

# Making Books with Generative AI

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# ABSTRACT

## Making Books with Generative AI

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The advent of powerful generative artificial intelligence (AI) has the potential to transform the way we create and consume artistic works, including artists' books. This research explores the impacts of generative AI on independent publishing and book arts.

Powerful new models like GPT-3 have the potential to transform creative workflows, raising questions around automation's role and preserving human craftsmanship. Through conceptual prototypes and speculative interfaces, this study reveals opportunities and critical challenges when adopting generative techniques. Integrating GPT-3, the prototypes demonstrate AI's capabilities for enhancing ideation and production, while highlighting issues like training bias. This research aims to contribute frameworks promoting thoughtful human-machine teamwork in this context. Drawing from computational creativity<sup>1</sup> research, the prototypes are evaluated for different types of exhibited creativity. By exploring the partnerships between generative models and artisanal creation, findings uncover strategies for ethical co-invention. The speculative prototypes of creative bookworks encourage discussion on emerging impacts of automation on creative roles. By revealing the current limitations and potential of AI automation, this research provides a conceptual foundation and prompts further interdisciplinary work at the intersection of independent publishing, book arts, and artificial intelligence, further exploring the codex as a site for research and creation.

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<sup>1</sup> Computational Creativity – a subfield of AI research – is the study of how to engineer software to take on creative responsibility in arts and science projects (Colton, 2012).

## DEDICATION

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## INTRODUCTION

Considering the future of the book in an age of rapid automation and powerful generative artificial intelligence, standard practices in the field of independent publishing are in the midst of grand transformation. A paradigm shift is taking place in the arts, one where creative work is being increasingly automated in the context of an AI-powered industrial revolution that is rewiring society's communication and information methods (Forbes, 2023).

Imagining how these new AI systems may impact the future of books, the research is positioned in relation to a recent history of Processual Publishing (Ludovico, 2012) and its technological methods for writing, printing, and reading books that have appeared since the start of the digital age.

GPT-3, OpenAI's Generative Pre-Trained Transformer 3 (GPT-3), a type of Large Language Model (LLM), has been trained on massive amounts of text data. It operates using technology like the predictive text messaging on a smartphone. It can offer continuation of existing text as well as manipulation and generation of new text. Interacting with the model using natural language prompts, known as prompt engineering, makes LLMs accessible to virtually anyone. LLMs like GPT-3 are also known as Foundation models for their massive training datasets and wide downstream use cases (Bommasani, 2022). Generative AI models, including a growing number of LLMs, can produce human-like text, images and audio. Recent large-scale deployment of chatbots like ChatGPT have revolutionized how many people incorporate AI into their daily work. My creative research explores new possibilities within this context of rapidly expanding generative AI capabilities.

As an independent publisher and artist without strong technical skills, the accessible GPT-3 API allowed me to easily experiment with and apply large language model capabilities to creative projects, providing a platform to explore the potential of generative AI within my practice.

It is within this context that this research unfolds, at the intersection of book arts and artificial intelligence, where bookworks made in collaboration with algorithms present questions related to computational creativity (Elgammal, 2017; Boden, 1994), as well as automation in literary and visual art (Kelly, 2017).

Building upon my established practices in independent artbook publishing and bookbinding, with a focus on investigating new technological practices, in this thesis I explore how generative AI may transform the way we create and experience books. This interest exists within the context of production, physical interactivity, as well as literary and artistic aspects. Through this research, questions are explored around how design methods and principles could allow artists to counteract the hyperproductivity of Generative AI. Additionally, the research asks how one might collaboratively work with Generative AI to encourage lateral thinking.

This research also seeks to share non-technical, conceptual understandings of the technology, contributing to and encouraging the development of a new poetics (Khan, 2015) of language to be established to make accessible and break down barriers to technical understanding. As these practices converge with Generative AI, a new and continually expanding problem space<sup>2</sup> is presented, where each stakeholder (artist, designer, editor, publisher, etc.) must consider the prospect of their work being automated and be able to describe and discuss their input. Practices in this new disciplinary field rely on “black box technologies” (Ashby, 1956), technologies that even the engineers who work on these models are unable to trace through the steps of the neural network and explain how exactly it generated texts were formed. These models offer processes that support entirely novel approaches to creative production and artistic output. As the function of these new technologies and their integration into creative practice are actively forming in real-time, new theoretical perspectives of evaluation need to follow (Bijker, 1995, Hesse-Biber, 2006).

Investigating at the intersection of book arts and artificial intelligence, this study adopts a

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<sup>2</sup> As developers of LLMs increase parameters of their models, scaling laws have proven the unpredictable emergence of new abilities (Brown et al., 2020)

precautionary approach to the integration of AI. Some believe that AI may transform humanity in extremely positive or negative ways (Bostrom, 2014), and this research methodology aligns with Slow Design principles (Strauss, 2008) and Reflection-in-Action (Schön, 1983) to responsibly evaluate and develop prototypes that integrate Generative AI. The approach, specifically, involves identifying potential long-term impacts and problems when introducing new technologies, as advocated by precautionary design theorists like Carmela Cucuzzella (Cucuzzella, 2011). It also examines ethical and social implications through mindful reflection during the prototyping process itself.

Using various Generative AI systems to produce a collection of bookworks and experiences for making and reading books, the study reflects on these questions as it examines how this technology could be integrated into making artist books, revealing opportunities and challenges of using AI in the creative process more broadly. The speculative prototypes serve as spaces to practice responsible innovation on a small scale by revealing tensions and questions surrounding human-AI collaboration in artist books and independent publishing practices.

## **PROCESSUAL PUBLISHING**

This study into the new realm of Generative AI and its application to the history and future of the book begins with an examination of the field of “processual publishing,” coined by historian and technologist Alessandro Ludovico. The term refers to the book in all its technological forms and the evolving publishing practices that have emerged with the rise of the internet, electronic reading formats, network infrastructures, digital printing methods, and modern consumption trends (Ludovico, 2012).

Ludovico’s research, which looks closely at new industrial models like automatic web-feed of print files, print-on-demand (POD) methods, and generative techniques for producing content, shows that artists and independent publishers have already pushed the boundaries of publishing to

the point where the content and design of a book can be completely generated with minimal effort from the author. Independent book publishers and book artists have been exploring automation throughout the 20<sup>th</sup> century and have increasingly been integrating digital technologies into traditional approaches to making books since the formation of modern desktop publishing in the mid-1980s (Ludovico, 2011). This movement has made a transformative impact on book conception and production, allowing authors and independent publishers to use digital software for home computers to make professional-looking documents. This resulted in the obsolescence of jobs such as typesetters and compositors and reduced the demand for traditional printing methods. Along with these new digital tools running on personal computers, Xerox technology made digital printing affordable for small quantities - within copyshops, the office, or at home - reducing the demand for traditional printing methods. Desktop publishing tools propelled the 'zine' movement in particular, feeding the growth of this counter-culture milieu and providing the ability for artistic and activist communities to easily produce and self-distribute printed booklets.

With the help of Generative AI, it is now possible to create unique publications using automated and industrial POD procedures. In his bookwork titled *Anna*, artist and educator Gregory Chatonsky explores the use of Generative AI in automatically writing and illustrating books (Chatonsky, 2019), combining OpenAI's GPT2 with AttnGan neural network (see Fig. 1). With the creation of various generative artistic bookworks, he has explored speculative designs for fully integrated, multi-modal, and automated book production systems. Chatonsky hypothesizes that the personalized, on-demand content these new systems offer will gradually allow society to move away from the industrial model inherited from the 19<sup>th</sup> century, which relies on economies of scale and leads to unsustainable material extraction processes (Chatonsky, 2018).

I seem to speak (it is not I) about me (it is not me). I had not come (to speak about you). You do not come to speak about me (it is not I) - the doubt will arise only when you do not come to speak about me (it is not I) - he speaks about me (it is not I).



**Figure 1:** Anna, Gregory Chatonsky, 2019. The description from the artist’s website reads: “A book, Samuel Beckett’s *The Unnamable*, is completed by a Transformer-type generator based on the GPT-2 dataset. The title is the word that comes after the original title when you complete it. The images are then produced by another neural network by entering the texts. This project is part of the “Completions” series producing data of data, i.e. the ability of artificial neural networks to create new data from stored data and to pursue a document beyond its limits by applying statistical induction to all past cultural production. The aim here is to show that this recurrence does not produce a simple identical repetition or a pure difference but can, depending on the procedure, generate a similarity.”(Chatonky, 2019)

Across an extensive and heralded new media practice, Chatonsky proposes several new non-technical terms for the high-level understanding of using AI in a creative context and useful introductions to the processual publishing lexicon. He suggests the particularly useful adjective “hyperproduction” for describing the nature of working with neural networks, where the systems are capable of generating content in quantities which are humanly impossible to consume.

# GENERATIVE AI

## Historical References

The idea of a machine that can generate language and books is certainly not a new one. A popular and early example is found in Jonathan Swift's *Gulliver's Travels*, whereupon visiting a new society, a Knowledge Engine is witnessed and described, operated by hand via dozens of hand cranks and shifting characters. Another popular example is found in George Orwell's book *1984*, published in 1948, where a team of workers from the "ReRites" department used novel-writing machines to automatically produce fiction in a mostly industrial fashion (Orwell, 1948). In 1952, Christopher Strachey programmed a computer to generate "overwrought love letters" and essentially pioneered a movement in engineering generative texts (Strachey, 1952). Philip K. Dick mused on the idea in *Penultimate Truth* (Dick, 1971), describing a machine called a Rhetorizer, which created speeches on command, while J.G. Ballard further expanded on the idea with the description of a verse transcriber, which created poetry on command (Ballard, 1971).

