THE *SHADOWPOX* STORYWORLD AS CITIZEN SCIENCE FICTION: BUILDING CO-IMMUNITY THROUGH PARTICIPATORY MIXED-REALITY STORYTELLING

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Abstract

Scientific evidence can influence us in decisions like whether to get immunized, but so can storytelling, the artful show-and-tell of cause-and-effect which can convey misinformation as readily as it does fact. Building on inoculation theory and active learning, I argue in "The *Shadowpox* Storyworld as Citizen Science Fiction: Building Co-Immunity through Participatory Mixed-Reality Storytelling" that a new form of participatory storytelling called "citizen science fiction" can intervene in vaccine hesitancy by helping people explore what makes a story compelling, what makes science convincing, and how fear and distrust can be engineered to sway us away from action we might otherwise take. This research-creation dissertation recounts the design and testing of three multimodal experiments in a single science fiction storyworld, titled *Shadowpox*. The first experiment is a full-body videogame, the second is a networked narrative, and the third is a new form, a pedagogical-dramatic art hybrid I am calling a "courseplay".

The design of the gallery-installation videogame *Shadowpox: The Antibody Politic* began with generative visual effects motion-tracked to the player's body and avatar, but its procedural rhetoric came together only with the addition of 99 other avatars embodying the concept of community immunity. The vaccine-trial role-play of *Shadowpox: The Cytokine Storm* re-imagines immunity as an acquired superpower whose bearers are framed as villains as often as they're hailed as heroes, inviting participants to think more deeply about the story design and real-life toll of misinformation. With the advent of Covid-19, these pre-pandemic workshops in London, Cape Town, and Manitoulin Island were joined by the online courseplay *Digital Culture: Science & Fiction*, where York University students in lockdown blended reading, writing and role-playing to explore the scientific and social-media dynamics around a historic rollout of new vaccines. I propose a new research-creation pedagogy, "action refraction," to help learners reflect on the interplay between evidence, affect, fiction, and alternative-fact confection. Citizen science fiction as a broader methodology, meanwhile, has the potential to promote participants and researchers alike from storytellers into story-*listeners,* moving from the one-way explanation of many scientific-literacy efforts to the reciprocal empathy essential for truly healthy citizenship.

Preface

This document is a print version of the original "complex digital dissertation," which is hosted on the Scalar online media scholarship publishing platform.

York University guidelines define a "complex digital dissertation" as "a work with a high reliance on media (e.g., images, audio, videos, computer code and/or data set) in which the digital material is an integral part of the work as a whole." The original online version includes over 200 video clips, most of them written and performed by the participants in the *Shadowpox* project.

For archival safekeeping, the author has adapted the online dissertation to this print/ Portable Document Format (PDF) version. In the PDF, all links are live and can be clicked. All efforts have been made to incorporate as much material as possible from the original online version, but some elements are hard to translate into a print format. Selected video elements have been replaced with their YouTube links in parentheses, while most video elements and some images of secondary importance have been removed.

The original online version is thus the best format in which to experience this dissertation, and readers are invited to explore it via either of the following links:

https://scalar.usc.edu/works/shadowpox-citizen-science-fiction/
or
https://www.alisonhumphrey.com/p/dissertation.html

Dedication

To my mom and dad, for getting me vaccinated… among other gifts.

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It takes a community to build co-immunity. I will try here to record my gratitude to everyone in the extended network of participants, contributors and supporters who made this work possible, though it has been such an epic journey that I fear I may miss someone. Thankfully, given that the online dissertation is the definitive version (see Preface), I will at least be able to add them there if I wake sweating in the early hours with a late realization.

To start, I am beyond grateful for the faith my visionary supervisor Caitlin Fisher put in this unusual project. Research-creation is still a relatively new scholarly concept, so I've been extraordinarily fortunate to have one of its pioneers paving my way. Funding from her Immersive Storytelling Lab and Future Cinema Lab also made it possible for me to collaborate with the big-hearted and galaxy-brained Lalaine Ulit-Destajo, who shone as *Shadowpox* technical director and developer through every line of code and every late-night crunch.

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York University's Department of Cinema and Media Arts has been an ideal home for this boundary-pushing research-creation, despite being Canada's oldest such program at over half a century. Sharon Hayashi and Michael Zryd as graduate program directors have shown how still waters can run both deep and kind, Kuowei Lee has been a font of strategic intel, and I've received invaluable encouragement, support and guidance from Taien Ng-Chan, Patricio Davila, Janine Marchessault, Brenda Longfellow, John Greyson, Ken Rogers, Geneviève Appleton, and the late and much-missed Amnon Buchbinder, among many others.

