's motivation is a bit more altruistic, and a bit more clear. Tina's not looking for a specific significant "other" but just a good friend. Which also means that Lock isn't hitting on Tina so much as proclaiming friendship with the "that's not true" line. He's also not putting on quite so much pressure, which is nice.

Figure 7.6. An excerpt from Coughlin-Galbraith's translation of Final Fantasy VI, featuring a scene in which Locke and Tina discuss their feelings. Green text indicates the 1994 North American localisation, blue text indicates their own localisation attempt.

"Having a character emphasis allowed me to become a resource for a lot of [fanfiction] authors that I admired," noted Coughlin-Galbraith, who recalled that much of their work "sacrificed tone for meaning" with the expectation that community members would eventually craft better dialogue. From the beginning, the text occupied a liminal space, guiding those who wished to create their own derivative texts based on *Final Fantasy VI*.

This annotated style is something that kWhazit's and Coughlin-Galbraith's endeavours hold in common. kWhazit's translation journey similarly began with a strong interest in SNES/SFC games—he excitedly listed titles ranging from *Chrono Trigger* (1995) to *Lufia 2* (1995) during our interview—and he developed his language skills through college-level Japanese classes. After hearing rumours about potential differences between regional variations of *Final Fantasy VI*, he tracked down a Japanese text dump[96] to determine if these claims held any truth:

> Anytime you see anything about a game that was originally in Japanese, of course, you'll get all kinds of rumours, some true and some not, about how "this was censored" or

[96] A "text dump" is a document that contains all the text from a game, extracted from a ROM image, usually organised to be more readable (e.g. listing dialogue in a roughly sequential order).

> "that was cut out" or "they messed around with the meaning of this thing." That's kind of what got me started, just looking at these things in depth.

While similar in scope, kWhazit's process differed from Coughlin-Galbraith's episodic message board posts. Instead of writing for a specific audience and soliciting feedback as he went along, kWhazit originally had no aspiration to make his findings public. Translating directly from Japanese and using what few paratexts were available as supplementary materials,[97] he inscribed his translation efforts into a spreadsheet and only published them to his website after realising that other folks may be interested in his findings. The grid-based spreadsheet structure has permeated his web layouts: three columns, each featuring a different set of text, with headers providing additional context and commentary (Figure 7.7).

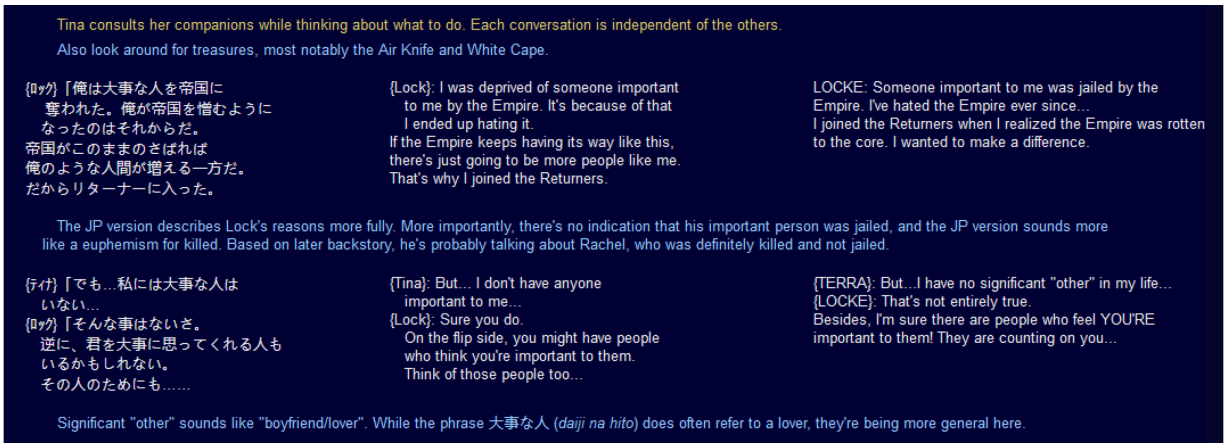

Figure 7.7. An excerpt from kWhazit's translation of Final Fantasy VI, featuring the same scene as mentioned above. From left to right: Japanese text, kWhazit's own localisation, and the 1994 North American translation.

Regardless of their initial expectations, Coughlin-Galbraith's and kWhazit's work has travelled extensively since they first published them. This begs the question: why did they draw so much attention? While neither would claim to be the first informal localisation of *Final Fantasy VI*, they were likely among the first to publicly share their efforts in a comparative format. As I will discuss ahead of my localisation analysis, it is very difficult to compare videogame translations by playing them in sequence. Even in instances where *Final Fantasy VI*'s dialogue has been dumped to a text file, a different problem emerges: the dialogue is presented bereft of narrative context. Coughlin-Galbraith and kWhazit address this issue using similar strategies. First, they include supplementary information, akin to stage directions, to describe the on-screen action that accompanies spoken lines. Second, they offer a side-by-side comparison of the game's North American text and their own re-translations (and, in kWhazit's

[97] Both Coughlin-Galbraith and kWhazit note that a Japanese artbook, which was scanned and uploaded to the Internet, influenced their work. Although written in Japanese, it presented romanised versions of character names, including the controversial translation of the game's primary antagonist "Kefka" as "Cefca."

case, the Japanese text), allowing readers to rapidly flip back-and-forth. Finally, their commentary identifies points of contention and suggests possible re-localisation strategies. While they did not expect their work to become foundational, they effectively created central texts that *Final Fantasy VI* localisers continue to reference. Their localisations prove insightful as they provide a glimpse of what an idealised meta-text for an English version of *Final Fantasy VI* might have been in mid-aughts: a North American localisation that rejects Nintendo of America's censorship policies and translates text in a much more literal fashion.

Literal translation, however, was an expectation that both amateur localisers tempered as they gained a better understanding of the localisation process. Coughlin-Galbraith readily admitted their early cockiness: they had previously proclaimed that Ted Woolsey was a "hack" and recalled being "particularly insufferable" about discovering omissions and errors in the game's script. This unearthing is important to note as, at the time, localisation processes were steeped in mystery. kWhazit recalled that much of his initial motivation involved dispelling rumours that swirled around the English localisation of the game. This impetus, as Reinhard recounts in his study of archaeogaming, is part of a broader myth-hunting ethos that hobbyist and scholarly media archaeologists share:

> Much of videogame archaeology is a search for myths. This ranges from the Atari landfill, to quests to find prototypes or lost games, to glitch-hunting in established titles. (Reinhard, 2018, p. 27)

Reinhard furthers that most of these so-called myths never really had to be mysteries to begin with (2018, p. 28). In the case of *Final Fantasy VI*, and many other similar titles, they are the result of corporate practices that intentionally obfuscate regional differences and erase development histories. North American fans were expected to accept the game at face value, unaware of regional differences that manifested due to corporate, technical, and cultural reasons. Coughlin-Galbraith's and kWhazit's efforts were among the earliest deconstructions of these changes and helped spur questions about the game's provenance.

If I had to pick a fulcrum for the growing interest in Square Enix localisation processes, it would be Square Enix translator Ted Woolsey. Early informal translators framed Woolsey as a nefarious villain, chastising his linguistic ineptitude and his implementation of Nintendo of America's censorship policies. This led many fans to desire what was essentially an inverted director's cut, which would strip away Woolsey's influence on the game's narrative. These criticisms would soften over the years due to the recognition of the limitations Woolsey faced—both Coughlin-Galbraith and kWhazit recounted the tale of him translating the game in 30 days[98]—and a growing appreciation for his creative flourishes. In many ways, Woolsey's localisation is a pivot text: a version of the game's script that, while not the original, has proven to be foundational to future localisations.[99] Woolsey has been remarkably open about his experiences at Square Enix over the years, and his comments about working with limited cartridge space contributed to many rumours about *Final Fantasy VI*'s localisation. In an early

[98] Woolsey has confirmed this timeline in multiple interviews (Woolsey, 2016).

[99] O'Hagan and Mangiron have discussed how French, Italian, German, and Spanish localisers often use the English localisation of Japanese game as a "pivot language" to base their work on (2013, p. 121).

interview with *Super Play Magazine*, he lamented that "you can get twice as much information in the same space when written in Japanese as you can writing in English" and, because of this, it was often necessary to "rethink an entire plot without actually changing any of the parameters that govern how the plot has implications on the rest of the game" (West, 1994, p. 15). This self-admitted reduction of narrative depth motivated Coughlin-Galbraith, kWhazit, and many others, who presumed that, since they were not beholden to technical limitations or corporate logistics, they could create a superior rendition of *Final Fantasy VI*. The process, of course, ended up being more difficult than they ever imagined.

Woolsey's reflections are a useful bridge between textual and technical analysis, as his claim that English takes up more space on a videogame cartridge is well-known but rarely interrogated. Thus, to better comprehend the efforts of fan translators and game hackers, I will now briefly scrutinise how dialogue is stored and executed within *Final Fantasy VI*. While somewhat complex, these processes reveal the affordances and limitations faced by the game's developers that were, subsequently, passed on to the informal actors (hobbyists, hackers, etc.) that have extensively tinkered with *Final Fantasy VI* during its afterlife. In this pursuit, I take a cue from Montfort and Bogost to discuss how the SNES/SFC console and cartridges "enable, constrain, shape, and support the creative work that is done on them" (2009, p. vii). However, while early platform studies are concerned with how technology shapes formal game development, I am equally intrigued by its effect on ensuing informal practices.

Hex Keys

In my methods section, I stressed the importance of code-based analysis when studying cartridge-based videogames while lamenting the barriers that hinder this type of research. There is the initial barrier of studying game data that is stored on a physical cartridge, as it first needs to be extracted as a ROM image to be properly examined. Additionally, due to console affordances and cartridge storage limitations, code is often compressed in esoteric ways, written in a low-level programming language, or wedded to a particular hardware device (Wm. R. Bailey, 2008, p. 75). Thus, *Final Fantasy VI* and other titles prove difficult to access and interpret without the aid of special tools. Luckily, ROM hackers have developed a bevy of applications that make scrutinising and editing *Final Fantasy VI*'s code structures possible, crystallising informal diagnostic techniques that have proliferated during the SNES/SFC's afterlife.

I am not an electrical engineer nor an expert hacker, so instead of working from scratch I once again refer to Bucket Mouse's excellent guide on the underlying architecture of SNES/SFC games (2019), appended with information from numerous other wikis and how-to guides. While this technical documentation was once only available to professional developers, material communities have since experimented with hardware and co-opted the console's original development manuals (Nintendo of America, 1993) to figure out how the SNES/SFC operates. As Arsenault and Keogh have noted, designing games for nineties consoles was an extremely formalised process limited by licensing agreements, development kits, and upfront costs (2017, p. 30; 2019, p. 22). As home computers became powerful enough to develop and run SNES/SFC emulators, however, game design expertise for the console has been essentially re-learned and

re-inscribed by informal actors. Understanding how a cartridge works is often a first step for ROM hackers and reproduction makers who wish to start their own projects.

I begin my summary with the somewhat broad idea that, when the SNES/SFC is turned on, it maps information into different areas of its memory, so it knows where to find what it needs, when it needs it. This memory mapping is driven by the console, but Bucket Mouse points out that "what is activated and what is not is (mostly) determined by how the cartridge is wired" (2019). Essentially, the SNES/SFC will map memory in slightly different ways based on what type of cartridge is inserted.[100] Nintendo's official development manual, seen in Figure 7.8, provides a glimpse into how this is handled.