All of these examples of literature-generating machines are now arguably present in today's large language models and readily accessible to all, proving the potential for machines to produce the fruit of cognitive processes - creativity - previously considered as "untouchable" and one of the most difficult tasks to possibly engineer into AI (Bostrom, 2014).

## The Emergence of Generative AI

Modern LLMs have been developed upon a foundation of research in Natural Language Processing dating back to World War II, when the technology was originally conceived and developed as a means of language translation (Stanford, 2021). The paradigm shifting "transformer" neural network architecture was introduced in 2017 by a group of Computer Scientists focusing on translation research (Gomez, 2017). This marked a significant shift away

from previously established methods for text generation, such as using Recurrent Neural Networks.<sup>3</sup>

These revolutionary new transformer systems - such as the GPT-3 and GPT4 - are trained on massive datasets of text, images. These models can interact with humans through Natural Language Processing (NLP) technology, meaning that they can understand and respond to language as we speak or write it. This ease of human-computer interaction eliminates the need for fluency in computational languages, breaking down barriers in communication between users and AI systems. It is worth noting that while GPT4 currently understands over 50 languages (OpenAI, 2023), the robustness, fluency, and understanding of a language's nuance will be directly reflective of the extent that texts in the given languages are found across the web and in the obscured training data.

The emergence of Generative AI marks the arrival of a second wave of transformational AI, which is believed by some to be even more impactful than the internet in terms of its effects on society (Audry, 2022). Also known as Foundation Models, as defined by the Stanford Institute for Human-Centered Artificial Intelligence (Rishi, 2022), these systems are a “paradigm for building AI” in which an unsupervised model has undergone training on vast amounts of unlabeled data and can be adapted to many downstream applications, extracting statistical patterns from large datasets.

The founder of Stability AI, Emad Mostafa, refers to generative AI as a “rocketship for the mind” (Forbes, 2023). This development is revolutionizing the way we create, communicate, and imagine, with an increasing number of downstream applications being developed daily. Users of the technology are applying it as a sparkplug for extending creativity, allowing the generation of textual and visual content for powering their ideation processes. It is clear that how these models are used and integrated into various creative practices has yet to be resolved. The process of artists and early adopters working with the technology, subverting it, exploring implications and

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<sup>3</sup> Recurrent Neural Networks (RNNs) handle sequential data, like sentences, by remembering past information, and have been particularly useful in translation and text generation.

unintended uses will undoubtedly surprise the computer engineers who developed it as well as shaping how the larger public of users will approach it in future releases (Audry, 2022).

Passive content consumers may soon play an active role as co-creators of the media they consume (Sabeti, 2020; Audry, 2022), with books, movies, and other forms of content soon being generated on-demand, based on their users' preferences. Romance novels, for example, could be automatically rewritten and new variations generated from different movie genres (Audry, 2022). The reader of the future may have the choice of a generalized plot outline of a book, which can then be printed in any given language, set in another time, and written with vocabulary and literary devices aligned with their personal reading level. This could also be applied to elements such as tone, character, style, and aesthetics, which could be controlled according to readers' preferences. A reader could expand content, summarize, or increase qualities such as humor in a work, much like increasing the volume on a television. The same principle could possibly be applied to audio and video modes, making it possible to soon watch our favorite movies in an ever-evolving on-demand manner, according to our individual preferences.

In 2019, artist Gregory Chatonsky proposed a speculative prototype called "Machine Book" - an autonomous artist-book generator requiring minimal NLP prompts. The application combines cloud-based APIs to automatically generate content, design layouts, and output print-ready book files. This work explores new human-machine collaboration dynamics in independent publishing and machine creativity. As Chatonsky explains, "there is a permanent exchange between the human being and the machine that imagine each other. The definition of artificial imagination is exactly the grey zone between human and machine." Future development could customize parameters like style, humor, and complexity to construct personalized storylines. This prototype reveals the potential for AI systems to participate in autonomous creative production within book arts.

This signals a new era of "hyperproduction" where users are active participants in the co-creation of a work. Such preference parameters may lead to individual experiences of a work being

different, as they determine the output of any body of work. This concept supports the claims by philosophers and technologists of a current rewiring of how society communicates and creates information, leading to a rewiring of communication across society (Forbes, 2023).

### **OpenAI's GPT-3**

With OpenAI's series of GPT transformers and dozens of other models being trained and released by other research organizations and technology companies, LLMs have become popular for their capacity to complete texts, generate literature, and even write usable code. LLM models can be switched from one kind of problem to another by employing natural language prompts with a minimum amount of instruction. This new technique of prompt engineering essentially "primes" the model with a structure of text which has some degree of probability of continuation or action; its statistical analysis of one's words determines the continuation. If prompt engineering were compared to playing piano, the results will similarly be dependent on the player sitting at the keys, whether they choose to poke random keys or play complex arrangements. Further fine-tuning of these models can be performed, with the possibility of creating datasets of example prompts and generations. The fact that they are frequently referred to as "foundation models" within the industry is an indication of how significant this quality is.

In 2019, OpenAI released its precursor, GPT2 - a powerful generative pretrained transformer trained on a vast number of books and internet text and e-books (Radford, 2019). While the full-scale model was kept from the public for "safety" reasons (Medium, 2019), less powerful models were developed and released by the research organization HuggingFace.

In 2020, OpenAI released GPT-3, a fantastically more powerful text transformer than the previous version, by feeding the training process with much more data (Brown, 2020). Surprisingly, scaling laws were revealed, known as known phase transition, where the behaviour changed, and the ability of the model increased beyond what the system was capable of at a smaller scale. With emerging abilities increasing, this third iteration of the GPT model was able to generate usable

computer code, among its growing 137 bench-marked use-cases (Wei, 2022), demonstrating that these types of systems developed new capacities as their training data was increased. With hundreds of billions of parameters trained on a massive, undisclosed dataset, the GPT-3 LLM can make accessible knowledge about everything it has learned, coherently stitching information from different sources across disciplines. It organizes and condenses all this knowledge in endless ways and serves as tool for the manipulation of language toward any intention held by the user. Through the cross-transposition of disparate fields of knowledge, LLMs reveal their capacity for “combinatory” creativity, showing us not what most likely has been said previously between multiple subjects, but what most likely *would* be said.

OpenAI’s GPT-3 model is trained on an enormous amount of text and operates on technology related to next-word prediction on a smartphone. The training data comprises Wikipedia entries, eBook archives, and academic journals, as well as the bulk from social media and web-based user content. As a result, one of the pitfalls of this training data is that ethical issues arise such as the potential bias in the output of the transformer (Bender et al., 2021). As an unsupervised deep learning technique, the transformer architecture may be considered a “black box” technology; even the engineers who work on these models are unable to trace through the steps of the neural network and explain how exactly it generated the texts. This lack of interpretability is consistent with all neural networks built using excessively large and complicated datasets. Unlike fine-tuned, human-guided downstream products like ChatGPT<sup>4</sup>, the base engine of GPT-3 (currently the Davinci\_text\_003 model) holds a much wider potential and feels much more powerful to “play” (if comparing these to an instrument). GPT-3 displays the power of suggestion when working with it; you can ask it to be the most truthful and honest source of expert information, or prompt it to form pure incoherence, lie with the utmost confidence, or produce random output which is inverted to its training data.

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<sup>4</sup> OpenAI released ChatGPT in Nov. 2022, falling outside the research period of this study.

An effective example of the ability of GPT-3 for the uninitiated was shared by technologist Aram Sabbetti on his blog in 2020, entailing the results from various prompt exercises. In one, the LLM is asked to continue a transcription of a stand-up comedy routine between Jerry Seinfeld and Eddie Murphy, where they discuss various issues and complaints of living in San Francisco. Upon reading the transcription which followed, one can genuinely hear the voices of these two comics in their head; the transformer thus learned the comics' individual speaking styles - patterns in the style of language and grammar they use - and convincingly predicted how a dialog between the two might proceed.

Considering that the GPT-3 model alone was generating a textual output equivalent to 80,000 books per day in March 2021 (OpenAI, 2021), it has been remarked that the technology feels like a prequel to the novelist Jorge Luis Borges's fictional "Library of Babel" (Borges, 1968). A relevant marker in considering how language may be treated in a purely mechanical, combinatorial process, the Library of Babel portrays a fictitious universal library that holds any combination of 410 pages of books, or every book that has ever been written or could ever be published.

In this spirit, Jonathan Basile has created a web-based project, the *Library of Babel* (Basile, 2015), where books are generated on demand, using every combination of 3,200 characters, resulting in  $10^{4,677}$  possible books, and growing. Interacting with it is as simple as typing plain, natural language in the Playground Web interface. This web-based API allows us to interact directly with the 10,000 graphic processing unit (GPU) cluster, which powers the systems' processing of the inferences submitted by the user. The user begins by typing a prompt into the text window, with several sliders controlling the length and creativity of the output, among other parameters. At its most simple interaction, the user will enter a text and the model will pull from a latent space to foresee the continuation of a document and generate a completion. The manipulation of language

through the GPT-3 LLM has been likened to both a chance operation<sup>5</sup> and an instrument requiring practice to develop skill.