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Serendipity struck my PhD a month before it started, when research-creation leading light Natalie Loveless sent out an email looking for a last-minute replacement for a research project "bringing artists and health policy/law/advocacy folks together around the issue of vaccines." <*ImmuneNations*> has been an unparalleled opportunity to think and create alongside those folks, especially *Shadowpox: The Antibody Politic*'s fantastic scientific director Steven J. Hoffman, statistical analyst Susan Rogers Van Katwyk, and Poxémon nanostory writer Caitlin Fisher, but also Sean Caulfield, Vicki Kwon, Patrick Mahon, Annemarie Hou, Rachelle Viader Knowles, Mkrtich Tonoyan, Kaisu Koski, Johan Holst, Jesper Alvaer, and Timothy Caulfield. *The Antibody Politic* also benefitted from the talents of Poxémon deckhand Sean D. Sollé, animators Jos Humphrey and Geoffrey Cramm, and pictograph artist Leremy Gan.

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Chapter One: Introduction

Context of the Research Project

When young actors are just starting out, there's an exercise called a "neutral scene" that introduces them to the exploratory and interpretive power of the dramatic arts.

A neutral scene consists of just a few lines of dialogue, and nothing more. No indication of who is speaking, no stage directions, no character descriptions, no context. No explanation of any kind.

From that sparse text, actors are free to build any number of interpretations. It can be thrilling to see two dozen acting students start from the same neutral scene and take off in wildly different lines of flight. Who's speaking? Where? How? Why? Each person or group grows their own unique scenario out of a common seed.

I once imagined writing a neutral scene about vaccination. Pared to its essence, it would contain just three lines:

I don't wanna.
You don't haveta.
We kinda gotta.

Disgust. Denial. Debate.
The I. The you. The we.

There is much dramatic conflict built into the unnerving medical intervention of vaccination. It must be taken before we need it. It works invisibly to prevent an invisible threat. It invites us to consider ourselves not just as possible victims of infection, but as potential victimizers as well. Needles provoke fear. Vaccines are manufactured by profit-making corporations. The very concept of ingesting a pathogen to protect our health is cognitively dissonant.

Since the technology was first invented, people have shared stories about why they don't want to get vaccinated, from the (true) fact that vaccines contained "bestial humours" in 1805 (Fulford and Lee 2000) – to the (science fictional) rumour that vaccines contained "5G tracking microchips" in 2020 (Heathers 2021).

Any time we would fundamentally rather not do X, we can get very creative in retrofitting our reasons against it. Therefore, if we want to encourage the doing of X, whether at the policy level or the personal, we need to be equally creative in inviting people to explore the points in its favour. Storytelling – showing and telling how cause leads to effect – is thus at the heart of vaccine hesitancy, vaccine denialism, and vaccine confidence.

In this multimodal, born-digital, research-creation dissertation, I have created and tested a participatory storyworld that explores immunization through a superhero metaphor. I was curious to explore how young people can develop democratic skills – civic, scientific and media literacy – through the reflective, refractive, active making of science fiction. My research brings inoculation theory (McGuire 1964) into the realm of participatory mixed-reality science-fiction storytelling.

I call this method *citizen science fiction,* integrating three elements which I contend are essential for young citizens learning to grapple with politically-charged scientific issues like climate or vaccine denialism: the civic, the scientific, and the storytelling.

My objective is to offer 21st century educators a method for using metaphoric world-building and mediated role-play as an inoculation, helping young citizens build emotional and intellectual antibodies against diseases of the body politic.

Hesitancy and Denialism

While in theory it is possible to create one category for people who confect and distribute disinformation that they know to be untrue, and another for people who genuinely believe in the misinformation they pass along or even create, in practice it is not so easy to distinguish cynical strategy from sincere belief.