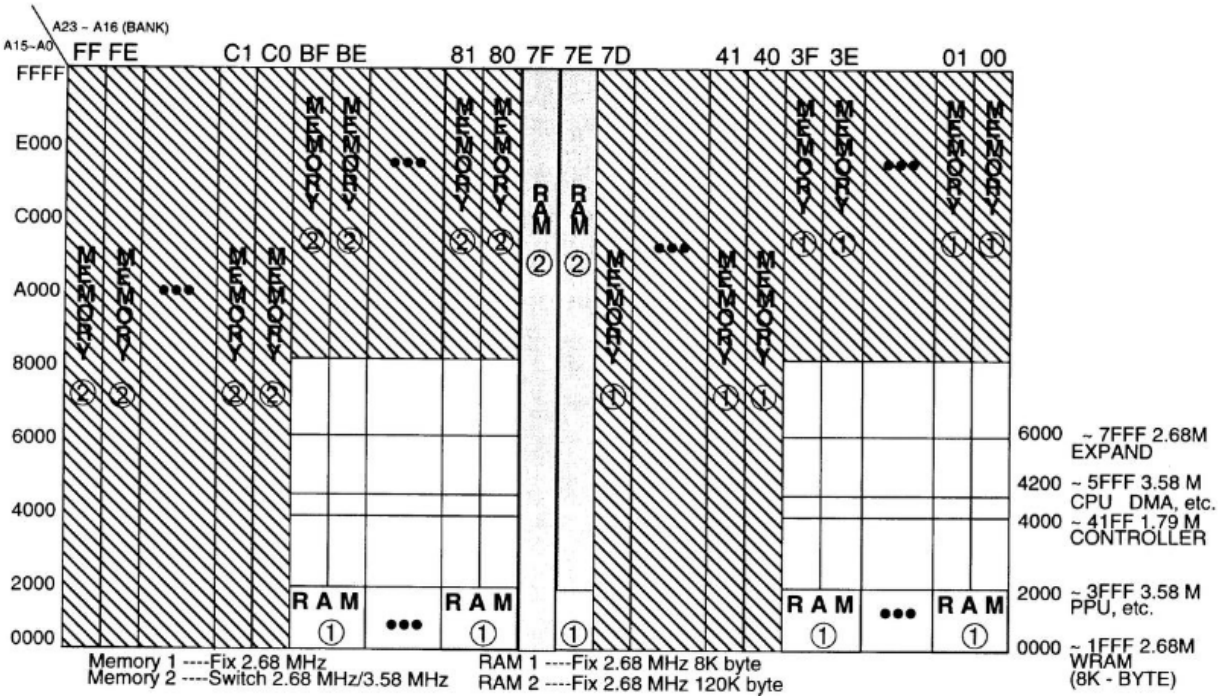

Figure 7.8. An excerpt from the *SNES Development Manual* (Nintendo of America, 1993)

Technical manuals are necessarily complex, but it is only important to extract a few basic concepts from this diagram. Broadly speaking, the diagram represents all the memory space available to the SNES/SFC when it is in operation, mapped using hexadecimal numbers that range from $000000 on the bottom right to $FFFFFF on the top left.[101] This is an important foundational concept as the SNES/SFC uses hexadecimal addresses to identify where information is stored in the memory map. The white section of the diagram represents areas of

[100] The SNES/SFC featured numerous cartridge variations with the most common types being LoROM, HiROM, Super MMC, SAS, SFX, and ExHiROM. However, as I mentioned in *The Super Nintendo Emulation System*, these are generic mappings and there are many other variations.

[101] Hexadecimal is a base 16 numbering system that can be used to represent large numbers with fewer digits. Instead of counting from 1 to 16, hexadecimal works in the following sequence: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F. The "$" prefix is often used to signal a hexadecimal address.

the memory map that are usually predefined by the SNES/SFC, providing access to memory and registers at set locations. It is best to think of this part of the map as basic functions that are more-or-less the same across different cartridges, such as RAM addresses and controller inputs/outputs.

Most relevant to my analysis is the shaded part of the memory map, which encapsulates areas where the SNES is expecting data from the game's ROM chip. Depending on the type of cartridge, the game ROM can reserve approximately 1MB to 6MB of space for game data. Theoretically, the developer could organise data (graphics, text, etc.) in this space in whatever fashion they please, but they typically followed a few basic conventions. For example, a ROM header is usually mapped between $00FFC0-$00FFDF, which identifies the game title, producer, region, and several other technical parameters (*SNES ROM Header*, 2020). While this process was designed to work with original hardware, it is now possible to mimic the SNES/SFC's hardware- and software-side functions using an emulator and a ROM image (a computer file which contains a copy of the data from a read-only memory chip).

There are countless additional nuances and details about how the SNES/SFC functions, but this is a good enough baseline to develop a few key ideas. First, as Woolsey recounted, there is an extremely limited amount of space in a game cartridge for data. A game rich with assets, such as a sprawling JRPG, would typically use most or all this space, and developers would often devise ingenious (sometimes counterintuitive) methods to compress data. Second, there is no set way that game data is arranged in a ROM. If you open two different games, even from the same developer, their text, graphics, and sounds would be stored in different places. Retroactively figuring out what content is where is one of the key struggles for videogame hackers, who usually strive to create a ROM map to identify how a game's data is arranged. Finally, retroactively making changes to a cartridge-based videogame can be difficult due to the stringent space requirements. For example, if a ROM hacker wanted to implement one of Coughlin-Galbraith's suggested translations…

> **Original Text:** "Someone important to me was jailed by the Empire. I've hated the Empire ever since…"
>
> **Updated Text:** "Somebody important to me was taken away by the Empire. I have hated the Empire ever since because of that."

…this would, by default, result in complications. As the new line of dialogue is longer, it would exceed the amount of space initially allocated in the ROM. As a result, it would either get cut off or would overwrite whatever data is stored afterward.

The bulk of *Final Fantasy VI*'s dialogue is mapped between $CD0000 and $CEF0FF in the ROM (geiger, 2022), but this does not paint a complete picture of how the game stores its text. First, the location of each line of text must be listed in a pointer table that coordinates how it is activated by a character, event, or object. Second, text is subdivided into sections depending on how it is presented in the game (battle text, dialogue, item names, etc.). Finally, all the game's text is stored as hexadecimal values rather than plain text and thus cannot be parsed at a glance. Understanding and editing hex code is central to the efforts of hackers, so I will take a moment to scrutinise Tina Branford's character introduction to demonstrate how intricate this

process can be. The text in question is “A mysterious young woman, controlled by the Empire, and born with the gift of magic…”

Opening the *Final Fantasy VI* ROM image[102] in WindHex—a hex editor made by Bongo of Genecyst East Software in the mid-aughts—and navigating to $CD0620e (as defined in the game’s dialogue pointer table) reveals how this text is stored (Figure 7.9).

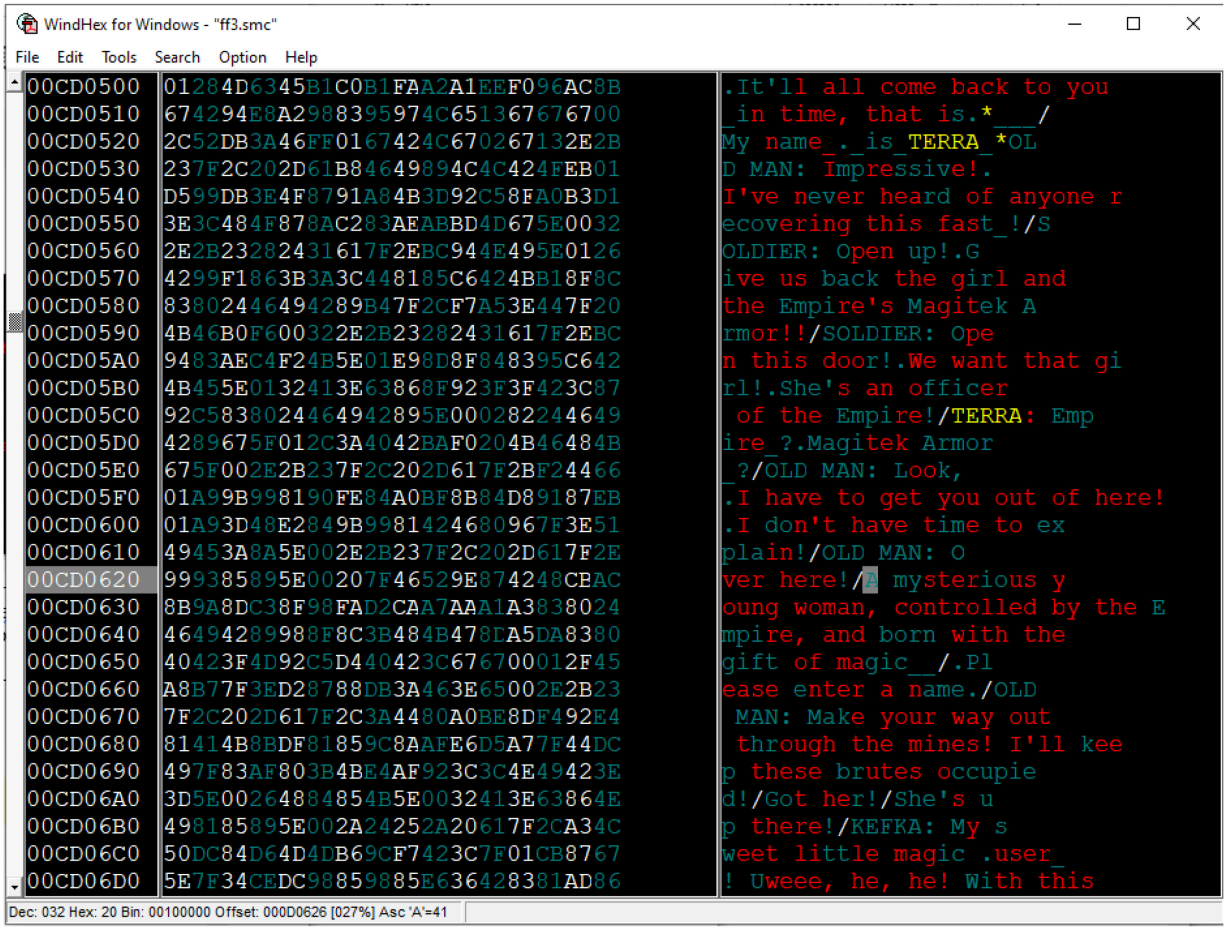

Figure 7.9. A screenshot of the hex editor WindHex, beginning at address $CD0620. From left to right, the different panes are hexadecimal address, hex values, and a plain text translation of the text info that is generated by the editor as an add-on feature.

As expected, instead of legible letters and words, WindHex displays line after line of values ranging from 00 to FF. Each one of these values is associated with text characters that, in turn, are represented on screen using stored graphics (a font created for the game). Tina’s introductory line is made up of the following values, in sequence:

[102] For all examples of ROM image analysis, I use a ROM image I created myself using an Analogue NT and the North American release of *Final Fantasy VI* (*Final Fantasy III*). I discuss some of the legalities of this practice in earlier chapters but, ostensibly, this is allowed under fair use/dealing in North America.