This notion of endless permutations of human knowledge is perhaps a parallel concept when perceiving the potential of GPT-3, which Australian philosopher David Chalmers has described as “one of the most interesting and important AI systems ever produced” (Chalmers, 2020). LLMs are said to be the most important AI systems today (Forbes, 2022), with the growing technology expected to revolutionize the world, much like how electricity did. From a publishing perspective, we can compare the impact of these models to that of the printing press, and how it was responsible for the rapid expansion of human knowledge. Rolled into creative practice, this technology is poised to usher in a strange new paradigm of creativity and be at once exciting, startling, and a cause for concern.

## CHATGPT

In 2022, OpenAI released ChatGPT, an improved version of its GPT-3 Davinci\_text\_002 model, with the goal of making it more useful, truthful, and careful. These alignment objectives resulted in much less “hallucinative” and more truthful outputs than seen in the previous model. ChatGPT was fine-tuned to provide more informative and helpful outputs and combined with Real Human Live Feedback (RHLF), a reinforcement learning technique. Released as a beta in November 2022, ChatGPT improved upon GPT-3 in ways that include the ability to respond to follow-up questions, correct false assumptions, and decline inappropriate requests.

ChatGPT has made headlines for its ability to write coherent essays and articles and has received a record adoption rate by users (Hu, 2023). It has also passed benchmark exams in business and law schools (Kelly, 2023). However, some college students have been caught using ChatGPT to generate written assignments and essays, leading to detection by professors who noticed an

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<sup>5</sup> A Chance Operations is a term introduced by John Cage, where creative methods are intentionally left open to chance or unpredictable outcomes, such as flipping a coin or pulling a card from a deck. (Latham, 2011).

improvement in the coherence of their writing. To address plagiarism concerns, OpenAI has introduced a classifier that identifies generated text by analyzing its perplexity. Perplexity is a metric that serves as a proxy in the evaluation of output in LLMs. A low score indicates being most probably and statistically close to the training data, therefore more likely to have been generated, whereas a higher score suggests an increasingly complex and less probable grouping of words and indicates the likelihood of being written by a human.

To provide an example,

Low-perplexity: *“AI is transforming the book publishing industry by automating tedious tasks such as typesetting and formatting.”*

High-perplexity: *“The publishing realm of literary tomes is undergoing an unprecedented revolution brought about by the integration of advanced artificial intelligence systems.”*

OpenAI is also making ChatGPT customizable by users “within society's defined limits,” which is to say that they will essentially agree to allow the model to behave a certain way if a majority of their user base and the general public determine it to be appropriate (OpenAI, 2023) . This open and democratized approach may lead to use cases and outputs that some may disagree with, raising the sensitive and political issue of who gets to decide how these systems act. Other tech companies are also entering the market with similar systems as large language models like ChatGPT receive attention.

### **Text-to-Image Generation**

Along with Large Language Models, Generative AI includes text-to-image Diffusion Models. Similar to LLMs, newly released systems are operated with simple natural language, in short, textual

prompts which describe attributes of an image. These diffusion models follow on the heels of another recent image-generation technology which has had a profound impact on visual culture. Generative Adversarial Networks (Goodfellow, 2014), developed in Montreal by Ian Goodfellow and a team at MILA, brought forth the notion of a latent space capable of generating never-before-seen images. Following a training on a corpus of images, the neural net would “learn” the set of images and then be able to create new ones related to the training set through a pairing of generative and discriminator algorithms. This image-making technology quickly reached across disciplines and marks a turning point in visual culture, where it became possible to generate new images in the style of any artwork, photo technique, or resembling any real or imaginary person (Tyka, 2019).

During this research, various GAN and text-to-image Diffusion systems were explored, which afforded a similar experience of working with the state-of-the-art diffusion models available at the time of publication (2023) and served to prove concepts prototyped in a number of bookworks. Over the period of this 4-year study (2019–2023), the technology advanced exponentially; images created with the early text-to-image generators developed by Runway, DeepAI, and OpenAI - which were only suggestive of coherent images created from the text - have now improved to the point where the images are often indistinguishable from human-created images.

Of the low-fidelity models available online at this time of this study, Text2Image<sup>6</sup> was one which quickly conveyed the reactive experience of having an algorithm produce images based on textual input. Developed by Deep AI, Text2Image appeared to have been trained largely on a dataset with a high presence of photos of puppies, birds, and spiders, as these were often introduced to generated outputs and had a higher rate of clear output. With this model, the more detailed the textual prompt provided, the higher the detail of the output returned by the transformer. Another image-to-text generator explored in this study was Runway ML’s Generative Storytelling. With real-time visualization, Runways’ version would continuously hold an image interpretation of the token, modifying the image with every additional keystroke. Built on the AttnGan algorithm, this

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<sup>6</sup> The Text2Image generator is a simple and freely available at <https://deepai.org/machine-learning-model/text2img>

model was applied as an illustrative companion, offering unique imagery to serve as a visual interpretation of a text.

With these systems' capabilities relying on massive datasets for training, leading companies OpenAI, Stable Diffusion, and Midjourney all have relied on the scraping of public image repositories to gather billions of images. While the entire lists of image sources that make these datasets are still undisclosed, the number of images that make them is in the billions and reflects all manner of internet images, social media uploads, and stock photo repositories.

In simple terms, the Diffusion training process takes tagged source images<sup>7</sup> and gradually decomposes the image to a point of random noise, then reverses these steps to reconstruct the image. Once trained, the model works in a predictive manner, generating the most probable image reflective of a textural prompt. Starting from random noise, the model predictively resolves every single pixel in the image frame until the complete image has been output.

A forerunner in Diffusion models receiving most of the attention is Midjourney, which produces stylized, coherent images in any imaginable way, with harmonious color and structure. With detailed prompting, users can modify the baseline styling of Midjourney and introduce image qualities that break free from the recognizable Midjourney aesthetic.

With their goal of “expanding the imaginative powers of the human species,” Stability AI released Stable Diffusion - an open-source diffusion model with API access<sup>8</sup> - which now powers applications for many developers. Making controversial headlines via its use in the Lensa app (Biron, 2023) - an app that generates stylized portraits of the user - Stability AI's model has received criticism for using copywritten images within its datasets.

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<sup>7</sup> Imagenet, for example, is a massive dataset of images with human-written textual descriptions, which has played an important role in the development of diffusion models.

<sup>8</sup> Many generative AI models have been made available via Application Programming Interfaces hosted remotely via cloud computing.

At the time of the publication of this research study, the debate around the fair use of internet-scraped images is currently unfolding, with two separate lawsuits having been filed against Stability AI (Mattei, 2023). The outcome of these lawsuits - which will analyze how images were collected and processed, and how similar the outputs are to the original - will determine the direction that the makers of this technology take for future development and how they will be used in the future.

## DEFINING CREATIVITY

According to Margaret Boden, creativity is the ability to come up with new, surprising, and valuable ideas or artifacts. To quote Einstein, “the true sign of intelligence is not knowledge but imagination” (Einstein, 1929). Creative ideas are unpredictable and grounded in conceptual thinking, perception, memory, and self-criticism (Boden, 1992). Rather than asking if an idea is creative or not, it is more productive to ask *how* creative it is and in what ways (Boden, 2010).

Boden has identified three forms of creativity: exploratory, combinatorial, and transformational creativity:

- a) ***Exploratory creativity*** is the ability to explore the limits of what is possible, while remaining within the rules. For Generative AI, a text prompt effectively suggests loose guardrails for the model to follow, in the constraints of an obscured neural network. In conversation, digital poet David Jhave Johnston has likened this to pulling the handle of a slot machine.
- b) ***Combinational creativity*** is the ability to combine two different constructs in an interdisciplinary way. With GPT-3, this quality can be observed when given a prompt asking the model to synthesize completely disparate topics and predict what might be said

of them.

- c) *Transformational creativity* refers to the exceptional ability to generate game-changing ideas. While GPT-3 has arguably demonstrated the first two forms of creativity, it has not yet been conclusively shown to possess the third.

With established definitions of exploratory, combinatorial, and transformational creativity in mind, we can next consider methods for assessing creativity in artificially intelligent systems, such as the Lovelace Test 2.0 (Reidl, 2014). This test was proposed by Mark Reidl as an improved measure for evaluating an AI system's creativity, building upon the well-known Turing Test (Turing, 1950), which has been criticized for its simplicity. The test is named after Ada Lovelace, considered the world's first computer programmer. Setting the foundation for artificial intelligence with her work on Charles Babagge's Analytical Engine, Lovelace determined that computational processes inherently had "no pretensions whatever to originate anything" (Menabrea, 1843), and put forth the notion that since humans create things, any positive test of intelligence should include the display of this key trait. This perspective remains instrumental in our understanding of AI and its creative potential today.

To pass the Lovelace Test, an AI must generate output that cannot be explained by its programmers. The results should mystify even the system's creators to demonstrate true creativity (Bringsjord, 2015). It could be argued that advanced LLMs like GPT-3 pass this test, since their innerworkings remain largely opaque "black boxes" to engineers. The steps leading to specific outputs cannot be fully traced or deciphered.

Other philosophers, like Berys Gaut, have argued that agency and intention are crucial in the creative process, therefore any system that cannot display these traits cannot be considered truly intelligent (Gaut, 2018 and 2010). The mission of building these qualities into AI systems and achieving a complete definition of intelligence has sparked debate, with some predicting that

successfully building these traits into computational systems will make them harmful (Bostrom, 2014).