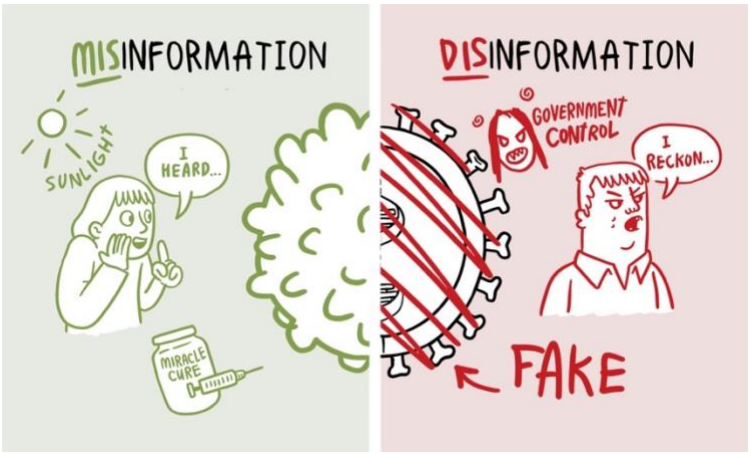


Figure 1. "Information, Misinformation and Disinformation." Still from animated GIF in "Siouxsie Wiles & Toby Morris: Now Let's Flatten the Infodemic Curve" (2020). Licensed under CC BY-SA-4.0.

Spies (2020) considers a variety of academic definitions of disinformation and misinformation, and offers a provisional definition of disinformation as "a rhetorical strategy that produces and disseminates false or misleading information in a deliberate effort to confuse, influence, harm, mobilize, or demobilize a target

audience." By contrast, misinformation can be defined "as false or misleading information, spread unintentionally, that tends to confuse, influence, harm, mobilize, or demobilize an audience." Acknowledging the challenges of determining the intention of the informer, he suggests that "it may be best… to speak of 'dis- and misinformation' unless the specifics of the communication are known."

A rare blatant example of vaccine disinformation is the study by Broniatowski et al. (2018) revealing how Russian trolls weaponized outrage through a deliberate disinformation campaign stoking both sides of the vaccine debate on Twitter, "using vaccination as a political wedge issue" as part of a much larger "strategy of promoting political discord" (1379).

More common, however, is the challenge presented by the fact that "the terms 'antivaccinationist' or 'antivaxxer' have become a stigmatising label," as Cafiero et al. (2020) observe. They investigate "the growing success of critics who present themselves as different from antivaccinationists, using phrases such as 'I'm not antivaccine but…'" (1), attempting to identify where such distancing is genuine and where it is a rhetorical strategy, "a gateway to the age-old ideology…[of] radical rejection of vaccination and modern science" (3).

Vaccine hesitancy is the preferred term for what MacDonald et al. (2015) define as "delay in acceptance or refusal of vaccination despite availability of vaccination services. Vaccine hesitancy is complex and context specific, varying across time, place and vaccines. It is influenced by factors such as complacency, convenience and confidence." People merely wishing to ask legitimate questions in the process of a vaccination decision are not necessarily "anti-vaccine", and the loaded term "anti-vaxxer" can feel like an insult to their intelligence and a foreclosure of good-faith discussion.

However, in a small minority at the extreme end of the hesitancy continuum stands what the World Health Organization (2017) terms the *vocal vaccine denier,* "one who has a very negative attitude towards vaccination, [who] is not open to a change of mind no matter what the scientific evidence says," and who is motivated to spread messages of vaccine denialism. Like "anti-vaxxer", "denier" is a charged label, one that few would choose for themselves. Groups that might fall within the WHO's definition tend to prefer terms like *critical thinking, skepticism, informed consent* and *medical freedom*. However, while I agree with Larson that the word "anti-vaxxer" is "too oppositional" (Anderson 2020), and am mindful of the scholarly responsibility to be cautious not to use terminology that "reinforc[es] a hostile climate for debate" (Allen et al. 2018), I have not yet found a term to replace "denier" for a person who is effectively dead-set against revising their beliefs on a topic, regardless of how much reliable information is presented to them.

Hoofnagle and Hoofnagle (2007) define *denialism* as

> the employment of rhetorical tactics to give the appearance of argument or legitimate debate, when in actuality there is none. These false arguments are used when one has few or no facts to support one's viewpoint against a scientific consensus or against overwhelming evidence to the contrary.

They identify five key tactics used across a wide range of issues including climate change, Holocaust history, 9/11, and health-related topics like tobacco's link to cancer, HIV's link to AIDS, and the safety and effectiveness of vaccination. Cook (2020) summarizes these five techniques of denial with the acronym FLICC: "fake experts, logical fallacies, impossible expectations, cherry picking, and conspiracy theories" (47). There is a significant difference between these approaches and a fair-minded, good-faith engagement in debate.