20 7F 46 52 9E 87 42 48 CB AC 8B 9A 8D C3 8F 98 FA D2 CA A7 AA A1 A3 83 80 24 46
49 42 89 98 8F 8C 3B 48 4B 47 8D A5 DA 83 80 40 42 3F 4D 92 C5 D4 40 42 3C 67 67

When I first located this string of values, I believed that each one could be converted into a single letter of the English alphabet, but this is not the case. To save space on the ROM, some hexadecimal values represent common combinations of letters and numbers, functioning as a space-saving cipher. In fact, there are over two hundred different letter/number combinations that can be referenced using hexadecimal values, as seen in the game's text table:

$11=2	93=r	A9=l	BF=u	D5=l'	EB=e!	03=LOCKE	29=J	3F=f	55=1
$16=2	94=n	AA=ed	C0=al	D6=li	EC=ld	04=CYAN	2A=K	40=g	56=2
$14=1	95=at	AB= f	C1= p	D7=ho	ED=no	05=SHADOW	2B=L	41=h	57=3
80=e	96=to	AC= y	C2=g	D8=of	EE=ac	06=EDGAR	2C=M	42=i	58=4
81= t	97= i	AD=hi	C3=om	D9=Yo	EF=ce	07=SABIN	2D=N	43=j	59=5
82=:	98=,	AE=is	C4= d	DA=h	F0=k	08=CELES	2E=O	44=k	5A=6
83=th	99=ve	AF=es	C5=f	DB= n	F1= u	09=STRAGO	2F=P	45=l	5B=7
84=t	9A=ng	B0=or	C6= g	DC=ee	F2=oo	0A=RELM	30=Q	46=	5C=8
85=he	9B=ha	B1=l	C7=ow	DD=de	F3=ke	0B=SETZER	31=R	m	5D=9
86=s	9C= m	B2= c	C8=rs	DE=so	F4=ay	0C=MOG	32=S	47=n	5E=!
87=er	9D=Th	B3=ne	C9=be	DF=gh	F5=w	0D=GAU	33=T	48=o	5F=?
88= a	9E=st	B4='s	CA=ro	E0=ca	F6=!!	0E=GOGO	34=U	49=p	61=:
89=re	9F=on	B5=nd	CB=us	E1=ra	F7=ag	0F=UMARO	35=V	4A=q	62="
8A=in	A0=yo	B6=le	CC=ri	E2=n'	F8=il	20=A	36=W	4B=r	63='
8B=ou	A1= b	B7=se	CD=wa	E3=ta	F9=ly	21=B	37=X	4C=s	64=-
8C=d	A2=me	B8= l	CE=we	E4=ut	FA=co	22=C	38=Y	4D=t	65=.
8D= w	A3=y	B9=a	CF=Wh	E5=el	FB=.	23=D	39=Z	4E=u	66=,
8E= s	A4=en	BA=te	D0=et	E6=!	FC=ch	24=E	3A=a	4F=v	67=_
8F=an	A5=it	BB= l	D1= r	E7=fo	FD=go	25=F	3B=b	50=w	73="
90=o	A6=ar	BC=pe	D2=nt	E8=ti	FE=ge	26=G	3C=c	51=x	7F=
91= h	A7=ll	BD=as	D3=m	E9=We	FF=e_	27=H	3D=d	52=y	/00
92= o	A8=ea	BE=ur	D4=ma	EA=lo	02=TERRA	28=I	3E=e	53=z	*01
								54=0	*13

Table 7.3. The main text table used for dialogue in the North American release of *Final Fantasy VI*.

Some of these hexadecimal values refer to variables, such as character names, that are customised by players and are stored in SRAM (save data). For example, while this text table currently reads "02=TERRA", more accurately, it recalls whatever name the player has chosen for the character. However, one of the key purposes of the text table is to squeeze the most out of the limited space on the SNES/SFC cartridge. Many text combinations were likely chosen because they are extremely commonplace in the English language, such as "on" and "ll", reducing the number of stored values needed to write a sentence within the ROM.

This is a lot of technical information, but I mainly want to emphasise that the narrative of *Final Fantasy VI*, alongside its formal and informal iterations, is shaped by both technical and linguistic affordances. To provide a side-by-side analysis, I can compare the same line of text

from the Japanese and North American releases of the game, as presented in-game and as stored using hex values in the *Final Fantasy VI* ROM (Figure 7.10 and Figure 7.11).

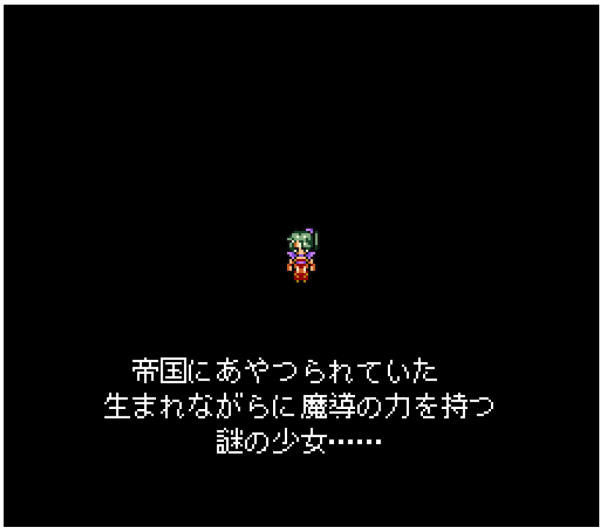

Figure 7.10. Japanese dialogue displayed in game (above) and stored as hex values (below)in the Japanese release of *Final Fantasy VI*.

D9 95 8B B1 83 A7 AD E0 7F 01 1E B9 9D AD 93 2B A7 95 E5 EB BB 1E 13 83 01 14 06 1D B4 9B 1C 5A 1C 1A D8

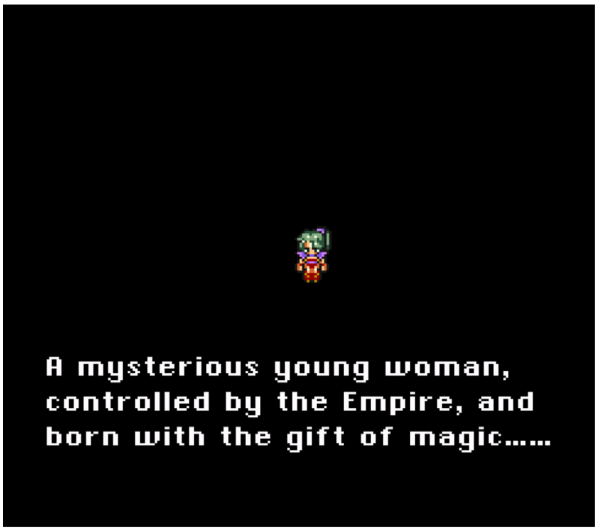

Figure 7.11. English dialogue displayed in game (above) and stored as hex values (below) in the North American release of *Final Fantasy VI*.

20 7F 46 52 9E 87 42 48 CB AC 8B 9A 8D C3 8F 98 FA D2 CA A7 AA A1 A3 83 80 24 46 49 42 89 98 8F 8C 3B 48 4B 47 8D A5 DA 83 80 40 42 3F 4D 92 C5 D4 40 42 3C 67 67

The difference in length between these text versions is obvious. Even though the North American release of the game utilises several programming techniques to cram as much dialogue into *Final Fantasy VI* as possible, it appears that Woolsey's assessment was more-or-less correct: English language text takes up almost 50% more space in the ROM image than the Japanese, complicating efforts to re-localise the game in its original medium. These technical constraints—alongside Nintendo of America's censorship policies, Woolsey's authorial voice, and differing cultural contexts—have converged to influence numerous localisation and re-localisation efforts.

Learning how to work with, or around, these constraints has led to the development of numerous applications that render *Final Fantasy VI* readable and malleable for informal users. In the purview of localisation, there is a cyclicality between text-based and technical work. Emulators and ROM dumpers, for example, were vital for Coughlin-Galbraith's and kWhazit's early work, allowing them to play the Japanese release of *Final Fantasy VI* and isolate the game's dialogue. In turn, localisation needs, such as the desire to create more space for dialogue within a game ROM, helped drive the development of new hacking tools. By observing these acts of deconstruction and reconstruction, I can better understand the "crystallized set[s] of social and material relations" (Sterne, 2006, p. 826; in Wershler, 2019) that are intrinsic to

material communities of localisers. Hex editors such as WindHex require users to learn the basics of hexadecimal code, informal text localisations like Coughlin-Galbraith's and kWhazit's establish best practices for approaching *Final Fantasy VI*'s script, and more sophisticated hacking tools (such as the all-in-one editor FFusME) standardise ROM-editing procedures. Each one of these technical achievements is part of an operative chain that solidifies past practices and defines new ones. As Siegert notes, people learned to count before they created abacuses, but each technical object enables and determines new operations (2013, p. 11). Homing in on any of any link in the chain can be enlightening, which is why I now turn my attention to Wanderbar, a program that embraces developments by both ROM hackers and fan translators to study the divergent localisations of *Final Fantasy VI*.

Come Wander(bar) With Me

In 2017, professional translator, hobbyist game hacker, and published author Clyde "Tomato" Mandelin created a unique program[103] called Wanderbar (Figure 7.12). When describing his creative process, Mandelin makes Wanderbar sound like a MacGyver-esque endeavour: "I basically took a Super NES emulator and glued it to a web browser" (Mandelin, 2020), using the results to display and compare different translations of Nintendo games. Like many hacker-made tools, Wanderbar is an assemblage of freely available components. The Snes9x emulator is used to play a ROM image of a game. While the game is booted, a Lua script "handles all the main logic and keeps tabs on the emulated game every emulated CPU cycle" (Mandelin, 2017). That is, by way of a cross-platform scripting language, Wanderbar keeps an eye on what is happening in the game as it is being played, identifies certain events to use as cues, and then feeds the data it extracts from the ROM image into an HTML sidebar. This sidebar is a customised browser window (or series of browser windows) that Wanderbar places next to the emulator on the user's screen.

[103] Referring to Wanderbar as a program is not entirely correct. It is more accurately a software assemblage that includes an emulator, a web browser, and interchangeable text files. However, I will refer to it as a program for the purposes of brevity, and because Mandelin has occasionally labelled it in a similar fashion.

Figure 7.12. Mandelin's Wanderbar application displaying five simultaneous translations of *Final Fantasy VI*.

Despite the program's Frankensteinian nature and its creator's self-admitted programming limitations, Wanderbar (or Wanderbars, as Mandelin refers to its various variations) has a fairly refined output. As seen in the above screenshot, the program can display four translations of a SNES/SFC game alongside an active playthrough, allowing for quick and easy comparative analysis. Wanderbar is not strictly limited to displaying dialogue, however, as it is capable of both extracting and editing data within the ROM image. For example, Mandelin created a custom plugin for *Super Mario World* (1991) that "keeps track of weird stats" and "changes things in the game when certain conditions are met" (2018), such as transforming all enemies into items at timed intervals. The flexibility of the program is impressive but still somewhat unrealised. Mandelin has only created Wanderbars for a small number of games and, while the program is freely available for other folks to work with, developing new Wandberbars requires the editing of improvised, esoteric code structures.[104]

Wanderbar's windowed structure and self-referential ethos tie well into broader discussions of the remediation that new media technologies make possible (Bolter & Grusin, 1999, p. 41). As I discussed in *The Super Nintendo Emulation System*, standalone emulators strive toward both immediacy (i.e. accurately reproducing a game console) and hypermediacy (i.e. introducing new meta-features, such as save states). Wanderbar builds upon the latter

[104] Mandelin has noted that he was hesitant to release Wanderbar to the public because it has not been tested on any system other than his own and he does not have the bandwidth to provide technical support (Mandelin, 2020).

concept through its multi-window assemblage. Each section of its HTML sidebar complements the main playthrough with information sourced from external iterations of a game or hidden code structures. As Bolter and Grusin note, hypermediacy "makes us aware of the medium or media and (in sometimes subtle and sometimes obvious ways) reminds us of our desire for immediacy" (1999, p. 34). Seeing different versions of *Final Fantasy VI* side-by-side, dynamically updated throughout a normal playthrough, I can not help but think of it as a technically enhanced continuation of Coughlin-Galbraith's and kWhazit's early analyses. There is a reflective nostalgia at work here that recognises the multiplicity of the game and the impossibility of reconciling it into a single text, while still recalling past forms and functions. Through his technical intervention, Mandelin builds upon informal localisation techniques and expertise to show how *Final Fantasy VI* has been influenced by various stakeholders.