Still, from the perspective of how these models can augment human creativity, and as demonstrated within this study, generative AI systems may serve a significant role. They can serve to support the ideation process and serve as a “creative companion” and “sparkplug of imagination” for many (Krawczyk, 2023). Makers of the GPT-3 integrated word processor LEX go as far as describing large language models as “thought partners,” which increasingly suggests that we have entered a new age of machine-human symbiosis (Kurzweil, 2005). As the relationship between art and technology is one that is complex and continually evolving, we can expect the question of whether machines can possess true creativity to continue to be a topic of discussion in both AI and philosophical circles.

Using prototyping as a research method, this study explores how the lateral thinking offered by the GPT-3 model supports general creativity and can serve as a powerful tool for the iteration of speculative designs. As a form of “knowledge engine” (Swift, 1726) - a machine made by humans to generate meaning and language, with many historical and recent manifestations - GPT-3 will thus be framed as a hyperproductive generator of solutions. The resulting prototypes contemplate how human creativity can be both supported and extended with machine intelligence, as well as how these processes can be viewed as a collaborative experience. They have been evaluated according to frameworks from independent publishing practices, processual publishing theory (Ludovico, 2012), and emerging aesthetics related to AI-generated art (Bunz, 2020).

## **MAKING BOOKS WITH AI**

The term “Machine Books” put forth by Chatonsky (Chatonsky, 2018) has proven useful in this research when referring to the bookworks and prototypes produced within this study. Machine books are bookworks where a combination of AI or mixed reality has been applied, and

computation is required in either the conception or experience of the book itself. Applied within the book publishing industry, its potential for transformation has been compared to the invention of the printing press.

Just as the printing press revolutionized the accessibility of literature in print, and desktop publishing automated many of the processes required to produce a manuscript and print on-demand, LLMs now offer a new means of accessibility to literature through their ability to digest and understand vast corpora of text in ways that surpass human capabilities. For example, LLMs have an advantage over literary experts in their capacity for machine-reading massive corpora of literature, which no human could conceivably read, even in multiple lifetimes (Alpaydm, 2021). While they have the ability to summarize or complete a text, the capacity of LLMs to synthesize knowledge from disparate areas of their training literature is where these systems are perhaps most valuable. This powerful combinational creativity, at scale and across disciplines, should inevitably lead to a new era in the literary and visual art practices associated with the book, and effectively revolutionize the way we create books.

*PharmakoAI*, a book written by artist, curator, and educator Kenric Allado-Mcdowell, was published by Ignota Books during the first half of the pandemic in 2020 and is heralded as the first book to be co-written with GPT-3. To write this book, Allado used the GPT-3 engine - under research access from OpenAI - as an experimental conversation partner (Allado-Mcdowell, 2020). Using fine-tuning, Allado trained a new model on a unique corpus he prepared, which included a wealth of psychonautic 1970s literature, holistic wellness texts, and meta-self-aware fringe science. Allado states that this writing process was similar to musical improvisation and was produced over the course of two weeks. The format of the book is unique, as it alternates between the output of the GPT-3 algorithm and Allado's voice. Over the course of the book, Allado comments on how the algorithm has adopted his writing style and that at one point, they note that they felt they began thinking and even dreaming in the algorithm's style.

As it is now possible to use LLMs to generate text that is remarkably similar to human-written

text, we can expect to see the trade book market increasingly flooded with content. This may include purely generated manuscripts by amateur “writers” looking to produce endless books for Amazon’s KDP Print-on-demand service, or with existing literary professionals and writers who make use of these tools to keep up with the industry and meet the new demands for content generation. As observed in a white paper by Tom Lebrun on AI in the publishing sector (Lebrun, 2020), it is now possible to quickly generate multiple drafts of a manuscript, then select only those aspects which work best. Similarly, for artist’s books, a LLM may be used to encourage creative flow and filling-in when a practitioner encounters creative block, offer coherent completion of texts, or be combined in novel conceptual works.

Technologist Kevin Kelly predicted in 2006 that all the books in the world would become a single liquid fabric of interconnected words and ideas, allowing users to bring together all texts on a particular subject (Kelly, 2006). This vision of a transdisciplinary amalgamation of humanity's collected knowledge has now been manifested in LLMs such as GPT-3.

In publishing, AI has been tasked with automating the tedious aspects of design work and is extending to include drafting and authorship of various components of a book, such as literature, visual content, and design. This means that publication contributors using Generative AI may become systems designers, taking a curatorial role over the systems they have trained and collaborated with the machine agents they are using.

## **CONCEPTUALIZING AN AUGMENTED CREATIVE PROCESS**

This study considers the new lexicon that has been emerging at the intersection of AI and the arts. Nora Khan, a technologist, writer, and educator, calls for the creation of new poetic language to help dialogue around AI. Stating that poetical language can be a useful device in understanding and collectively designing the future of AI, she offers a collection of metaphors herself in her essay, *Towards a Poetics of Superintelligence* (Khan, 2015).

Khan and others call for a subjective new language for discussion of the technology across disciplines in order to make concepts accessible and to share non-technical working knowledge for describing interdisciplinary creative experiences with machine intelligence (Khan, 2015; Bunz, 2020; McDowell, 2020).

In a similar effort of understanding and developing a more functional working language for the practice of working creatively with machine intelligence, Chatonsky has offered new terminology to help conceptualize such an integration, employing the terms Induction, Completion, and Transformation (Chatonsky, 2019):

- a) *Induction* refers to the initial process of training an algorithm, where large amounts of data are fed into the machine. Similarly, prompting a previously trained algorithm with a token of data may also fall under this definition. Induction is essentially the human-input that initiates the process; the nudge that sends the cart down the hill.
- b) *Completion* follows, where the machine begins to generate within parameters that it develops in an unsupervised manner. Some have referred to this as a machine hallucination, while the established definition of this state is latent space. It is at this stage, where a model is capable of returning artefacts from this latent space; the machine receives input and completes it with the return of a response or continuation based on its pre-training.
- c) The term *transduction* is useful for describing the process of passing one instance of completion to be processed through another model, for example to produce text from an image or vice versa.

A simple example of this process is writing a starter text, inputting it into AttnGan, a text-to-image model, and then delivering it to Google Vision, a model which provides image descriptions.

The new text description is then delivered to a text transformer, producing a continuation of the recent snippet of text, which can be repeated indefinitely. This feedback loop is referred to as "hyperproduction" by Chatonsky.

These notions of induction, completion, and transduction help us to understand and discuss how it is now possible to automatically produce unique and variable artefacts of literary and visual nature, as well as better describe our process when working with such situations.

A new technology, LLMs and Diffusion Models require a basic understanding of their workings in order for their application to best support one's objectives. All the while, creative practitioners looking to adopt Generative AI techniques may be encouraged by taking a conceptual approach to AI instead of a mechanical one. Borrowed from Human Computer Interaction (HCI) theory, this notion states that much more can be achieved if a user is not distracted by mechanics (Harper, 2019). An analogy provided by Professor Richard Harper is that of a soccer game: as spectators, we are not analyzing how the muscles of the players are able to carry them around the pitch, or the rules of physics that allow for the dynamic movement of the ball, but instead at the plays that are made between players. While it is important to consider the provenance of data used for training of the models and address critical issues of the new technology in context of the proposed application, the former analogy can be useful in formulating how generative AI systems might be integrated into existing practices.

Chance operations are also a useful reference point for working with LLMs in a creative practice. Rooted in the Fluxus movement as a device for the locomotion of creativity, these practices rely on random chance outcomes existing in a similar world of probabilities.

*Oblique Strategies* (Eno and Schmidt, 1975), a card deck created by Brian Eno, is one such chance operation where the "player" randomly pulls cards which are inscribed with text prompts meant to encourage creativity. Such techniques may be considered a prequel to using AI to generate new

ideas, moving quickly through creative blocks, and proving to be invaluable for lateral thinking.

## **ALIGNMENT PROBLEM IN AI**

Studies by Kate Crawford have revealed a chain of problematics embedded in the AI industry, which she gathers in her book, *Atlas of AI*. Touring the world and following each step of production, Crawford exposes the following issues:

- a) the exploitive, destructive, and energy-hungry industrial processes required to build and maintain AI;
- b) the impact of data extraction on society; and
- c) the severe environmental consequences at every stage, affecting a human, animal, and inanimate stakeholders (Crawford, 2020).

It becomes clear that there are some startling machine abilities that are now possible, including the unfair use of artistic and intellectual copyright, and a threat of automation of jobs in publishing and creative sectors (Ho, 2019). These problems are currently on a trajectory to worsen as demands for compute increase exponentially and further permeate our everyday lives. These broader critical issues of AI are useful when bringing design thinking and ethical review to the convergence of Generative AI and independent book publishing.

These being complex issues, and wicked problems (Rittel, 1973), they will require constant critical inquiry by users and the peoples affected by the technology, as well as transparency and cooperation by the tech companies building the LLMs, in order to show improvement. There have been a number of initiatives and conferences seeking to guide the ethical design and deployment of AI, which includes the Montreal Declaration for Responsible Development of AI (2017), and The

Asilomar Conference (2017). Both efforts sought to gather great minds and important actors in the field of AI, to co-design a collection of general, high-level principles that may act as guardrails to ethical and safe AI development.