Anti-vaccination denialism, and the misinformation it creates to undermine vaccine confidence, have existed as long as vaccination itself (Poland and Jacobson 2011), but social media allows a tiny group of highly motivated activists far greater reach and influence in our era. The Center for Countering Digital Hate (CCDH 2021) identifies a "Disinformation Dozen," twelve prominent vaccine deniers who "play leading roles in spreading digital misinformation about Covid vaccines," including 65 percent of anti-vaccine content "shared or posted on Facebook and Twitter" in early 2021 (5). In the current Covid-19 pandemic, these influential figures have shared what the CCDH (2020) calls "a 'master narrative' comprised of three key messages: Covid is not dangerous, the vaccine is dangerous, and vaccine advocates cannot be trusted" (10).

The pandemic has offered mis- and disinformers unprecedented opportunities for fictioneering, such as when anti-vaccine conspiracy website Natural News announced that "In a medical shocker to the whole world of vaccine philosophy, scientists at Sloan Kettering found that mRNA itself carries cancer CAUSING changes … the complete opposite of what the CDC and the vaccine manufactures are telling everyone right now about the Covid vaccines" (Kasprak 2021). While Sloan Kettering researchers did find in 2018 that "changes in… messenger RNA can inactivate tumor-suppressing proteins and thereby promote cancer" (Tontonoz 2018), the Natural News conveniently leaves out the detail that mRNA is a vital component present in every cell of the body.

Another denialist fiction flips the script with a biologically impossible claim that people vaccinated against Covid-19 can cause reproductive harm to unvaccinated women through "vaccine shedding." As with many compelling fictions, this one can be traced back to a faulty understanding of a scientific fact – in this case, that "Some live-virus vaccines in history have

'shed' the virus enough to affect others, including the oral polio vaccine and a rotavirus vaccine," a phenomenon known as "contact immunity" (McCarthy 2021).

When drama gets halfway around the world before evidence can get its boots on, it is not at all surprising that such stories would take hold in the public imagination, causing unease and leading to increased hesitancy about vaccination.

Inoculation Theory

Early in the COVID-19 pandemic, the World Health Organization's Director-General warned that "We're not just fighting an epidemic; we're fighting an infodemic" (Ghebreyesus 2020), and its Health Emergencies Programme Executive Director extended the analogy: "We need a vaccine against misinformation as well… we need a communications vaccine" ("WHO Emergencies" 2020). Broadening out from the public health context, Jankowicz (2018) speaks of a "disinformation vaccination" replacing a "band-aids" approach to foreign influence operations, and boyd (2018) argues that "We need to develop antibodies to help people not be deceived" by "weaponized narratives" in news and social media.

This immunological metaphor in studies of persuasion and misinformation goes back at least as far as McGuire's (1964) "inoculation theory." Compton (2012) describes the analogy McGuire drew between processes of resistance in biology and persuasion:

> In a medical inoculation, resistance results from protective responses, such as the production of antibodies, triggered by threat. Similarly, during persuasion inoculation, pretreatment messages offer weakened versions of counterarguments—again, weakened to prevent persuasion but strong enough to activate protective responses.... In both cases, resistance mechanisms, motivated by threat, confer protection against future attacks (221).

Roozenbeek and van der Linden (2018) invoke inoculation theory in designing a multiplayer game, *Bad News*, that invited high school students to play the role of fake news producers. Similarly, the online educational game *Epidemic: Self-care for Crisis* (Jenson et al. 2011), includes a mock social network environment in which users create fake-virus avatars and gain "contagion points" for posting stories and images that "go viral" (37). In both games, participants "are not merely exposed to small portions of misinformation (as is the case with passive inoculation)" (Roozenbeek and van der Linden 2018), but are motivated to win the game by actively learning and practicing the tactics that make disinformation compelling.

A browser-based version of the card-based *Bad News* prototype launched in 2018 at getbadnews.com (Roozenbeek and van der Linden 2019), and the team have produced two subsequent evolutions of the game: *Go Viral!,* to "inoculate against fake news about Covid-19"

(Roozenbeek and van der Linden 2020), and *Harmony Square, "*exposing people to weakened doses of the common techniques used in political misinformation especially during elections" (van der Linden et al. 2020).