Mandelin clearly recognises the potential of Wanderbar to weave various versions of a single game together, having used it as a centrepiece for his *Legends of Localization* Twitch streams. Though this live-on-stream comparison may seem like a niche venture, it is part of his semi-professional localisation analysis. Consalvo has outlined his contributions to the unofficial localisation of *Mother 3* (Consalvo, 2016, p. 44) and game publications (Corriea, 2014; Schreier, 2013) have extensively covered his Twitch streams and blog posts. One of the main draws of Mandelin's efforts is that, due to his career as a professional translator, he bridges the gap between informal and formal pursuits. In addition to pointing out differences between regional variations of a single game, he provides insights into the potential reasoning behind the changes. In his dissection of *EarthBound*'s North American translation, for example, he notes that a reference to a "Guinness World Record" was changed to "world record" and speculates it was done to appease Nintendo of America's cautious legal department (Mandelin, 2013). Mandelin essentially provides colour commentary on a game's localisation while recording a Let's Play, taking live feedback on Twitch and inscribing his findings in blog posts, articles, and even books. Since he began these public-facing efforts he has, much like Coughlin-Galbraith and kWhazit, become a central figure in fan communities and a resource for informal localisers.

I first stumbled upon Wanderbar through a simple Google search, but my discovery of the program was somewhat serendipitous. While I had not extensively communicated with Mandelin in the past, we were both active members of the Starmen.net community for periods of our lives and were vaguely familiar with one another. Mandelin had covered my EarthBound hacks, *HyperBound* (2009) and *Unearthed* (2017), on his *EarthBound Central* blog and I was well aware of localisation work and his status as co-founder of Starmen.net. Even more fortuitous was the fact that Mandelin's Wanderbar appeared to be *exactly* the tool that I was looking for, capable of comparing multiple translations of a videogame simultaneously—it even had a plugin for comparing localisations of *Final Fantasy VI*! There was a small wrinkle, however. While three out of the five iterations of *Final Fantasy VI* I wished to study were already integrated into Wanderbar, two of them (*Ted Woolsey Uncensored Edition* and *Retranslated*) were not. I initially thought adding new versions of the game to Wanderbar would be easy but as has become a common theme in my dissertation, it required a bit more work than anticipated. This tinkering proved productive, however, as it helped me understand several techniques that ROM hackers

use to work around the SNES/SFC's strict memory constraints to create new versions of the game that push past the limitations of initial releases.

I mentioned earlier that Wanderbar is less of a program and more of an assemblage of software and supporting files that can be modified to work with different games. In the case of the *Final Fantasy VI* version of Wanderbar, perhaps the most vital supporting file is an HTML document that contains text that has been dumped from several versions of the game. This HTML file is generated using a custom application that reads the hex values within a *Final Fantasy VI* ROM image, converts them into plain text, and then dumps that text into HTML files that are readable by Wanderbar. I have included an excerpt of one of these HTML files in Figure 7.13, to better display how this complex process results in a simple output.

```
<div id="gba-script-26">Guard: Open up! We're here for the<br />Magitek armor pilot!</div>
<div id="gba-script-27">Guard: Open this door right now, and hand<br />over that girl! She's an agent of the<br />Empire!</div>
<div id="gba-script-28">Terra: Empire...?<br />Magitek armor...?</div>
<div id="gba-script-29">Old Man: There's no time to explain! You<br />need to get out of here! These fools<br />aren't going to listen to reason...</div>
<div id="gba-script-30">Old Man: This way! Quickly!</div>
<div id="gba-script-31">A mysterious young woman,<br />born with the gift of magic,<br />and enslaved by the Gestahlian Empire...</div>
<div id="gba-script-32"><br />Please enter a name.</div>
<div id="gba-script-33">Old Man: Make your way out of town<br />through the mines! I'll try to buy you<br />some time.</div>
<div id="gba-script-34">Guard: There she is!</div>
<div id="gba-script-35">Guard: Up there!</div>
<div id="gba-script-36">Kefka: My sweet little magic user...<br />Uwee-hee-hee!<hr class="newpage" />With this slave crown, you'll be all mine!</div>
<div id="gba-script-37">Terra: No! Get away from me!</div>
```

Figure 7.13. An excerpt from Wanderbar's HTML file, showing dialogue text that has been extracted from the GBA version of *Final Fantasy VI*

Each line of text in *Final Fantasy VI* is associated with a hexadecimal address that defines where it is stored in the ROM, as listed in the game's text pointer tables. These text pointer tables are different between versions, due to changes in localisations or, as with the GBA version, an entirely new console architecture. What Mandelin has essentially done with his ROM dumper is create a program that sifts through formal and informal versions of *Final Fantasy VI*, converts varied ROM addresses into unified identifiers, and places the now-uniformly-labelled dialogue into an HTML file for easy access by Wanderbar. The back-and-forth nature of this process—taking dialogue that was meticulously compressed into a game cartridge as hex values and, decades later, reversing this compression to make it human readable—is highly representative of ROM-hacking workflows. Reverse-engineering leads to understanding which, then, leads to the creation of new versions of an old game.

After a quick email exchange, Mandelin was kind enough to share his ROM dumper with me so I could use it to pull text from *Ted Woolsey Uncensored Edition* and *Retranslated*, albeit with the warning that it was "probably pretty messy and will take some time to figure out maybe." He was not wrong. Sifting through the files for the first time was a harsh reminder of my own programming ineptitude as well as the complexities of working with a SNES/SFC ROM image. Written in C#, the ROM dumper contained numerous lines of code that were beyond my understanding, but I was nonetheless able to activate it in Microsoft Visual Studio without issue (Figure 7.14). I grabbed the first of my *Final Fantasy VI* hacks, *Ted Woolsey Uncensored Edition*, embedded it within the prerequisite file structure, ran the code, and… was greeted with an HTML file that made absolutely no sense. Perplexed, I ran some quick diagnostics using WindHex and determined that the game's text was not where I expected it to be. In fact, it was in a wholly new area of the ROM image that, by all accounts, should not exist.

```
0 references
static void DumpFF6Text()
{
    string romName = "ff6.smc";
    FF6TableReader_Script ff6ScriptTable = new FF6TableReader_Script("ff6-script-table.txt");
    Console.OutputEncoding = System.Text.Encoding.UTF8;
    FileStream romFile = new FileStream(romName, FileMode.Open);

    // The 16-bit number here tells the game when to jump to a new text bank if a line ID is >= to it
    romFile.Seek(0xCE600, SeekOrigin.Begin);
    int newBankID = romFile.ReadByte() | (romFile.ReadByte() << 8);

    for (int j = 0; j < 3451; j++)  // 3084 before
    {
        int loc = 0xCE602 + j * 2;
        romFile.Seek(loc, SeekOrigin.Begin);
        int offset = romFile.ReadByte() | (romFile.ReadByte() << 8);
        string line = "";

        // offset FFFF indicates the line doesn't exist
        if (offset != 0xFFFF)
        {
            int lineStart = 0xD0000 + offset;
            if (j >= newBankID)
            {
                lineStart += 0x10000;
            }
            line = ff6ScriptTable.GetLine(romFile, lineStart);

            //Console.WriteLine(lineStart.ToString("X6"));
        }

        ff6Strings[j] = line; // j.ToString() + "\n" + line;
```

Figure 7.14. An excerpt from Mandelin's ROM dumper, written in C#, which offers some insight into how the program identifies text locations within the ROM

So where did this new space come from? Eager not to be bound by the same technical limitations that complicated early localisations, ROM hackers have developed methods to cram more data into the game, perhaps the most notable of which is ROM expansion. As the name implies, ROM expansion generates more space within a game for storing code, data, or graphics. It accomplishes this by creating new banks within the memory of the ROM image, effectively adding new ROM addresses to map information to. *Final Fantasy VI*, by default, is a 24Mbit ROM with addresses that range from $c00000-$EFFFFF. Using the versatile hacking tool FF3usME, the ROM can be expanded to 32Mbit, creating new addresses between $F00000-$FFFFFF. As text is relatively economical in terms of the space, this is a large amount of space for ROM hackers to work with, allowing them to add new text to their heart's desire.

Since ROM expansion was first developed, hackers have used the technique to create definitive versions of SNES/SFC games that simply could not have existed beforehand. In the case of *Ted Woolsey Uncensored Edition*, Chiarelli takes advantage of ROM expansion to shift two categories of *Final Fantasy VI*'s in-game text, both of which appear during battles, into the expanded area to free up more space for character dialogue. Once I had tracked down these new addresses (with help of WindHex, documentation created by the FF3usME development

team, and guidance from Chiarelli himself), I adjusted code in the ROM dumper and managed to create new HTML files for Wanderbar. Following a similar process for *Retranslated*, while slowly aggregating individual ROM dumps into a single HTML file, I soon had a bespoke Wanderbar for my research needs (Figure 7.15).

Figure 7.15. A screen capture of my own version of Wanderbar, showing five different versions of *Final Fantasy VI*'s text side-by-side.

With this assemblage in hand, as well as a better understanding of *Final Fantasy VI*'s technical underpinnings, I could finally turn my attention to localisation analysis. Consalvo and Dutton's interaction mapping and gameplay logging both proved to be useful for this research: the former for its explicit focus on dialogue interactions with NPCs, the latter for its awareness of creative intent and intertextuality (2006). Intertextuality is key here as I am not only comparing five different versions of *Final Fantasy VI*, but I am also considering community discourse, informal and formal paratexts, and technical affordances.

Chimeric Variations

Perhaps a short review is in order now that I have returned from my technological tangents. In the early days of *Final Fantasy VI* localisation, fans compared the North American release with the Japanese one, in search of errors and omissions. While some of their discoveries are uncontroversial—such as spelling mistakes or cut dialogue—many of their script interpretations remain open to debate (even more so as the game has exploded into multiplicities). As Coughlin-Galbraith and kWhazit both mentioned, there is no singular way to translate Japanese to English and a localiser will always make creative decisions (i.e.,

transcreation) to guide a game into a particular cultural context. Creative decisions are always accompanied with technical constraints, especially in the case of cartridge-based games with extremely limited space and esoteric code structures.

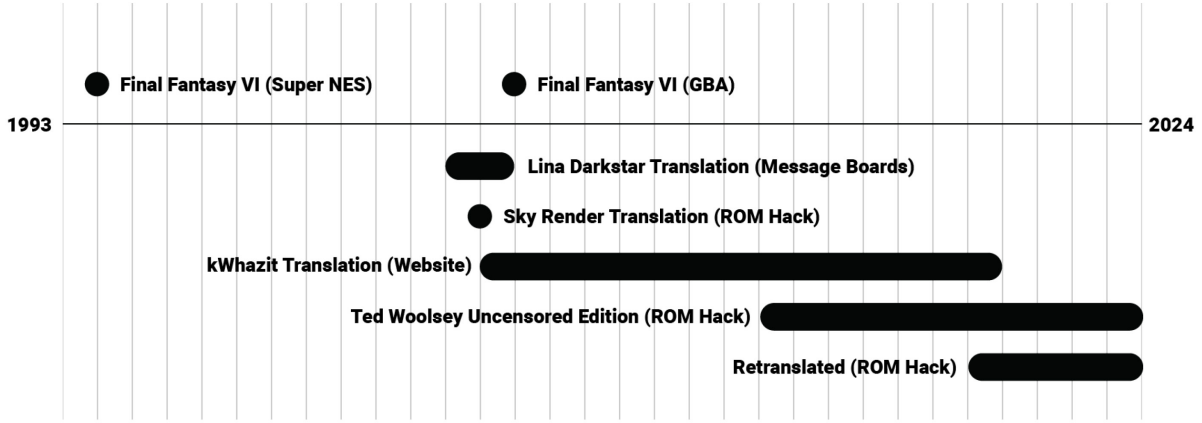

Figure 7.16. A timeline of a select number of informal and formal *Final Fantasy VI* releases, from 1993 to 2024.