With the widespread dispersion of these new generative AI systems easily available, questions around authorship must also be considered as we integrate them into literary and artistic practices, and we may increasingly see a demand for transparency around the use of these systems. For example, the widespread use of ChatGPT across the arts and sciences has resulted in publishers becoming inundated with generative text. To address this, Nature magazine has published guidelines explaining that Large Language Models cannot be attributed as co-authors and the use of generative techniques should be disclosed (Nature, 2023). Going forward, indicating the use of LLMs in literature is a practice with growing support.

### **Industrialization of Creativity (and Prejudice)**

While generative AI solutions can help with the quick production and editing of text and images, these same affordances may also result in their devaluation, and subsequent strain on the creative market, where budgets for written and visual content have been decimated due to a landslide of content produced by AI. Here too lies the risk of potential “reality apathy” by people towards the truthfulness of information, or losing faith in the reality of whether content has been produced by humans (Forbes, 2021).

The statistical generation of language, using deep learning neural networks trained on datasets of human knowledge comes with a threat of an era of homogenized and biased literature, where problematic thinking of the past may be amplified and reflected back to us. Humans are inherently unpredictable, biased, and often perpetuate harmful narratives; training LLMs in our image will thus expectedly produce models capable of reflecting this tendency back to us, and a training dataset that does not reflect equal representation of the world's diverse population may be harmful.

## **METHODOLOGY**

The thesis work centered around prototyping as a primary research method, and practiced reflection-in-action (Schön, 1983) in order to responsibly evaluate the integration of Generative AI in a book arts practice. With respect to Donald Schön's reflection-in-action theory, a deliberate and critical contemplation of each step in the creation process of these bookworks was practiced. The AI workflow found in each bookwork was considered for both its affordances and constraints, while broader impacts on project stakeholders were also evaluated. This reflective process proved to be an important aspect in integrating AI capabilities responsibly and thoughtfully, preserving human innovation and craftsmanship in the creative works produced for the study.

The research also applied principles from Slow Design theory (Strauss & Fuad-Luke, 2008) in its exploration of Generative AI within independent publishing. As proposed by Strauss, the principles of Reveal and Reflect influenced this investigation. The Reveal principle was integrated by taking a playful, studio art-inspired approach to uncovering new combinations of book materials and conceptual elements through experimentation with the prototypes. This revealed limitations, complications, and unexpected outputs from working with the generative systems. The Reflect principle was incorporated through ongoing reflection-in-action during prototyping. Consideration was given to the ethical and social implications surfaced by each prototype, such as how each output may be considered harmful or otherwise problematic. By combining precautionary thinking, problem setting, and reflection-in-action, the research methods attempted to counter the hyper-productivity of the generative models, where content can quickly be generated far beyond that which any human can effectively process.

### **Generating New Descriptions of Books**

This research presents a series of ten (10) bookworks where GPT-3 has been tasked with ideating descriptions for bookworks constructed from combinations of salvaged waste materials. By

merging traditional bookbinding practices with the generative capabilities of large language models, this project explores new methods of lateral thinking in creative practice, while pushing the boundaries of book arts with the introduction of an AI-empowered ideation pipeline. The approach to using GPT-3 to generate material combinations for bookworks is inspired by the publication, *The Book: 101 Definitions* by Amaranth Borsuk (Borsuk, 2020). This collection of concise personal definitions of what the book is or could be was collected from publishers, artists, and literary types from around the world. Borsuk's intention was to survey personal, concise definitions of what a book is or could be. For example, one contributor named Indigo Allegra offered this definition: "The book is a time travel device - allowing us to slip into the imagination of a future mind" (Allegra quoted in Borsuk, 2020). Borsuk's book was the inspiration for the general research method here and led to producing a collection of similar definitions which could be used to prompt the GPT-3 system to generate further definitions.

The preliminary work for a generation of the book descriptions followed a 'Few-Shot'<sup>9</sup> prompting method, where a collection of example book descriptions were provided to 'prime' the language model and guide it towards the desired output.

Example of a prepared book description:

*"A book with photos of cellphone stores, laser printed in BW on found plastic, bound between salvaged sheets of PVC."*

Several book descriptions such as this were prepared and used as examples in the 'Few-Shot' prompting. These descriptions were often specific, existing artistic bookworks, which had been restructured to incorporate both industrial and domestic post-consumer waste materials.

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<sup>9</sup> While a 'Zero-Shot' prompt provides no examples and leads to open generation, 'Few-Shot' prompting provides examples of the desired output, resulting in greater control and accuracy.

Example “Few-Shot” prompt:

*“Make a list of descriptions of artist books made from post-consumer waste  
A book with photos of cellphone stores, laser printed in BW on found plastic,  
bound between salvaged sheets of PVC.”*

*A book with a selection of photos of the artist's friends in Los Angeles. The book is  
made from pressed raw cotton, with a cover made from a salvaged steel sheet.*

*3. (Left open for continuation)”*

After establishing these parameters, the model could essentially generate an unlimited number of such prompts, demonstrating the ‘chance operation’ nature of the process.

From the unlimited text descriptions describing print methods, materials, and conceptual elements of bookworks, a subset was selected for fabrication into physical books. Together they form a speculative collection of bookworks that could be not yet completed in physical form, these new descriptions are ready to be evaluated and integrated into the book artist’s practice, if accepted. The decision to steer the model output towards the exclusive re-use of post-consumer materials was one of personal choice, and in accordance with a sustainable ethos which guided the research project.

The descriptions may reveal new combinations of post-consumer materials that, in accordance with Slow Design principles (Strauss, 2008), may have valuable applications and serve as a means for lateral thinking in ecologically minded research. To *reveal* is a particularly relevant principle here, as we realize new combinations of material and possibilities that may be realized through this generative process. The goal of the "reveal" principle in Slow Design is to make visible and bring awareness to the origins, meanings, and stories behind objects. As described by Carolyn Strauss, Slow Design aims to "reveal narratives of production, use, and ecosystem" through creative practices.

Functioning as an engine to power reflection and expand on the potential of waste materials, this

generator proposes what may be considered a new solution to post-consumer waste with each return. Much like an embodied version of a Generative Adversarial Network (Goodfellow 2014), the cognitive labor of imagining a new material proposition has been automated by neural networks while human judgment has been reserved for the evaluation of the descriptions.

## **Fine Tuning**

A LLM can be customized by ‘fine-tuning’, resulting in a prepared model which performs much more predictively after having been fed a large enough collection of desired outputs. This training corpus can be made up of literature, data, or virtually any form of mode of textual language.

For the research project, a fine-tuned model was prepared on top of GPT-3's text-Davinci-002 engine. This model was the strongest at the time of fine-tuning and could generate coherent long-form text. A collection of 200 entries were made into a simple 2-column spreadsheet, which is considered the absolute minimum number of examples.

The goal of fine-tuning was to customize a model for open-generation, applicable to a wide range of uses, but tuned for a specific collection of literature on the topics of processual publishing, media arts theory, artist book descriptions, and design thinking. The result was a fine-tuned model that qualitatively performs better at producing longer outputs with higher complexity.

For example, the two generations below are exports from the same prompt:

*"Conceptual art ideas for books made from post-consumer waste materials and trash."*

*Pre-Fine Tuning:*

*"Trash Book. A book made entirely of trash. The pages are made of recycled paper. The binding is made of recycled cloth. The covers are made of recycled*

*cardboard. The title is printed on the book using recycled ink.”*

*Post Fine Tuning:*

*“Book of the Dead. A book with pages made from paper recovered from the remains of a deceased person. The title is printed on the cover using letters cut from the deceased's clothing. The book is bound with thread spun from the deceased's hair. The book contains images of the deceased and their loved ones, as well as passages from the deceased's favorite books. The book is bound in a cover made from a photograph of the deceased. The book contains a lock of hair and a lock of the deceased's blood. The book contains a handwritten copy of the deceased's final will and testament. The book is bound in a cover made from an image of the deceased's last meal. The book contains the deceased's ashes. The book is bound in a cover made from the deceased's coffin.”*

Both inferences were made using the same few-shot prompt and control preset, priming the model to provide title, materials, and production methods.

In a similar fine-tuning test, a collection of approximately 250 artist book descriptions and catalog entries were manually scraped from internet archives of various websites, including the Museum of Modern Art, Printed Matter, and Art Metropol. The resulting fine-tuned model proved far more adept at the open generation of artist books that included extensive details on both form, concept, and collection, as well as a tendency towards critical tone and academic language used in many of the training data.

## **PROTOTYPES**

The following section demonstrates attempts at integrating Generative AI into book-making practice, if not a wider creative context. The selected collection of prototypes attempt new approaches to producing artist books, speculate on how we might use our body or voice to design a book, and proposes new working relationships we could have with books.

## Book Prototype I: Describing Machine Books



*Figure 2: Describing Machine Books, Harley Smart, 2021. Initial AI-generated bookwork proposals were collected in this "Describing Machine Books" bookwork, an early experiment using generative AI to conceive novel bookworks through recombination of recycled materials and as a starting point for the series that followed.*

This first prototype book (see fig. 2) compiles a selection of book descriptions generated by GPT-3, and serves almost as a table of contents for the nine subsequent bookworks. Utilizing the 'few shot' prompt of artist book descriptions and a 'word bag'<sup>10</sup> representing salvageable or discarded materials, the algorithm was primed to produce new bookworks upon request. These initial GPT-3 outputs for the prototype were developed with LLM support by research mentors David Jhave Johnston and Alexandre Reben.