This kind of role-playing as active "prebunking" is a potent approach to teaching media literacy, though it focuses more on a particular kind of misinformer motivation. Some people create disinformation for troll-farm roubles or clickbait dollars, others for "lulz" (Spies 2020). But boyd (2018) acknowledges the possibility that not everyone "weaponiz[ing] narratives" is so cynical, and warns educators that "if we're not careful, media literacy and critical thinking will be… strategically perverted by other people who believe themselves to be resisting the same powerful actors that we normally seek to critique." Many anti-vaccine activists sincerely believe their blood-libel-esque story that Big Pharma, government and mainstream health practitioners are knowingly causing autism in children to make a profit, and that every argument to the contrary is part of a vast conspiracy (Atlani-Duault 2015; Gorski 2020).

Science and Fiction

Calls for media literacy education are frequently paired with calls to improve scientific literacy. In an age when Dr. Google will provide any diagnosis or conspiracy confirmation you seek, some experts place the blame for misinformation on the death of deference to experts. Latour (1999) has frequently empathized with scientists' fears about Science and Technology Studies shining a light backstage, acknowledging that "Between a tissue of proofs and a tissue of lies… people who know nothing about the practice of science are quick to confuse the two" (2017). But science mis- and disinformation do not prove the pernicious influence of "post-truth" philosophers (Ruark 2017, Kofman 2018); they prove how urgent it is to train more young non-scientists to appreciate science's "tissue of proofs" by learning how it is constructed and contested.

A growing trend in health communication scholarship (Dahlstrom 2014, Rodriguez 2016, Shelby and Ernst 2013) argues that real-life stories with strong emotional impact, not just intellectual facts, are essential to increasing the public understanding of science. Other scholars, conversely, aim to increase scientists' understanding of the public by excavating the folkloric foundations of anti-vaccine and similar health narratives (Kitta 2016, Goldstein 2004). "Edutainment" (Tufte 2008, World Bank 2017) and "serious games" (Ohannessian et al 2016) have been widely recruited to put the arts of story and play at the service of public health.

These approaches frequently take a top-down broadcast approach, in which a professionally-produced entertainment product is delivered to audiences in finished form. They have also tended to use more-or-less realistic, rather than fantastical, storytelling genres. My

dissertation research innovates by combining the participatory approach of digital storytelling (Flicker and Hill 2014) with the most popular narrative genre in the world today (Box Office Mojo 2021): science fiction and fantasy film, specifically the larger-than-life subgenre of the superhero.

Science fiction is alternately blamed by scientists for stoking unfounded public fears – a rhetorical approach Kitzinger (2010) dubs "the sci-fi alibi" – and praised for its power to win hearts in schools (Spiegel et al. 2013, Braund 2015, Wilson 2019) and to change minds in the wider culture (Sasaki 2018). Since the "poisoned candy" and "chocolate-covered broccoli" perspectives both risk discounting the audience's autonomy (Hall 1980), I argue for putting the genre to more complex use, drawing on Suvin's (1972) Brechtian (1948) definition of science fiction as "the literature of cognitive estrangement," a turbine that turns the familiar into the unfamiliar to generate enlightenment.

Research Question

My focus in this dissertation is on exploring how "citizen science fiction" can help build resistance against mis- and disinformation, through an analysis of the process of constructing the *Shadowpox* storyworld.

In chapter 2, "Origin Stories," I begin by introducing the research-creation methodology of this project, then explain, through my origin story as a creator and researcher, how I came to apply a superhero metaphor to the issue of vaccine confidence. I then propose a theoretical framework for imagining misinformation as an antigen – or anti-gen – by asking "What's generating the anti?", and offer a participatory storytelling research-creation approach to grappling with that challenge.

In chapter 3, "Mixed Reality as Inoculation: Graft and Glyph," I trace the evolution of the visual metaphors at the heart of this storyworld: from the virus as the simplest circle, to its crescent-shaped vaccine, to mixed-reality visualizations of infection and transmission. My earliest explorations focused on graphic and interactive ways to represent how vaccines work, in the belief that such knowledge was what was needed to overcome vaccine hesitancy. I draw a parallel between this visual storytelling and Anishinaabe petroglyph-based narrative knowledge practices, and describe how design choices in the procedural rhetoric of the game *Shadowpox: The Antibody Politic* influenced the process of narrative design laid out in the following chapter.