When considering how notions of authenticity have evolved across thirty years of formal and informal localisations (Figure 7.16), a good place to start is by identifying patterns and sticking points. For fan localisers, ROM hacks, text translations, and formal releases all serve as central texts that have become integral to understanding *Final Fantasy VI*'s characters and narrative. Building on Marvin's notion of textual communities, Whiteman discusses how fans cultivate a set of imagined narrative and ludic values that they then ascribe to a game series in order to judge the validity of its sequels and variations (2008, p. 35). She uses the term "idealised meta-text" to describe this phenomenon, and notes that fans "deal with the multiplicity of textual consumption by essentializing and constructing frames of reference" (Whiteman, 2008, p. 32) for their beloved media objects. Much like the media imaginaries reified by innumerable SNES/SFC emulators, which weave between real and hypothetical due to user development practices (Kluitenberg, 2011, p. 48), informal variations of *Final Fantasy VI* aspire to perfection in various ways. And, not to be forgotten, Square Enix occupies an important authoritative role in these debates: rendering aspects of *Final Fantasy VI* canonical through repetition across formalised remasters.

To conclude this chapter, I compare five different versions of *Final Fantasy VI* using Wanderbar to identify common themes and divergences. I turn toward Joe Chiarelli, creator of *Ted Woolsey Uncensored Edition*, for additional context on the process of creating a technically complex localisation of *Final Fantasy VI*. Much like Coughlin-Galbraith, Chiarelli is embedded within a community that seeks a more authentic localisation of the game, but his motivations are somewhat inverted. While Coughlin-Galbraith, kWhazit, and other early localisers were keen to overhaul *Final Fantasy VI*'s initial North American localisation, Chiarelli believes that preserving elements of Woolsey's work is just as important as striving for accuracy. Citing

Coughlin-Galbraith, kWhazit, Sky Render, Clyde Mandelin, Ted Woolsey, and Tom Slattery as influences, but departing from them in important ways, Chiarelli has gradually developed an interpretation of *Final Fantasy VI* that imagines "if the game came out today, and was translated by Woolsey, how would it look?" Chiarelli's work is representative of later localisation efforts that pick-and-choose from numerous *Final Fantasies* to create an idealised version that fits a specific time, place, or preference, rather than treating the Japanese as an infallible urtext.

"Sleep Laughing" - Censorship and Key Terms

One of the more fascinating aspects of the GBA version of *Final Fantasy VI* is its reifying effect. After a decade of fan speculation of the game's script, Square Enix released a version of *Final Fantasy VI* that confirmed many user observations. Seeing what localisation choices the GBA version doubles-down from the initial North American localisation is particularly enlightening, as it shows which ones Square Enix deems important to the game. While the GBA translator, Tom Slattery, opted to correct many terms that departed from the Japanese script due to errors or now-defunct censorship policies, he also preserved aspects of Woolsey's localisation intact. Most prominently, Slattery appears to have been given a longer leash to include adult content in the game—something that fans have been obsessing over at least since Coughlin-Galbraith's passionate commentary on the Icy Brian RPG forums.

The most straightforward manifestation of this de-censorship is the inclusion of words that were softened in Woolsey's initial localisation due to Nintendo of America's censorship policies. In the GBA release, Kefka commands his troops to "kill them" rather than "get them," Mog exclaims that he thought the party was "all dead" rather than "feeding the worms," and the morally bankrupt Emperor taunts his subordinate by telling him he will "die laughing" instead of the (deeply confusing) "sleep laughing." Many of these updates move beyond simple word-swapping, however, with Slattery drastically altering scenes that include previously removed references to suicide and eugenics, as seen in Figure 7.17.

Figure 7.17. A scene from *Final Fantasy VI*, as viewed using Wanderbar, which shows how different localisations of the game address the Emperor Gestahl's creepy request for magical offspring.

The game's more adult tone has been embraced by fan localisers and ROM hackers—after all, reversing Nintendo of America's censorship practices has long been one of their goals. But, while the GBA version of the game is certainly less G-rated than the original North American localisation, it is not without its own censorship quirks. Both the Japanese and North American GBA releases remove a scene in which Celes, one of the game's protagonists, is restrained and tortured by sadistic Imperial soldiers. When questioned about this omission, Slattery explained that the establishment of CERO, the Japanese rating board, in 2002 was likely to blame:

> Violence is rated very strictly in Japan, much the same way that sexual content is in the U.S. Presumably [Square Enix] wanted a CERO A rating for the GBA version in Japan, and you cannot get an A rating if a game depicts violence against a restrained human being. (Slattery, 2014)

This is an important point to ruminate on for a couple reasons. First, it demonstrates how censorship is dynamic: games do not necessarily become more or less censored but instead are subject to complex configurations based on shifting corporate desires and cultural norms. Second, while new releases of a game may claim to be definitive or authoritative, they are strategic not just in terms of what they add but what they take away. Together, these factors provide a motivation for continued informal versions of *Final Fantasy VI*, even when re-releases allegedly fix the problems that initially drove users to create their own versions.

Figure 7.18. A scene from Final Fantasy VI, as viewed using Wanderbar, which shows how different localisations of the game choose to refer to “espers” and “the War of the Magi.”

But censorship is not the only issue at work here. Debates still exist around foundational terms in the game—ones that have been interpreted differently across formal and informal localisations. To put forth a key example, ‘espers’ is the moniker given to a group of magical beings that are central to the game’s narrative, but the term ‘esper’ is a transcreative decision made by Woolsey. Based on a Japanese term (幻獣, Genjuu), which has no direct translation, it loosely corresponds to the ideas of illusion/dream/phantom + being/beast/brute. Coughlin-Galbraith considers translating the term as “surreal being,” Sky Render uses the term “phantom beast,” and kWhazit opts to simply use the original “Genjuu” as he believes there is no convenient parallel (Figure 7.18).[105] While there is still some debate if ‘esper’ was the correct choice, especially considering that the *Final Fantasy* franchise has adopted different names for similar creatures (such as eidolons in *Final Fantasy IX*), the term seems to have settled and remains unchanged in formal releases and most ROM hacks. Through repetition across franchise entries and fan discussions, these terms have not fully settled but have reached somewhat of a consensus.

[105] This holds many parallels to the work of fansubbers, who leave in some Japanese words (i.e. “nakama” in the *One Piece* franchise) as they feel there is no worthy equivalent.

"Son of a Submariner"- The Death and Revival of Woolseyisms

While many terms have stabilised, others remain contentious, and none seem to garner quite as much attention as Woolsey's more unusual turns of phrase. Despite the desire to purge 'Woolseyisms' in the early days of fan localisation, many of his linguistic flourishes have since become beloved inclusions in both ROM hacks and formal re-releases. Chiarelli, perhaps the most ardent supporter of Woolsey's work, has discussed how members of the hacking community are polarised on *Ted Woolsey Uncensored Edition* due to his attempts to combine Woolsey's style with a more authentic translation of the Japanese text.

> Some folks really wanted me to pull out the Woolsey stuff [from the hack]. Pull out "son of a submariner," pull out "call me a treasure hunter or I'll rip your lungs out," all because that's not what they said in Japanese. But that's what localisation is! It makes the game more accessible to the target audience while still getting the story across.

While Charielli is correct in stating that localisation is not solely about accuracy, Woolsey does take a few significant detours in his script. In fact, some of his dialogue lines have become memorable *because* of how jarring they are, such as Kefka's infamous "son of a submariner" line that supplants what was originally, more-or-less, a short string of exasperated cursing (Figure 7.19).

Figure 7.19. A scene from Final Fantasy VI, as viewed using Wanderbar, which shows how different localisations of the game deal with the "Son of a submariner" line.

Despite the strangeness of this line, as seen above, only the early Sky Render hack opts to remove the line completely. This highlights the shift in desire among various localisers, where literality has fallen somewhat to the wayside. Even the GBA release, which completely overhauls

Final Fantasy VI's script, does not completely dispose of the noted Woolseyism. Slattery only opted for a small edit, replacing "submariner" with "sandworm", to make the dialogue less anachronistic while still maintaining its recognisability.

When reflecting on the staying power of Woolseyisms, as well as his own fondness toward them, Chiarelli argues they have become an integral part of the game, the *Final Fantasy* franchise, and videogame history at large:

> No one ever changes "you spoony bard." Nobody ever changes "it's dangerous to go alone, take this." Nobody ever changes "I'm sorry, Mario, but our princess is in another castle." Why? Because they're iconic in videogame history. So, you don't change "son of a submariner."

However central Chiarelli claims Woolsey's influence is, it is important to remember that just as many of his additions have been rejected as embraced. While much of his work has become canon in English-language versions of *Final Fantasy VI*—such as "welcome to my barbecue," "you licentious howler," and "I'm a GENERAL, not some opera floozy"—others have been removed from all versions save for *Ted Woolsey Uncensored Edition*.

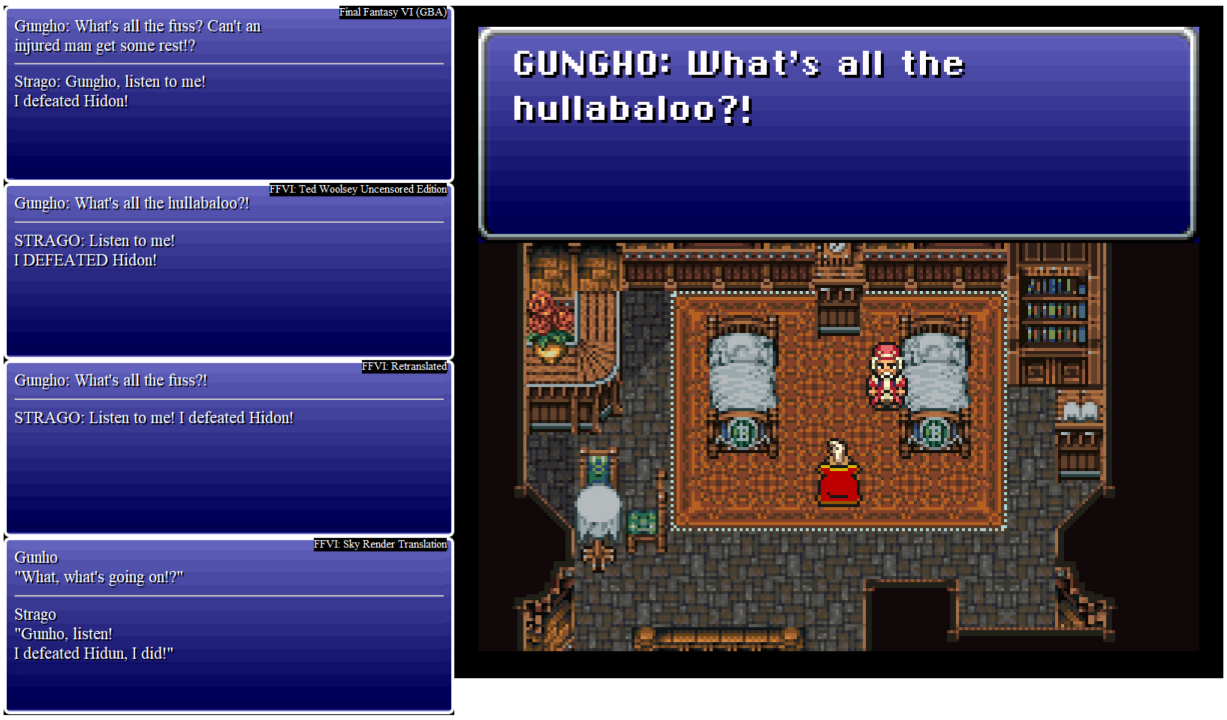

Figure 7.20. A scene from *Final Fantasy VI*, as viewed using Wanderbar, which shows how the word "hullabaloo" only enjoys limited popularity among formal and informal localisations

A trend among these removals is that they involve American-sounding phrases and words. While they all technically make sense in the flow of the game, "hullabaloo," "blockhead," and "let's give 'em a bloody lip" feel a bit jarring in the context of a fantasy game (Figure 7.20). As Consalvo and Iwabuchi have documented, one of the goals of localisation is to remove the "cultural odor" (Consalvo, 2016, p. 126; Iwabuchi, 2002, p. 221) of the original media in order to

make it fit into a different cultural context, but perhaps these particular lines have over-corrected. However, even with these omissions, Woolsey's work has remained a point of reference for both formal and informal localisers, despite the existence of an allegedly improved GBA remaster, with Woolsey cementing his place as a celebrated (or derided) designated interpreter.