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<sup>10</sup> "Word Bag": refers to a list of key words or short phrases fed to a generative ai system which establishes context and primes it towards a specific language generation task. For example, a word bag for post-consumer waste might include keywords such as 'cardboard, aluminum foil, polyethylene shopping bags, scrap canvas' etc.

The book is constructed entirely from domestic plastic waste, including plastic bags (laminated together to form paper), soda bottles (cut into thread for sewing signature binding), and #2 HDPE containers (shredded and shaped into 3mm sheets). The pressed HDPE sheet cover was achieved with help from non-profit organization Precious Plastics Montreal, which provided an introduction to the collection, processing, and working with post-consumer plastics. The resulting multi-use panels served as material for the book's hardcover. The pages were created by laminating common polyethylene plastic bags together through ironing, resulting in a sheet material with a distinct texture. Following specific instructions, a simple handheld device was crafted to convert plastic soda bottles into cord, enabling the sewing of the book block binding using everyday plastic waste.

While generating bookworks through combinations of salvaged materials showed potential for fostering innovation and upcycling waste, reflection revealed this resulting book was no longer recyclable, and the ink was in fact an introduced and extremely toxic substance. Insights from Concordia University Professor Carmela Cucuzzella highlighted this risk. Cucuzzella's work on precautionary design principles, referring to observations by Voss and Kemp, notes that unintended consequences commonly arise when developing new technologies or systems. Upon reflection of these principles in the context of the research methods, it became apparent that unintended downstream effects could emerge from integrating generative AI techniques into artistic processes.

This highlighted the importance of considering long-term impacts and sustainability, particularly when using automated tools for conceptual ideation.

Having established the GPT-3 supported ideation method used to generate the book descriptions, a dozen physical book prototypes were produced next. Of these, the following five books have been selected for inclusion in the study (book prototypes II to VI)



### Book Prototype II: Abandoned Factory

**Prompt :** *“Description of an artist book and made from post-consumer waste, which provides details about how the book was made and what the conceptual issues are.”*

**GPT-3 Completion (excerpt):** *“A book with a unique cover made out of a wall of an abandoned factory. The cover is made in the same manner as a building.”*

*Figure 3.1: Abandoned Factory book, Harley Smart, 2021. “A book with a unique cover made out of a wall of an abandoned factory. The cover is made in the same manner as a building.” – GPT-3*

This bookwork (see fig. 3.1) was constructed based on the short description of material specifics above. The environment of the research studio in Montreal was chosen as factory, the former site of textile manufacturer Colonial Jute, which operated in the space from the 1970s into the 1990s. The space was left derelict after a fire, and the business had closed. As Jute was their primary raw material, the author used burlap for the spine reinforcement of the book, and cut a section of wall to use as the book cover.

Since there was no description of the interior, a series of peculiar composite images generated by an automated laser scan of the space was used. The scanning process created a data folder where these images were contained, hidden deep in a data file. These images were intended to be interpreted by architectural or virtual environment software and textured to create the studios' "twin" virtual space (see fig. 3.2).



**Figure 3.2:** *Abandoned Factory book; interior spread. Harley Smart, 2021. “A book with a unique cover made out of a wall of an abandoned factory.” – GPT-3*

Throughout the book, the images were printed in their original form, resulting in 72 pages of abstraction that directly reflect the space and catalog the materials and textures found within. The method and logic used, as well as the frequent glitches inherent in this computer vision process, contribute to the distinctive nature of the image series and represent the physical space in an entirely new way.

This bookwork exemplifies the symbiotic relationship between machine ideation and human creativity. While the initial concept was machine-generated, human creativity was instrumental in filling the gaps and bringing the concept to life. The creative process was significantly accelerated by the use of generative AI and automated computer vision, demonstrating the potential of such technologies in enhancing human creativity and innovation.

### Book Prototype III: Rubber Tire book

**Prompt :** *“Description of an artist book and made from post-consumer waste, which provides details about how the book was made and what the conceptual issues are.”*

**GPT-3 Completion (excerpt) :** *“A book with a unique cover made out of a wall of an abandoned factory.”*



**Figure 4:** *Truck Tyre book, Harley Smart, 2021. “A book with the covers made from a salvaged truck tyre.” – GPT-3*

The idea of crafting a book from reclaimed truck tires was intriguing, particularly because of the challenges it posed within the automated ideation process. Given the limitations of a traditional tire's shape, an alternative was sought. The solution came in the form of a pliable, recycled flooring

material derived from tires, which was used to adhere to the specifications of this machine-generated bookwork (refer to fig. 4). Despite its flexibility, the material resisted most adhesives.

The covers were wrapped around a stack of roughly 100 blank sheets of Mohawk superfine cover stock, designated as the book's interior pages. The spine was crafted using a double-fan exposed perfect binding process with Planatol glue, and the book block was given a flush cut for a neat finish.

Without any suggestion by the LLM as to what might appear on the interior pages of the book, they have been left blank, and the bookwork serves as example of a binding constructed in an unexpected and perhaps never-before seen way.

The description for this bookwork has proved to be somewhat of a benchmark in ongoing research, providing a simple text-prompt for evaluating the progress of Diffusion models.

The "Salvaged Truck Tyre" book may exemplify the concept of "Oblique Strategies" (Eno, Schmidt, 1975), where a simple prompt containing seemingly impossible and unrelated elements can stimulate the imagination and drive creative momentum.

#### **Book Prototype IV: SkyCam**

**Prompt**

*“Description of an artist book and made from post-consumer waste, which provides details about how the book was made and what the conceptual issues are.”*

**GPT-3 Completion  
(excerpt):**

*“A book of photographs of the same view of the sea, published every year. The covers are made of metal panels that are sewn together to make the cover.”*



**Figure 5:** *SkyCam book, Harley Smart, 2021. “A book of photographs of the same view of the sea, published every year. The covers are made of metal panels that are sewn together to make the cover.” – GPT-3*

*A book of photographs of the same view of the sea, published every year. The covers are made of metal panels that are sewn together to make the cover. (GPT-3)*

To compile this book (see fig. 5), images were sourced from the SKYCAM network<sup>11</sup> a public webcam listserv offering continuous streaming from various locations. Predominantly European-based, these cameras are positioned around public beaches across the Mediterranean region.

The photos are obtained via screen capture, each featuring a timestamp and offering a view from the camera's perspective. Image quality varies due to atmospheric conditions and dynamic public spaces, such as tourists, birds, boats, and vehicles. Each edition is constructed with metal-paneled covers sewn together, providing a durable format appropriate for the creative exploration of open-source webcam archives.

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<sup>11</sup> Skycam is a freely available service found at <http://skycam.com>

To produce new editions, one would revisit the curated webcams each year, perform screen captures, and compile the dated images into a compilation highlighting the passage of time and changes viewed through this lens.

### Book Prototype V: Plant Book

**Prompt :** *“Description of an artist book and made from post-consumer waste, which provides details about how the book was made and what the conceptual issues are.”*

**GPT-3 Completion (excerpt):** *“A book as a house for a plant. A book made entirely of concrete, with a hole cut out at the top for plants to grow through. The pages are made from shredded newspaper. The cover is a cast concrete slab that is also used as the roof”*



**Figure 6:** *Plant book, Harley Smart, 2021. “A book as a house for a plant. A book made entirely of concrete, with a hole cut out at the top for plants to grow through. The pages are made from shredded newspaper. The cover is a cast concrete slab that is also used as the roof” – GPT-3*

Following the instructions of the LLM as faithfully as possible, the paper used in the binding was produced in a long process of collecting newspaper, shredding with local independent hand-made paper manufacturer. The covers were constructed by pouring concrete into wooden moulds. The bookwork was presented with a small species of plant, nestled into a circular opening on the face of the book filled with dirt.

Iterating on the same prompt used previously for generating ideas for new bookworks, the Plant Book (see fig. 6) was one of the first descriptions produced following the fine-tuning of a GPT-3 model. This process involved the preparation of a dataset of selected texts which were intended to contribute to the model's ability to provide coherent output rooted in critical design theory and the history of artist books. The resulting customized davinci\_2<sup>12</sup> engine was trained on catalog entries from museum archives databases, excerpts of academic essays, and collections of book descriptions from independent publishers, among other texts.

Book ideas generated using the new fine-tuned model possessed more detailed descriptions, which often made attempts at such conceptual tools as juxtaposition and subversion. Specifics on binding and materials as well as literary and visual content within these books was more often present, increasingly detailed and coherent than previous.