In chapter 4, "Science Fiction as Attenuation: Antigen and Agon," I turn to the development of a dramatic framework for exploring sociological phenomena: the process of designing the protagonists and antagonists in this superhero storyworld, and the choreography of their

conflict. Realizing that showing how vaccines work was necessary but not sufficient, I also wanted to model the dynamics of vaccine misinformation, refracted through a mutant metaphor similar to the one found in the *X-Men* comics of my youth. Returning to the question of "What's generating the anti?", I show how the participatory scenario *Shadowpox: The Cytokine Storm* attenuates these anti-gens by framing their classic villain-building techniques in its story-within-a-story.

In chapter 5, "Storyworld as Assay: Refraction and Reflection," I describe a shift from a focus on storytelling to story-*listening*. My participants themselves were engaged in research-creation, and through building a framework to listen to their creative choices, I began to see how these choices embodied an understanding of their audience's receptors for particular anti-gens. I ask whether by reflecting on the anti-gens in stories participants tell and hear, they can self-test for their own receptors, and learn to resist misinformation's viral influence.

In chapter 6, I conclude by summarizing my contributions in creating story devices like the *Shadowpox* storyworld and the pedagogical form of the "courseplay". I propose two expansions to inoculation theory: the concepts of "refraction" as attenuation (science fiction storytelling to build new antibodies to misinformation), and reflection as assay (story-listening to understand pre-existing antibodies). Finally, I lay out directions for further research in citizen science fiction as participatory research-creation.

Chapter Two: Origin Stories

Methodology: Research-Creation

The methodology I am using in this dissertation is *research-creation*, an approach which, according to Natalie Loveless (2019), "insists that at the doctoral level, artistic production is no longer solely an object of scholarly inquiry but is itself a legitimate form of research and dissemination" (13). Loveless begins *How to Make Art at the End of the World* with one quote from Donna Haraway, "Stories are much bigger than ideologies. In that is our hope," and a second from Thomas King: "Want a different ethic? Tell a different story" (19). From this, she lays a foundation for her "manifesto for research-creation" through the observation that

> Both authors implicitly insist that to do research—of any kind—is not simply to ask questions; it is to let our curiosities drive us and allow them to ethically bind us; it is to tell stories and to pay attention not only to which stories we are telling and how we are telling them, but how they, through their very forms, are telling us. (24)

Loveless sees research-creation as a problem-oriented methodology in which the researcher must not only bring artistic practice to bear on their problem of choice, but must also consider the forces attracting them to that problem in the first place. Drawing on *eros* as a driven, gripping mode of love in contrast with the more disinterested *agape*, Loveless defines research-creation as putting "situated curiosity—troubling and troublesome, erotic curiosity—at the helm" (29).

In the spirit of her invitation to attend to "those drives and desires that animate our stories… stories that grasp us as much if not more than we grasp them" (96), I open this chapter with an exploration of what drove me to approach the challenges of vaccine confidence through research-creation in general, and through participatory superhero science fiction storytelling in particular.

My Dramatic Origin Story: Why Superhero Science Fiction?

(Let me open this section by clarifying that by "dramatic origin story" I'm somewhat cheekily referring to my origin story in the dramatic arts. Whether this story is in itself dramatic, I leave to the judgment of the reader.)

A key metaphor of this project is that immunity is a superpower. This is a common comparison, used by both public health educators (for example, Kumanan Wilson's motion comic *Immunity Warriors,* 2017) and wellness entrepreneurs (see Moon Juice's SuperPower™ Immune Support Supplement, $49.95 for 30 capsules). However, that's not the only science-fictional parallel I see, and it's certainly not one of "those drives and desires that animate [my] stories," as Loveless puts it.