"I challenge thee to honorable combat" - Infinite Fantasies

The selective adoption of Woolseyisms in both Slattery's and Chiarelli's localisations are indicative of a trend that solidified across informal translations of the game: there are endless possibilities when creating a definitive version, so long as the localiser can point toward some sort of overarching rationale. The Sky Render translation aims for an extremely literal translation of the Japanese text, reflecting similar efforts by text-based localisations. Chiarelli's *Ted Woolsey Uncensored Edition* reconciles accuracy with Woolseyisms, attempting to "find consensus among fans as to what the best or most iconic dialogue lines" for inclusion. And while hairy_hen's goal for *Retranslated* ostensibly hearkens back to early endeavours—a version of *Final Fantasy VI* that is more "faithful to the meaning of the Japanese script in all of its story and character details" (hairy_hen, 2019b)—it is apparent he has dedicated the most energy to one character who is known for his quirky elocution. In the Japanese version of *Final Fantasy VI*, the character Cyan Garamonde speaks using stereotypes associated with Samurai in Japanese media, particularly his tendency to end every sentence with "de gozaru" (Coughlin-Galbraith et al., 2008, p. 36). Woolsey, likely realising that these samurai tropes would be less discernible to North American audiences, decided to make Cyan speak in a knightly, chivalrous fashion. Instead of saying "you", he says "thou", and regularly substitutes archaic English forms into his speech. Cyan's characterisation has been consistent across informal and formal localisations, even within Sky Render's hyper-literal translation, but hairy_hen finds these efforts insufficient.

> This was an excellent localization choice, but unfortunately it was applied inconsistently and often with incorrect grammatical forms. The GBA translation took this idea farther than the original release and corrected a variety of issues, but it became apparent that there was a great deal of room to take it farther still. (hairy_hen, 2019a)

Looking toward the King James Bible as a core influence, he provides a four-page manifesto alongside his ROM hack that clarifies grammatical choices (thou, thee, thine), justifies his chosen level of formality, and comments on how the SNES/SFC and GBA versions incorrectly handle archaic English forms. Akin to early web-based localisations, hairy_hen's language work is designed to guide future localisation efforts, but his focus is so narrow that it may only appeal to a niche audience (Figure 7.21).

Figure 7.21. A scene from *Final Fantasy VI*, as viewed using Wanderbar, which shows how Cyan's battle taunt has been handled across various translations

An obsession with characterisation brings us back to where we began this chapter. Paralleling Coughlin-Galbraith's message board posts, many ROM hacks reflect a desire to deeply connect with *Final Fantasy VI* by developing expertise about its characters and narrative: Locke should be known for his altruistic nature and tragic backstory, Cyan's status as a noble warrior must be well established, and Terra's inner turmoil should be written eloquently. Even Chiarelli's ROM hack, which does not claim to favour a single character, dedicates a great deal of energy to the game's primary antagonist, Kefka. Much like how hairy_hen took an aspect of Woolsey's characterisation (Cyan's antiquated style of speech) and expanded upon it, Chiarelli does the same by embracing aspects of Kefka's colourful North American localisation:

> If you just directly translate Kefka, you just get this very dry clown—more of just a monstrous bad guy. Whereas this very over-the-top villain that Ted wrote is exactly what Kitase envisioned.

Interestingly, Chiarelli mentions an interview with Yoshinori Kitase, one of *Final Fantasy VI*'s directors, in which he praises Woolsey's interpretation of the character. While I was not able to track down the source of this quote, the notion of directorial intent clearly still holds water as both motivation and justification for both formal and informal interpretations of *Final Fantasy VI* and its characters. Just as Square Enix invoked Kazuko Shibuya to validate the graphical changes they made for their mobile remake; Chiarelli does the same with Kitase. In doing so, he demonstrates one of many ways localisation quirks may embed themselves in informal and formal contexts, travelling in unexpected ways.

Closing Discussion

I close this chapter by revisiting the idea of travel, an idea I borrow from Consalvo and have circled around during my technical and textual analysis of *Final Fantasy VI*. Consalvo has documented how ROM hackers and/as fan translators reimagine "what 'the global flow' of videogames means as it facilitates unintended travel for certain Japanese games" (Consalvo, 2016, p. 42). The early fan studies angle into this phenomenon predominantly frames it as an informal activity that takes place in the aftermath. When a corporation decides against localising a media property into a specific region, fans often fill the gap with their own version, taking advantage of digital affordances while building expertise about formal media workflows. Jenkins, for example, has touched upon the efforts of fansubbers, who created and distributed their own translations of nineties anime after Japanese companies strategically decided against investing in the North American market (Jenkins, 2006, pp. 156–160). However, reimagining the global flow of games does not just involve discovering new ways they travel along the same pathways. It means muddying the boundaries between previously delineated stakeholders, reconciling different types of expertise, and destroying and rebuilding media to create countless iterations. Recalling Keogh's discussion of the deformalisation of the videogame industry is important here, as he builds upon Lobato and Thomas's spectrum of (in)formality to acknowledge the multi-directional development and distribution of games (Keogh, 2019; Lobato & Thomas, 2018). Techniques, expertise, and forms persist and proliferate in unpredictable ways, combining the old with the new.

This perspective is vital in transcreative contexts as, while localisation is sometimes imagined to be a direct and literal process, it is instead highly opportunistic. Japanese games are localised numerous times for various ends and, as O'Hagan and Mangiron note, may even incorporate 'American-ised' elements to sell back to Japanese audiences (2013, p. 175). In an extreme example, the original *Animal Crossing* (2001) game for the Nintendo GameCube was solely intended for Japanese audiences but, when it was decided to create a localised version for release in North America, the game was "fully adapted and rewritten in order to make [cultural elements] fit North American culture." This version of the game, which altered text and graphics extensively, proved so popular that it made the return trip to Japan, with its American content in tow, as *Animal Crossing E-Plus* (2003). While this is certainly an outlier case, even the quirkiest of transcreative flourishes may become beloved to informal and formal stakeholders. During our discussions, Chiarelli recounted how *Final Fantasy VI* director Yoshinori Kitase commented that Woolsey's North American localisation of the game inspired his creative process while developing *Final Fantasy: Dissidia*. A strange tangent in the *Final Fantasy* franchise that incorporates characters from past series entries, *Dissidia* features *Final Fantasy VI*'s antagonist Kefka as one of its playable characters and Kitase chose to incorporate elements of Woolsey's colourful characterisation into the new iteration of the antagonist. Kitase's reflections are a strange variation on the idea of a director's cut, as he reflects on someone else's interpretation of *Final Fantasy VI* and identifies elements out that he feels best align with a version of a character he never got to write.

But this travel does not solely happen in-between formal releases of *Final Fantasy VI*. Informal localisations have proven to be remarkably persistent, and fans have found ways to

embed them in formal releases, most recently through the venue of modding. I have avoided the term 'modding' throughout this chapter as it often connotes a co-productive arrangement with a game's developer, facilitated through tools or marketplaces, that ROM hackers typically do not enter into (Keogh, 2019, p. 23). As the videogame industry formalised, PC game modding provided some of the "only viable informal options for meeting the technologically-driven standards of videogames of the time" (Keogh, 2019, p. 24). ROM hacking, inversely, has been persistently rejected by developers, with Nintendo lashing out against ROM-hosting websites (O. S. Good, 2018), emulator developers (Fenlon, 2024), and even individual hackers in an attempt to quash the practice (Alexandra, 2016). Despite these legal concerns, and the technical expertise needed to undertake game hacking,[106] hacker creative outputs still make their way into formal contexts. In 2002, Nexus Mods user Mudstep integrated *Ted Woolsey Uncensored Edition* into *Final Fantasy VI: Pixel Remaster* by allowing Chiarelli's work (and, by extension, elements from numerous predecessor projects) to become available to new audiences.

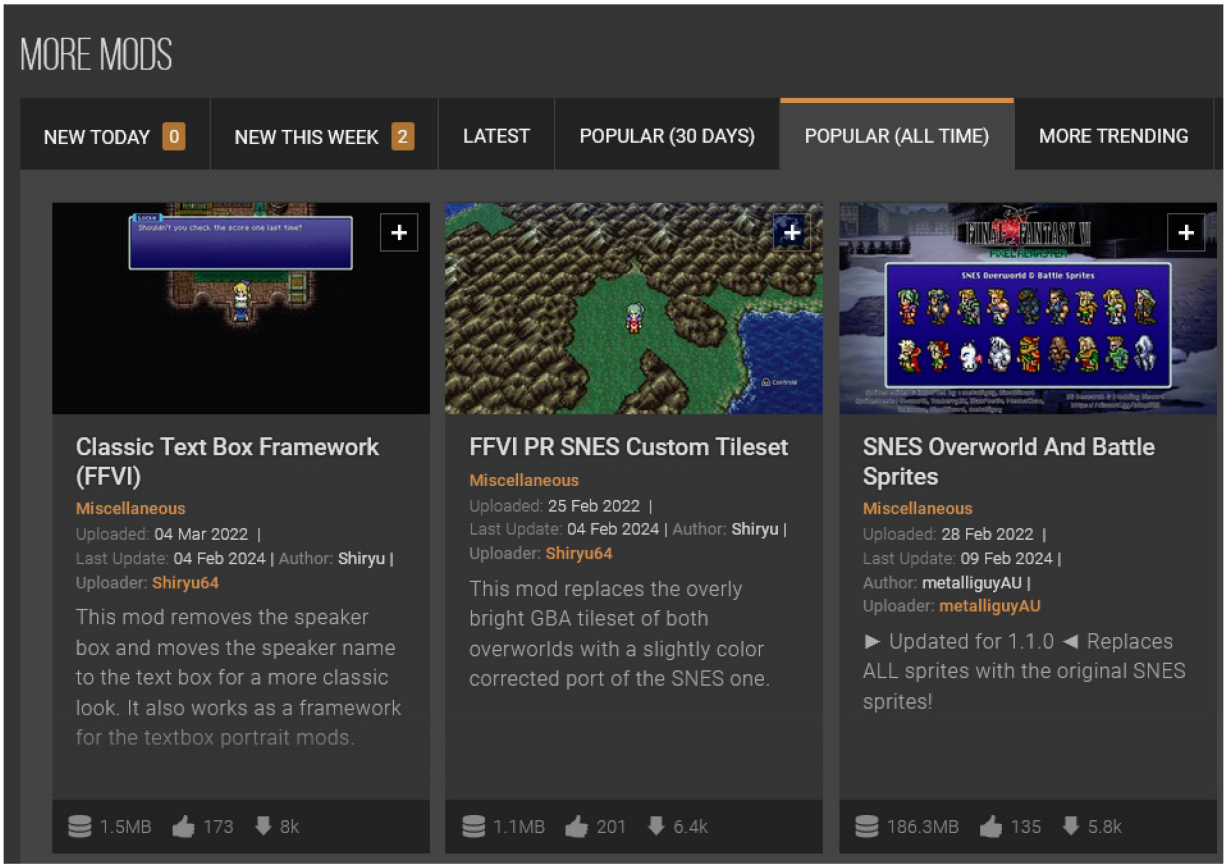

Figure 7.22. A screenshot from the Nexus Mods landing page for *Final Fantasy VI: Pixel Remaster*, showing the top three most popular mods.