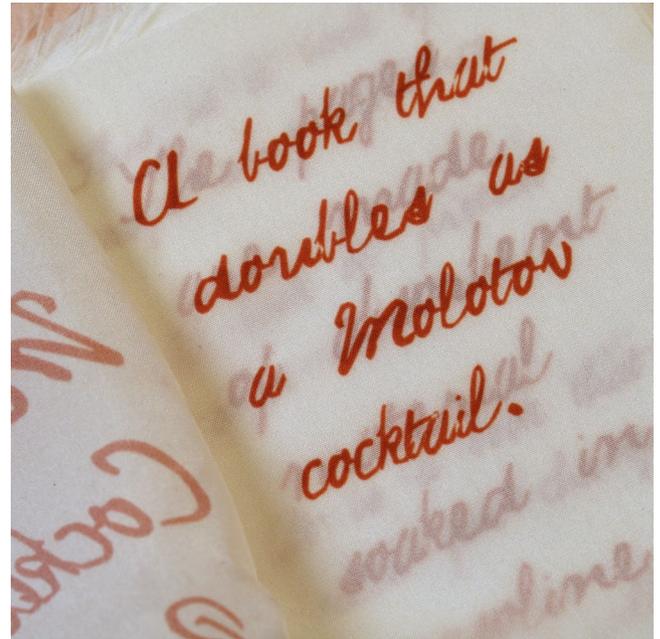
### **Book Prototype VI: Molotov Book**

**Prompt :** *“Description of an artist book and made from post-consumer waste, which provides details about how the book was made and what the conceptual issues are.”*

**GPT-3 Completion :** *“A book that doubles as a Molotov cocktail. The pages are made of absorbent material soaked in gasoline. The cover is made of cloth or paper and printed with instructions on how to make the cocktail.”*

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<sup>12</sup> There are increasing number of GPT models available, each with different speed, ability, and modality. GPT3-Davinci\_2 was the most powerful model available at the time of this study.



**Figure 7:** *Molotov book, Harley Smart, 2021. “A book that doubles as a Molotov cocktail. The pages are made of absorbent material soaked in gasoline. The cover is made of cloth or paper and printed with instructions on how to make the cocktail.” – GPT-3*

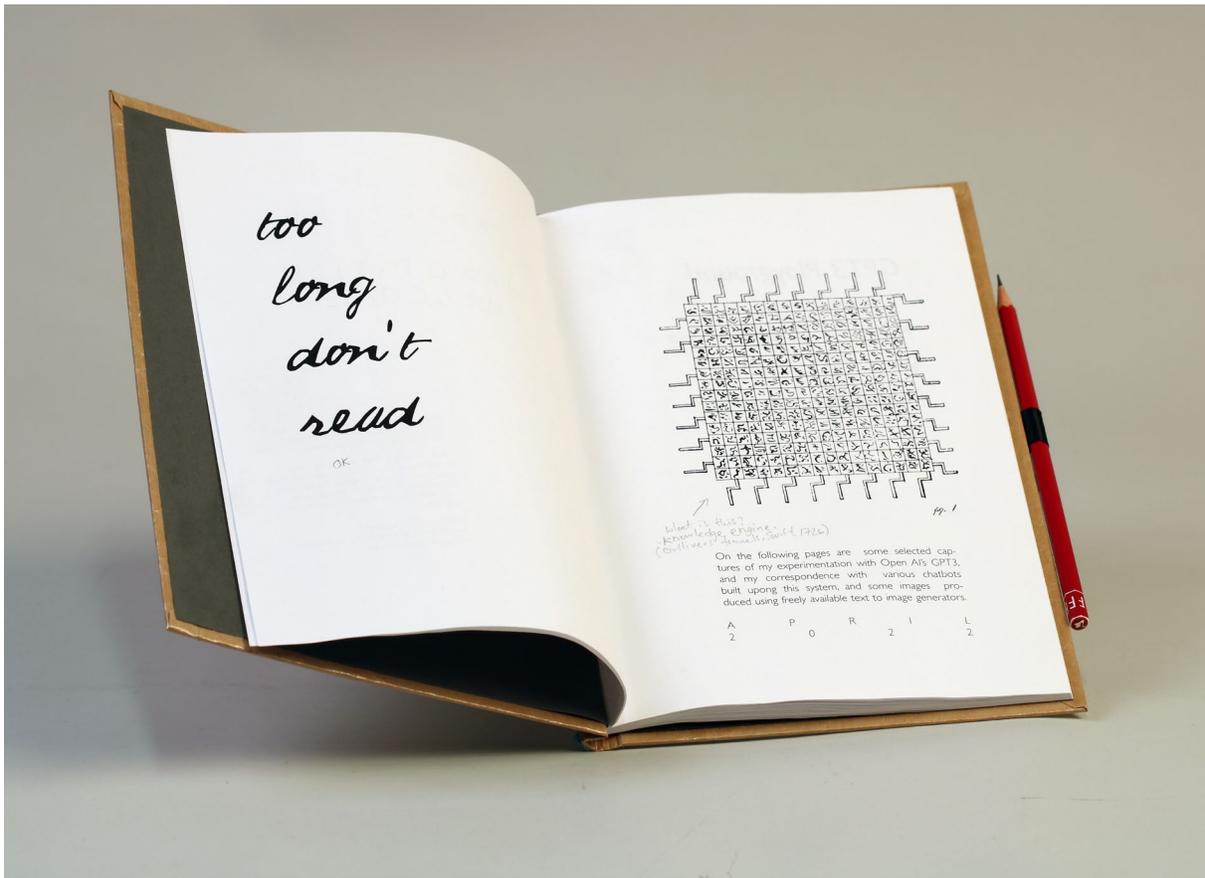
This book description was selected for its poignancy, considering at the time that a war was in its early days of unfolding between Russia and Ukraine. At the time, footage was being broadcast around the world of resistance efforts by common Ukrainian people making home-made Molotov Cocktails to defend against Russian Tanks.

In order to generate text for the book, GPT-3 was set into motion to write detailed instructions for the construction of the work (see fig. 7), as well as asked to write poetry and manifestos based on the book description. The selected texts were printed by inkjet in red ink on natural-colored silk, then stuffed into the mouth of a glass bottle containing spirits.

An example of the poetry selected to print on the pages is here:

*“This is a book of rage and violence  
A book of protest and rebellion It is a book that calls for change  
The Molotov Cocktail is a weapon It is a tool of the oppressed  
And it will not be silenced” – GPT-3*

## Book Prototype VII: TL:DR



**Figure 8:** *TL:DR*, Harley Smart, 2021.

Within this book is a collection of outputs from GPT-3, produced over the course of the research (see fig. 8). Titled *TL:DR*, the quality of modern web reading is summarized, *Too Long : Didn't Read*. This title speaks to the hyperproductive nature of the language models and their potential to produce far more text than we could ever desire or be physically capable of reading.

The book was bound in hardcover and presented with a pencil holder. Readers were invited to write annotations directly in the book; marginalia sharing comments, criticism, doodles, etc. This bookwork demonstrates print media as a work-in-progress where a conversation takes place in the margins of the book page. The social reading practice of adding written annotations and other marginalia has been common throughout the history of the printed book (Borsuk, 2018).

Here, the use of physical human annotation over print attests to the enduring importance of the physical book as a platform for human discourse and knowledge sharing.

Upon reflection on the series, it is this final book- with annotation and its demonstration of hyperproduction of text- that presents a new quality of networked dialog among readers that will be explored in the following three speculative human-computer-interaction (HCI) prototypes.

### **HCI 1: Mixed Reality Book Design**



*Figure 9: HCI, Harley Smart, 2021*

A speculative design for a book conception and layout interface was developed, in the form of a video prototype demonstrating creation of book content through voice commands (see fig. 9).

This first interfacing prototype proposes an open, interoperable layer of information across a dummy book to augment the writing, design, and layout process within a creative book arts practice while imagining future workflows that integrate gestural commands, NLP, and Generative AI. The video prototype demonstrates a custom NLP assistant, named Ghostbunny, providing support for common tasks and assisting with writer's block.

In the video, voice commands direct the assembly of a hands-free book page layout. The interface also demonstrates dictation and automatic graphic art generation. A stanza of poetry is recited and Ghostbunny is asked to illustrate it in real-time using a text-to-image model called AttnGAN 3.

## HCI 2: Marginalia



*Figure 10: HC2 Marginalia, Harley Smart, 2021.*

Combining LLMs and Diffusion models in such a way with robust computer vision and wearable technologies might be used for textual and visual content to complete unfinished content, expand

upon ideas, and support storytelling, while also reinventing the way in which a book designer or artist might creatively interact with their work in the studio.

A final prototype, called Marginalia, combined research on how LLMs could support lateral thinking in book publishing procedures and facilitate creative reading. The app demonstrated an engaging experience (see fig. 10) combining AI discussion, on-demand photo generation, and social sharing of annotations by integrating GPT-3, Stable Diffusion, and Open Annotation.

Marginalia sought to demonstrate how LLMs may inspire fresh concepts for personalized reading experiences by enabling users to engage in meaningful conversations with AI summarization and information extraction tools across a range of reading levels and content types. In a similar vein, it raised the possibility of machine-assisted ideation regarding cooperative book development and publication paths incorporating reader feedback and dynamically generated features via automating annotation sharing. The prototype demonstrates how LLMs' integrated generative capabilities may enable lateral reconceptualization of conventional print and digital reading models.

Our personal collections of books are a window into our minds, and in a time of confinement like we experienced with Covid 19, many of us have likely been comforted by revisiting these spaces. The future library may be a space where you can sit with a book to have a conversation. The introduction of technology like this to our personal collections of art and books could conceivably empower readers and viewers as active participants in the collective knowledge of the world and democratize access to that knowledge.