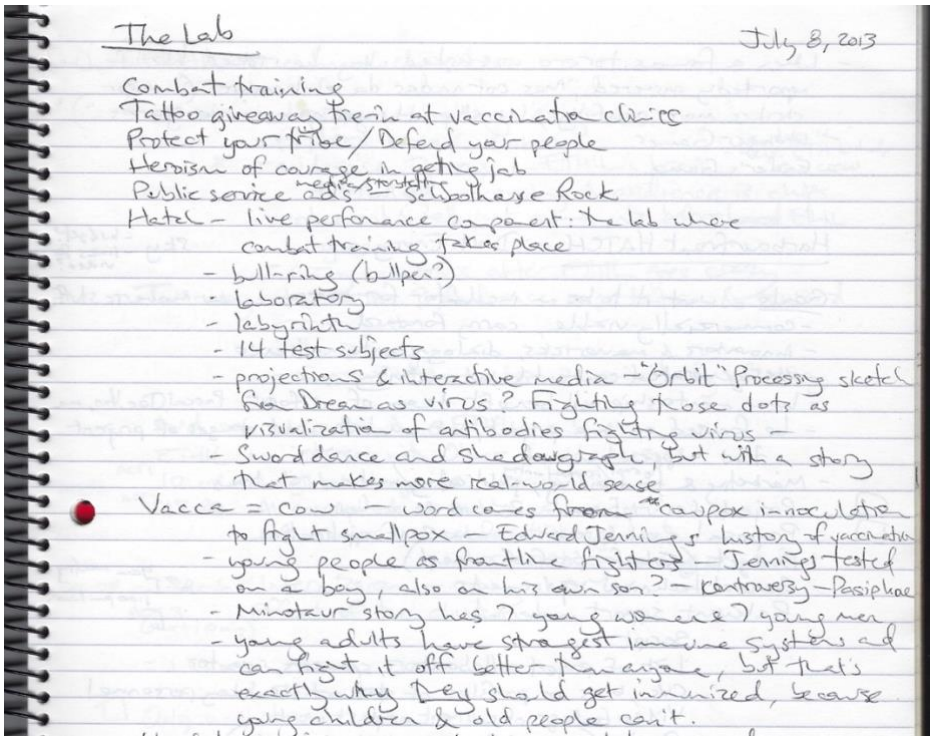
The more anti-vaccine misinformation I read, the more resemblances I see to superhero storytelling, complete with mad scientists, evil corporate executives, and conspiracies for planetary domination. In these stories, the operative metaphor is that vaccines (and their proponents) are villains. If in real life this medical intervention has saved more lives than almost any invention in human history, one would think vaccines would be the heroes of the story.

What insights can superhero storytelling as a creative process give us into why misinformation creators choose to frame some "heroes" as "villains", and what techniques they use to generate this antipathy in their audience?

This, then, is my core curiosity-driven question: "What's generating the anti?"

My earliest notebook reference to the *Shadowpox* project came in July 2013, shortly after I finished my MFA in theatre directing (Figure 2). I had already been working for five years on a reimagining of the Greek myth of Ariadne, as one way toward my goal to create more female action heroes. I was trying to find a way to update the story of 14 Athenian young people shipped off to a labyrinth in Crete, of whom only one, Theseus, was a volunteer.

I was intrigued by the idea of this boy needing to learn how to fight the labyrinth's monster from a girl – and not just any girl, but the daughter of the woman whose experiments were the proximal cause of the monster. I was further fascinated by the idea that fully half of "the Twice Seven" were girls like Ariadne, though not likely to *like* Ariadne, given their status as human sacrifices. Theseus risked everything to slay the Minotaur, and became a culture hero. Ariadne did the same, but was excluded from joining the people she had fought to save – abandoned on an island on their voyage home to Athens.


The Lab

July 8, 2013

Combat training
Tattoo giveaway freeze at vaccination clinics
Protect your tribe / Defend your people
Heroism of courage in getting jab
Public service ads — Schoolhouse Rock
Hotel – live performance component: the lab where combat training takes place
- bull-ring (bullpen?)
- laboratory
- labyrinth
- 14 test subjects
- projections & interactive media – "Orbit" Processing sketch for Dream as virus? Fighting those dots as visualization of antibodies fighting virus –
- Sword dance and Shadowgraph, but with a story that makes more real-world sense

Vacca = cow – word comes from "cowpox inoculation to fight smallpox – Edward Jenner's history of vaccination
- young people as frontline fighters – Jenner tested on a boy, also on his own son? – controversy – Pasiphae
- Minotaur story has 7 young women 7 young men
- young adults have strongest immune systems and can fight it off better – Norwegian, but that's exactly why they should get immunized, because young children & old people can't.

Figure 2. 2013 notebook entry reimagining Minotaur labyrinth story as The Lab.

The in-group and the excluded. This was a set of relationships that as Loveless puts it, grasped me as much as I grasped them. The "drives and desires" that kept this scenario roiling in my imagination went all the way back to my first encounter with superhero media at the age of six. I was having a lot of trouble understanding the social dynamics at school, and the explanation seemed to be that my parents had just divorced and I'd moved to a new town. I eventually changed schools nine times before university, and each time the move felt less and less like the sole reason that I found my peers hard to parse. It would be another several decades before I got an official diagnosis of Asperger syndrome (now autism spectrum disorder), but once I did, I could look back to my grade one fascination with the television series *Super Friends* (1973) as the beginning of a lifelong use of the superhero genre as a social decoder ring.