Sifting through the Nexus Mods landing page for the Pixel Remaster highlights the persistence of the fan discourses I have discussed in this chapter (Figure 7.22). The top three

[106] Also, not everyone loves learning about hexadecimal code as much as I do.

most popular downloads are mods that restore *Final Fantasy VI*'s text boxes, tile sets, and character sprites to better match their presentation in the SNES/SFC release, echoing the nostalgic longings of fan translators and ROM hackers. It is important to remember that many of these authentic yearnings involve re-implementing aspects of *Final Fantasy VI* that only existed due to the SNES/SFC's technical limitations. *Final Fantasy VI*'s entire text system (fonts, text tables, windows) was designed around cartridge space limitations and legibility on CRT televisions—technical affordances that are no longer a concern in an era of mass storage and high-definition displays. Regardless, these elements have become sticking points for portions of the fanbase. While modding and hacking are relatively niche practices, these nostalgic impulses appear to be widespread. Square Enix, in a recent update to the Pixel Remaster series, added an option for players to revert fonts and music to "the style of the original game" (Castle, 2024).

In general, there appears to be a trend away from singular releases toward adaptable ones. ROM hacks commonly come packaged with suites of patches, allowing users to customise the game based on their own desires: from bug fixes to translation overhauls. Nintendo and Square Enix regularly release direct ports and expansive remakes, housed on everything from simulacrums of original hardware to mobile phones, and allow users to customise how 'original' their play experience will be. And hacking and modding websites provide new opportunities for prior work to travel, allowing niche fan translations to find fresh audiences. Authenticity is still central to these conversations, but it is no longer necessary for users to pick from a handful of versions of *Final Fantasy VI*. Rather, users are free to create bespoke chimeric versions that best match their desires.[107] Reflecting on their informal localisation work, Coughlin-Galbraith laments the impossibility of a truly 'authentic' version of *Final Fantasy VI*.

> Is there a perfect translation of *Final Fantasy VI*? I mean, is there a perfect translation of anything? They're still coming out with new translations of The Bible. They're still coming out with new translations of Antigone. (Coughlin-Galbraith)

While these are lofty comparisons, it has become clear, 30+ years into its supposed afterlife, *Final Fantasy VI* will continue to fragment and will never fully settle.

[107] And, as I discussed in *The Super Nintendo Emulation System*, they can play their chosen version of *Final Fantasy VI* on any number of software and hardware configurations.

8. Conclusion

My goal with this dissertation has been to interrogate and expand the platform studies archive of the SNES/SFC by centering the informal technologies, practices, and industries that have emerged following the console's commercial lifespan. I have accomplished this by consolidating user-made technical information, dissecting numerous in(formal) media practices that have proliferated around the console, and engaging with material communities that reimagine its past and future. When considering my research through the lens of platform studies, I believe this unbounding of the SNES/SFC is scholarly productive but also risks exploding its platform archive to a near-infinite degree. The afterlife of the SNES/SFC is defined as all facets of the console's "total life beyond its intended design and commercial circulation" (Guins, 2014, p. 4) and, as I have learned throughout my research work, this is a staggeringly large area of study that only expands over time. I have tried to limit this research project through targeted case studies, but even then, I struggled with scope. If there are infinite versions of the SNES/SFC, how can one study them all? Do we require multiple platform studies, with each one targeting a new aspect of the SNES/SFC? And at what point does the platform studies paradigm become less useful than studying a practice (e.g. software preservation), a family of technologies (e.g. emulators), or an industry (e.g. reproduction cartridges)?

However, I will also contend that there is a momentum to be gained by working within a single hardware ecosystem. As I learned through my tinkering and experimentation, building expertise of the SNES/SFC's technical infrastructure reaps a great number of benefits in understanding both informal and formal variations (and the communities that have formed around them). And while staring at a single device may seem a touch myopic, by delving into the components and code of the SNES/SFC, I noticed that the boundaries between the console and other technologies become somewhat porous. This has led me toward a more rhizomatic understanding of the device, destabilising the SNES/SFC as a singular console while forging commonalities with broadcast, film, and the Internet. The greatest strength, weakness, and joy of my dissertation work has been discovering endless technologies, practices, and industries that tell me different stories about the console, its users, and the broader media ecosystem.

As I have treated each chapter of this dissertation as a self-contained case study, I do not feel the need for an extensive concluding statement. Instead, I offer some closing connections and provocations. First, I consider two themes that underpin this entire research project: a) the stewardship of the SNES/SFC; b) the console's fragmentation into endless variations. Next, I reflect on three research limitations—elusive users, regional bias, and research costs—and pose some broad ideas for addressing them. To close, I consider two intriguing research paths I could pursue in the aftermath of this project.

Stewarding the SNES/SFC

If I have learned anything from this research project, it is that material communities play a vital role in (re)generating and stewarding expertise related to the SNES/SFC. By engaging in forensic analysis and maintaining archives ranging from blogs to wikis, informal actors have aggregated a collection of knowledge about the SNES/SFC, its game library, and its paratexts

(from box art to digital magazines) that far exceeds what Nintendo has made available to the public. While the videogame giant does maintain its own institutions of memory—as I was wrapping up this dissertation the doors opened to the Nintendo Museum in Japan (Wong, 2024)—these are highly curated affairs that only tell select parts of the company's history. And as seen with my information requests in *Satellite Archaeologies*, which more-or-less hit a dead end with a generic response letter, the company's internal archives are at best, unknown, and at worst, woefully incomplete.

Media archaeologists commonly lament that "widely endorsed accounts of contemporary media culture and media histories alike often tell only selected parts of the story, and not necessarily correct and relevant parts" (Huhtamo & Parikka, 2011, p. 3) and that companies are usually more focused on mobilising the past for profit rather than comprehensively chronicling it. This impetus is perhaps best reflected through products like the Super NES Classic Edition, a plug-and-play reimagining of the original SNES/SFC console, which revives the device as a limited-edition collectible pre-loaded with a small selection of greatest hits. Even the Nintendo Museum, which ostensibly asks visitors to "discover Nintendo's commitment to creation and innovation while connecting it to your own memories and experiences," constrains engagement through an in-house 'coins' currency that limits the use of interactive exhibitions. Thus, the most formalised repositories of SNES/SFC history are either hidden away or pay-to-play, making informal documentation crucial for scholars who wish to learn more about the device's history.

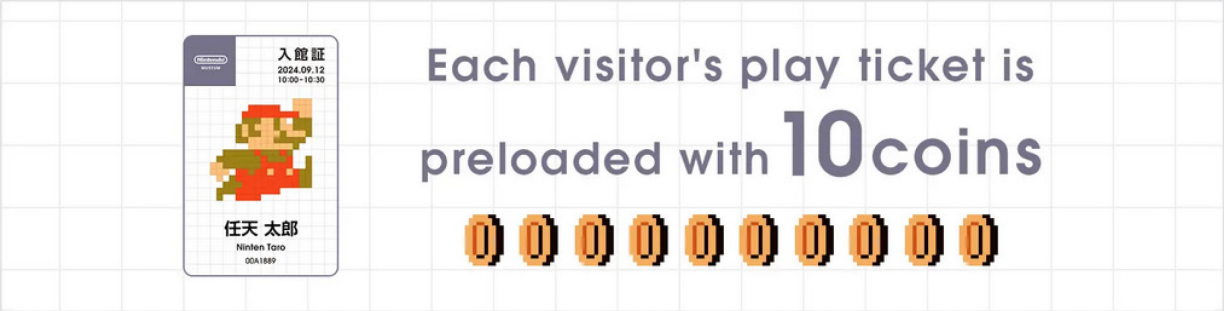

Figure 8.1. An informational graphic on the Nintendo Museum's website.

Throughout all my chapters, I heavily relied upon informal user efforts to learn more about the SNES/SFC: emulator developers who extensively document hardware functionality; satellite archaeologists who have become the keepers of a lost software ecosystem; reproduction makers who have painstakingly documented, remixed, and rebuilt the console's software library; and ROM hackers who have mapped the text and code of decades-old games. As others have noted (Navarro-Remesal, 2017; Švelch, 2017), user documentation has become increasingly central to historical games research, circumventing corporate red tape and including materials that lack formal stewardship. In many cases, "without the superfans who have written walkthroughs, recorded gameplay footage, assembled lists of reviews from long-defunct web publications, and collected physical copies of the game," there would be little-to-no evidence left of many game technologies (Salvador, 2020). However, I have also learned that

the critiques leveled at informal archival practices sometimes ring true. While I was undertaking my dissertation research, several invaluable informal resources (perhaps most notably ROMHacking.net) were discontinued for reasons ranging from community drama to administrator malaise. While I have learned to never underestimate the dedication and expertise of informal archivists, I have noticed a tendency for projects to be stewarded by small groups of people with little in the way of contingency or continuance plans. Burnout, tragedy, and legal action[108] can quickly erase years of work, with little recourse. These informal archives allow for more inclusive participation in the production of digital cultural memory related to the SNES/SFC but are also extremely volatile when compared to formal institutions. They are invaluable but not invulnerable, and I believe that part of a scholar's job is reinscribing and augmenting user-driven efforts to historicise and analyse videogame consoles.

Super Famicom (and on and on)

One of the throughlines for my dissertation has been the growing realisation that the Super Nintendo was, more accurately, a bevy of Super Nintendos. Nintendo released over half a dozen iterations of the SNES/SFC in North America alone and even ostensibly identical game cartridges commonly contained different PCBs, electrical components, and even game data. Unearthing these multiplicities was one of the first tasks of informal tinkerers, hackers, and modders—usually through the discovery of hardware iterations or regional variations—and their work created a foundation for the deformalisation of console expertise. While corporate discourses simplify the console's functionality using technobabble and buzzwords (Arsenault, 2017, p. 82) and technical protection measures make peering into the SNES/SFC's black box onerous (Wershler, 2022, p. 97), even Nintendo's most aggressive efforts to settle the device have left seams for users to pick at. Importantly, as users delve into hardware and software—from console mods that discover latent video capabilities to ROM hacks that uncover abandoned development paths—their efforts rarely end with documentation. As I first broached in my discussions of emulation, but has become evident across all my case studies, the SNES/SFC, its software library, and its peripherals have always existed in multiplicities, but it was not until users began to deconstruct them that they were rendered convivial (Sterne, 2007).

While editing *The Super Nintendo Emulation System*, my supervisor posed a question that stuck with me as I closed out my dissertation: "what is emulation FOR?" In that chapter, I discussed how emulators are Janus-faced devices that their developers create to manifest media imaginaries of what a videogame console was and what it has the potential to become. Users have effectively plumbed the depths of the SNES/SFC, documented its inner machinations, and then leveraged these findings to manifest bespoke software versions of the console. Each one of these variations is in response to a different "what for?" predicated on the desires of a material community: from simply wishing to play the SNES/SFC on a computer as frictionlessly as possible, to seeking out a perfect software re-creation, to adding anachronistic

[108] As I was discussing GitHub's functionality with Enric Llagostera, he mentioned that there is a dedicated repository that tracks every single DMCA takedown notice lodged against users. A great deal of these were submitted by videogame companies against informal uses of their intellectual property.

new features to facilitate shared hobbies such as speedrunning. I have used numerous lenses to study the motivations of material communities—nostalgia, authenticity, materiality, and others—but these are just the tip of the iceberg. The fracturing of media imaginaries is evident in the diversity of user projects, from reproduction cartridges to ROM hacks. The afterlife of the SNES/SFC is defined by multifarious practices that deconstruct and reconstruct the console.