# CONCLUSION

## Lineage

This research project builds upon a rich history of book artists, poets, and publishers exploring the intersection of technology, book arts and experimental literature. Groups like the French collective Oulipo pioneered computational and conceptual approaches within book arts during the 1960s and 70s (Ludovico, 2010). Generative book possibilities has been explored heavily within Media Arts through the 2000s onward by artists like Peter Bichsel and Martin Fuchs,<sup>13</sup> or Phillip M. Parker.<sup>14</sup> In 2019, digital poet David Jhave Johnston used AI to generate works based on large corpuses of literature (Johnston, 2019), while Kenric McDowell used GPT-3 to co-author published literary works. This thesis project extends investigation on modern Generative AI's impacts on artist books. The prototypes align with recent experiments by artists like Gregory Chatonsky, who has developed various parts of an autonomous system for generating books (Chatonsky, 2020). However, this research contributes new aesthetic frameworks, human-centered workflows, and ethical perspectives tailored to contemporary AI capabilities. By intermixing hands-on bookmaking with speculative interfaces, it brings to light emerging challenges around agency, copyright, sustainability, bias, and preserving craft. This fusion of generative ideation with material bookworks and cautious design principles builds upon yet differentiates this research from preceding projects at the cutting edge of books, computing, and technological change.

## Key contributions

This research has attempted to reveal Generative AI's potential to transform independent publishing by augmenting human creativity in areas like writing, illustration, and book design. The conceptual prototypes and frameworks developed hope to provide insights into opportunities and challenges at

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<sup>13</sup> Written Images, is a generative book project in 2010 by Bichsel and Fuchs, where each copy of the edition is uniquely generated on-demand.

<sup>14</sup> Parker holds the record for published titles on Amazon, with over 200,000 titles listed, all of which were algorithmically generated.

this intersection of emerging technology and craft. Core contributions include a collection of aesthetic vocabularies for evaluating AI-generated bookworks, demonstration of strategies for complementary human-machine collaboration, and an initial model for integrating automation to enhance creative workflows. Findings emphasize the continued importance of human skills like critical reflection and editorial agency when applying generative models in artistic domains. By investigating AI's double-edged impacts through an independent publishing lens, the research encourages thoughtful co-creation alongside machines while adding philosophical depth to dialogues on artificial creativity.

Through creating conceptual bookworks and prototypes, the goal of this research has been to surface both opportunities and challenges of integrating AI into creative book arts and publishing practices. Some examples include using GPT-3 for generating conceptual descriptions of bookworks made from recycled materials, revealing new material combinations and pushing the boundaries of creativity. This demonstrates how AI can encourage lateral thinking while principles like selective output curation and reflection-in-action help balance hyperproductivity.

## **Limitations**

The scope of investigation was constrained to a small set of conceptual prototypes meant to spur discussion rather than fully functional systems. Only 7 bookwork prototypes and 2 speculative interfaces were explored in-depth.

The capabilities of the AI models used represent cutting-edge but still narrow Generative AI compared to the full spectrum of machine learning techniques relevant to publishing. State-of-the-art models continue to rapidly evolve.

Findings presented in the research emerged through the specific lenses of independent book publishing and book arts practices. While aspects such as responsible automation and preserving

craft translate to other creative domains, the integration strategies and evaluative vocabularies explored have been tailored to the medium of physical books. Concepts for speculative HCI prototypes relied on hypothetical future advancements in areas like multimodal Generative AI, which did not exist at the time of study.<sup>15</sup>

As an individual thesis project, perspectives were limited to the opinion of the researcher, while more diverse viewpoints could reveal additional issues. Similarly, these prototypes represent self-contained explorations focused on conceptual insights rather than rigorous user testing.

### **Future Directions**

Further areas to explore include diverse stakeholder perspectives and long-term impacts when developing responsible AI systems. Frameworks like the Indigenous Protocol for AI (Lewis, 2020) can encourage responsible innovation by revealing perspectives beyond immediate users and considering broader, longer-lasting repercussions of new technologies.

Precautionary thinking and ethical foresight are needed regarding the societal impacts of deploying Generative AI in creative domains. Issues like training data biases, environmental costs of scaling AI, intellectual property disputes, and job automation risks require ongoing critical inquiry and interdisciplinary collaboration.

Concepts from independent publishing, process art, and slow design helped guide the research methodology. Techniques like fine-tuning, prompt engineering and conceptual frameworks were applied and will surely be aspects to iterate and improve upon in continued studies.

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<sup>15</sup> Multimodal systems have since been released, such as GPT4, which can process and generate a combination of image and text.

## Closing Statements

The research highlights the transformative potential of AI in creative practice while emphasizing the need for thoughtful integration that promotes, rather than replaces, human creativity. The study explored the intersection of Generative AI, book arts, and processual publishing through the production of a number of bookworks and interfacing experiences. In each bookwork, a varying balance between AI capabilities and artisanal bookmaking resulted. Rather than seeking to fully automate processes, AI was positioned as a collaborative partner for exploring ideas and encouraging lateral thinking, while the human researcher maintained essential roles in evaluating and realizing concepts, often completing, or combining generative content. This suggests a framework for responsible integration where automation complements rather than replaces human artistry, judgment, and craft.

Through these conceptual prototypes and ethical investigation, the project has shown potential and challenges in the intersection of AI and book arts. Practical methods for enhancing human-machine cooperation, vocabulary to discuss AI within book art, and a reference point for automation in creative processes are among the main contributions. It is hoped that the creative potential this exploratory project has demonstrated could encourage others across disciplines to conduct similar and ongoing studies.

If the experimentation, DIY ethos, and thoughtful reflection unique to independent publishing can help steer future advancements in its integration with AI, perhaps an augmented and exciting new symbiosis of human and machine creativity will emerge. The printed codex remains an appropriate site to explore this, with its historical significance as a container for human knowledge, and adaptable form making it a suitable multimodal and containerized playground to explore new technologies. The book persists as a vessel for creating meaning; by exercising critical design thinking, it should serve as an important site for investigation as we pass through unmapped digital frontiers.

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## APPENDIX: Dataset Samples for Model Fine-Tuning

The following list provides examples from the dataset used for fine-tuning the GPT3 Davinci\_002 LLM model used in this study for the open-generation of book-descriptions. This appendix contains 3 sample prompt-completion pairs, from the 250 examples compiled by the author to fine tune the language model. These sources include catalogs found on websites of organizations such as the MoMA, Printed Matter, Amazon, as well as those of individual publishers.

While not comprehensive, these samples convey the general nature of texts leveraged to familiarize the model with this domain.

**(Prompt)** *Idea for a new artist book:*

**(Completion)** *Title: Kim Jong Il Looking at Things Author: João Rocha and Marco Bohr Publisher: Jean Boîte Éditions City: Paris, France Year: 2022 Pages: 190 Dimensions: 24 x 16.7 cm Cover: Hardback - Board Binding: Sewn Bound Color: Color Comical and bizarre, Kim Jong Il Looking at Things has become a cult classic among photobook connoisseurs since its publication in 2015. The book was based upon one of the most followed, shared and imitated monothematic Tumblr blogs in recent years. Created by João Rocha, an art director at an advertising firm in Lisbon, the blog is a collection of photographs which depict the former “Dear Leader” of North Korea, often accompanied by military personnel or senior advisers, engaged in the act of looking at things. Since the blog’s creation in October 2010, Rocha has posted photographs appropriated from the North Korean Central News Agency, which he matches with deadpan captions: “looking at cows”; “looking at blue rods”; “looking at pastry”; “looking at a metalworker”; “looking at a DVD labeling machine.” Now available again after a long period of unavailability, this hilarious book includes an essay by visual culture writer Marco Bohr.*

**(Prompt)** *Idea for a new artist book:*

**(Completion)** *Florian Auer, Rough surface 140 x 225 mm 145 pages Cover: Paperback, color, glossy finish Binding: glue bound Interior: black and white Send through a hyper-oblique tunnel of camera vision a ball in flight reaches the eye in indefectible wholeness. Round. Out of lens range it is distorted – an ambiguous object squeezing through space. It generates a vision enveloped in deep time, a warp vision. What would we see in the amplitude of simultaneity, if camera vision and warp vision would share agency? Rough surface is a collaboration between the artist Florian Auer and the writer Ana Ofak. Together they explore the idea of shared agency between a ball in flight and an ultra high-definition 4K camera.*

**(Prompt)** *Idea for a new artist book:*

**(Completion)** *SO FAR SO GOOD is Elvire Bonduelle’s self-portrait. Fourteen short phrases - haikus, proverbs, folk wisdom and adages written or appropriated by the artist - are reproduced on a paper leporello that is meant to be opened and displayed everyday on a different page as a daily philosophical boost — the same way one would press and drink fresh citrus juice in the morning. Bonduelle’s characteristic light-heartedness is tonic. The text compositions, drawn by the artist using “BONDUELLE ONE”, a special font designed by Elvire for her calligraphy, are reproduced with pigment printing. Originally rendered in black carbon pencil along colored*

*grids, the texts are combined with pastel and vibrant colored gouache shapes — part of the artist's visual alphabet and outlines of some of the tools used to design the "BONDUELLE ONE". SO FAR SO GOOD is printed as a contemporary update to "Le Procédé Jacomet", the print-reproduction technique created by Daniel Jacomet in the early 1920's that coupled collotype and "pochoirs" (stencils). Daniel Jacomet printed countless artworks, including most of the stunning drawings by Sonia Delaunay, Henri Matisse, Juan Miro, Jean Arp and many other artists for the major modern art publishers of that era. Three Star Books has worked with Elvire Bonduelle to reproduce — as facsimiles — her text compositions with pigment printing combined with old-school hand-applied gouache stencils. A century after Jacomet developed his process, Elvire Bonduelle, a French artist living in Paris at the Bateau-Lavoir in Montmartre, is re-interpreting the pochoir technique with Three Star Books.*