While the anarchist in me strongly desires to frame these near-infinite informal variations of the SNES/SFC in a positive light—unshackled from corporate regimes of black-boxing and obsolescence, the console can now be fully claimed by users—the truth is, of course, much more complex. As Lobato and Thomas note, informal and formal media production and distribution are not fully oppositional, but instead share entwined pasts, presents, and futures: "media history is a story of interactions between and across the formal and informal zones" (Lobato & Thomas, 2018, p. 20). Emulators simultaneously enable software piracy and underpin extremely formalised online storefronts; reproduction cartridges allow users to append the SNES/SFC's game library with their own games yet enable marketplaces that surreptitiously capitalise on user labour; and user-made localisations flit between informal and formal contexts opportunistically. Informal practices do not necessarily result in the democratisation of a device but, rather, they open infinite arenas to debate what (and, by extension, who) it is for.

Research Limitations

The Elusive User

One of the most persistent limitations in my research has been the elusiveness of prospective participants. As I have demonstrated throughout my dissertation, engaging with experts from material communities is a productive way to learn about their practices, build technological expertise, and gain access to central texts: I would not have been able to recover Satellaview memory pack data or properly analyse *Final Fantasy VI* without the aid from numerous users. I feel this absence most strongly in *The Super Nintendo Emulation System* and *Pixels and Plastic*, as while I was conducting research for these chapters participants backed out of scheduled interviews due to legal concerns surrounding their projects. While I have found ways to work around these gaps, primarily by emphasising hands-on technical experimentation and discursive analysis, it is distressing to know that there are participants who could help expand ongoing scholarship but who are reluctant to do so, even when offered full anonymity. I only foresee this issue worsening as companies such as Nintendo tighten their grip on residual technologies through lawsuits and, perhaps more concerningly, attempt to circumscribe their intellectual property in new ways, such as patenting game mechanics (Norman, 2025). As user practices become chilled, so do the research projects that study them.

I do not have a comprehensive solution to this problem, but I can recall an interesting path forward proposed by the Video Game History Foundation. Salvador mentioned that Foundation staffers occasionally place historically vital materials in cold storage if there are legal concerns associated with them, in hopes that they can be released to a public at a later date (2024). I wonder if the same could be done with transcribed interviews and sensitive

informal development materials, with researchers placing them under embargo until a time when participants are comfortable having them shared. Archiving this documentation is vital when considering that, as seen with the tragedy of Near, there is no guarantee that important figures from material communities will be with us much longer (nor that their documentation will persist). I believe that scholars need to further consider the methodological complications of working with informal projects that exist in legal gray areas, particularly in regard to participant wellbeing.

Regional Bias

In the Winter of 2020, I served as a teaching assistant for Darren Wershler's *Video Games and/as Theory (Emulation Edition)* class in Concordia University's English department. As part of the course, we used the popular SNES/SFC game *Super Metroid* (1994) to study how different signal-processing assemblages (CRTs, consoles, etc.) change a user's relationship with the game. As part of the course involved playing *Super Metroid* on modded Nintendo Wiis, as part of a broader argument for featuring emulators in the classroom, the Residual Media Depot acquired half a dozen physical game cartridges to abide by intellectual property law requirements (i.e. possessing original copies of the game to source ROM images from). When the cartridges arrived, however, they looked a bit different than we anticipated (Figure 8.3).

Figure 8.2. A Playtronic release of *Super Metroid*.

Figure 8.3. A Playtronic release of the SNES/SFC.

The *Super Metroid* cartridges appeared mostly normal from the outside but featured an unfamiliar Playtronic logo at the bottom left corner of the label. While custom packaging is a common practice among reproduction makers—as I have previously reviewed in *Pixels and Plastic*—these cartridges were supposed to be originals. After some forensic analysis and online sleuthing, we confirmed that, although our purchased cartridges were facsimiles, Playtronic was a licensed distributor of Nintendo products in Brazil throughout the nineties (Figure 8.3). However, beyond this baseline knowledge, it was difficult for us to learn more about Playtronic's history. Even SNES Central, a veritable treasure trove of information about the console, only features a few pages about Nintendo's Brazilian releases (Gowan, 2017). This is despite the fact that the company produced a bevy of cartridges, consoles, and paratexts for sale in the region.

Throughout this dissertation, one of the ways I have expanded the platform archive for the SNES/SFC is by blurring the boundaries between what are imagined to be distinct distribution regions. However, I have spent little-to-no time discussing the console's proliferation outside of its three most oft-cited jurisdictions: North America (NTSC), Europe (PAL), and Japan (NTSC-J). As Felipe Pepe has noted in *The Gentrification of Video Game History*, "different nationalities all have their own game history, their cultural memory, with their own hits and particularities," but through the Western gaze "they're rendered invisible to anyone but themselves" (2025). And while North American fans and scholars have somewhat broadened their scope beyond their home countries, they appear most fixated on the flow of games from Japan to Western audiences. I am, of course, guilty of this as well, as demonstrated in both *Satellite Archaeologies* and *Final Fantasies*. However, omitting these regions means discarding important aspects of the SNES/SFC's history and vital research questions. Why was it more cost-effective for Nintendo to license their consoles in certain regions? How did these regional releases, and the user activities that grew alongside them, vary from other iterations of the SNES/SFC and its games? And is there truly an absence of documentation of these devices or is it simply not easily found by Western scholars and hobbyists who lack prerequisite language proficiency? While beyond the scope of this dissertation, these are all fruitful avenues of research that highlight important global media flows often overlooked by North American platform studies scholarship.

The Cost of Videogame History (i.e. The Palmer Luckey Problem)

One of the most persistent barriers to my technological experimentation was the cost of acquiring materials. While I did not keep a strict budget for this project, I would estimate that I spent over $1000 (CAD) on reproduction cartridges, Satellaview memory packs, electrical components, soldering and ROM-flashing tools, and other physical expenses. Despite being extremely well supported for a graduate student—my dissertation was funded by the Fonds de Recherche du Québec Société et Culture and a graduate scholarship from Concordia University, and I have access to free equipment through the Milieux Institute's game labs—there were numerous points where I had to scale back my research due to financial realities. For example, I would have loved to purchase a Satellaview console to take apart and analyse, but I could not justify spending $450-1200 (USD) on eBay for a mostly non-functional peripheral. Additionally, some purchases were financial risks akin to playing the lottery. I commonly had to order materials that were not guaranteed to work, such as Satellaview memory packs and second-hand ROM chips (that have roughly a 50% failure rate). Historical games scholarship is expensive, its precise costs are difficult to estimate ahead of time, and these challenges strictly limit who can participate. In short, my research was enabled and constrained in numerous ways based on my financial means.

This is well-known problem for those working in videogame history. The retro gaming market has exploded over the past 10-20 years, fueled by the increased user demand, a pricing boom spurred by the early days of COVID pandemic, and rampant speculation that has driven some items to be valued at hundreds of thousands of dollars (Gilbert, 2021; Greenbaum, 2022). And the reality is that even robust institutions such as museums, nonprofits, and universities

usually do not have the money to acquire important videogame artefacts. As I mentioned in *Satellite Archaeologies*, the only known Nintendo PlayStation prototype was sold to Greg McLemore, a dot-com boom millionaire, for the astounding sum of $380,000 (USD) (Machkovech, 2020). Its placement in a private collection likely closes the door for public scholarship on the pivotal device. I cynically refer to this issue as the 'Palmer Luckey problem,' to reflect that much of videogame history has *literally* been buried by the rich. Luckey, a weapons manufacturer who made his initial fortune with the Oculus Rift, is the owner of "the world's largest video game collection, which he keeps buried 200 feet underground in a decommissioned U.S. Air Force nuclear missile base" (Stern, 2024). Unless Luckey eventually decides to make his collection open to the broader public, he has effectively rendered large swath of important materials inaccessible. And, speaking more broadly, as videogame technologies become increasingly commodified, conducting material research them will become untenable to most. While organisations such as the Syd Bolton Collection, the Residual Media Depot, the Media Archaeology Lab, the Strong Museum, and the Video Game History Foundation are doing their best to build and maintain research collections, it is hard to compete with billionaires with deep pockets and an endless appetite for accumulation.

Closing Notes

Earlier in this chapter, I reflected on the joys of discovering an endless number of technologies, practices, and industries that have grown around SNES/SFC over the past 35+ years. While I have dissected four of these phenomena in my case studies, there is certainly no shortage of additional research avenues for me to pursue. Thus, to close things out, I choose to be a little self-indulgent. Here are two future SNES/SFC research projects that I would personally be interested in pursuing.

First, I believe there is still much to be said about the Satellaview, whose restorers have only accelerated their recovery efforts since I finished writing *Satellite Archaeologies*. As I was winding down my dissertation, one of my participants informed me that satellite archaeologists had finally manifested one of their longstanding goals: "a revival service to St. Giga's satellite service, Satellaview, which allows you to play special Satellaview games, read magazines, and more" by way of scheduled online broadcasts (*Satellaview+*, 2024). From 9:00am to 11:00pm (ET) every weekday, users can now download Satellaview content to their computer using an emulator, mimicking St.GIGA's original broadcast strategy by substituting satellites with an Internet connection. In an era of software preservation defined by institutional hurdles and tightening intellectual property law (Chalk, 2024), informal efforts are increasingly important in restoring access to abandoned software ecosystems. I believe it would be valuable to further flesh out the history of the device by speaking with its users, analysing its content and technologies in greater depth, and building long-term collaborations with satellite archaeologists by participating in and contributing to their ongoing restoration activities.

Second, as I have touched upon earlier in this conclusion, I would like to better understand the licensed regional variations of the SNES/SFC. To my knowledge, there are three companies that were authorised to manufacture and distribute regional versions of the SNES/SFC: Playtronic in Brazil, Steepler/Dendy in Russia, and Hyundai Electronics in South

Korea. These jurisdictions are commonly overlooked in platform studies and reflect a recurring blind spot for Western videogame scholarship. Still, while I believe this research is valuable, I am hesitant to claim that I would be able to undertake it alone. Even if I do miraculously learn to speak Portuguese, Russian, and/or Korean in the years following my PhD, I am detached from these jurisdictions and cannot rely on the same types of material communities as I did for my research in *Satellite Archaeologies* and *Final Fantasies*—North American fans and scholars do not seem to obsess over these countries to the same extent they do with Japan (for reasons that are too complex to unpack at this juncture).

Circling back to my post-humanist ideals, I strongly believe that collaboration will be extremely beneficial, if not necessary, for future research projects involving the SNES/SFC and other videogame consoles. I surely have not reached the limits of studying the device, and I feel that future research avenues cannot be fully explored without working closely with situated game scholars, consulting with technical experts, and building relationships with material communities that steward and iterate upon the console. As I have learned through years of collaborations that span research labs and online communities, no single person possesses the necessary technical, theoretical, or cultural expertise to fully circumscribe a videogame ecosystem (particularly one as rich in materials as the SNES/SFC). While I have made my scholarly intervention into the platform, my work represents only one set of epistemic provocations undertaken by a single scholar. A platform can be articulated in countless ways and there are an infinite number of Super Nintendos left to explore.

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