In *Life, Animated: A Story of Sidekicks, Heroes, and Autism*, Ron Suskind describes Walt Disney's directive to his early animators that "the characters and scenes should be so vivid and clear that they can be understood with the sound turned off." He cites this as the reason his autistic son Owen can use Disney films as "an analytical tool kit and emotional paintbrush" to make sense of the world around him. Unlike real life that "comes at you fast, faster than so many of the spectrum folks can manage," his son could "decipher [a movie] from the end of a remote"

(Suskind 2014). There was no way to pause or rewind the broadcast when the first season of *Super Friends* went to air just before I entered elementary school, but the show, and the *Justice League* comic book characters it was based on, modelled interpersonal dynamics in a form that was still far easier to study than the real-time whirl of a classroom full of first-graders.

Rather than caring about any individual superhero, I remember being intrigued by the concept of the team. How does a group of people work together? How do they choose whom to include – or exclude? What turns someone into an antagonist? How are conflicts resolved? Early episodes of *Super Friends* tended to feature opponents (many of them scientists like Dr. Thinkquick or Professor Goodfellow) who were using harmful means to achieve understandable ends, and the broadcast-standards-approved plotlines culminated less often in physical altercation than in a discussion where the antagonist learned the benefits of changing their approach. It was an idealized scenario – from the ease of conflict resolution to the fundamental idea that this group worked together because they were "friends" – but it was a sociological swimming lesson that helped me keep my head above water.

The superhero team through whom I learned the most, however, was one I wouldn't discover until middle school. The comic book *The Uncanny X-Men* featured a group of characters who had acquired their superpowers not through accidental bombardment with various wavelengths of radiation, or the bites of spiders similarly enhanced, but through genetic mutation. They were born different, though their powers usually didn't manifest until adolescence, making them especially resonant to a teenage reader.

The "uncanny" epithet in the title reflected the way the X-Men were perceived by the general public in the Marvel universe: with unease at best, and violent prejudice at worst. Whereas the Avengers were for the most part admired and appreciated, throughout the 60 years of both teams' publication history, "anti-mutant sentiment" has been the X-Men's most implacable foe. When I was collecting the series in the 1980s, the tagline at the top of the title page each month read, "*Mutants – feared and hated by the world they have sworn to protect. These are the strangest heroes of all!"* (Claremont and Byrne, 1978).

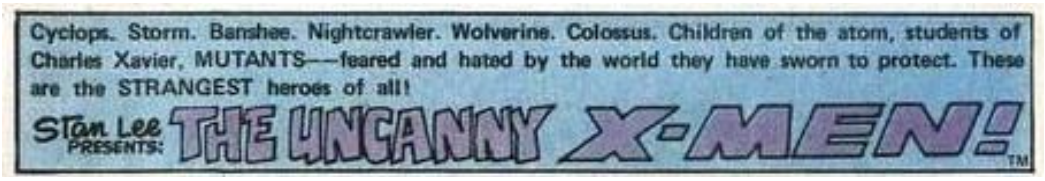


Figure 3. Tagline for *The Uncanny X-Men*, vol. 1, issue 113 (1978).
See full page at criticalcommons.org/view?m=ecu4AwPaS

In those days, *X-Men* was the best-selling title on the stands, appealing to a far wider readership than the average superhero comic. Much of that appeal lay in what is known among

fans and scholars as "the mutant metaphor." Ramzi Fawaz, in *The New Mutants: Superheroes and the Radical Imagination of American Comics,* argues that "The elasticity of mutation as a metaphor for a variety of embodied and cultural differences made it a potent popular fantasy for vitalizing Marvel Comics' cosmopolitan ethos at the level of both comic book content and public reception" (2016, 144-145).

The idea of a team of ostracized heroes also appealed to a kid unaware of her own neurodiversity, in an era long before that term existed – before the concept of an autism "spectrum" stretching beyond boys with visible support needs. As a girl in junior high, I was only beginning to learn to use my intellectual strengths to mask my social challenges, and for all my academic success, the one question I could not answer was, "If I want to be friends, why don't they?" It was appealing to spend time in a storyworld where to be "uncanny" meant you had powers rather than deficits, and you could band together with other outcasts, not just for fellowship, but to find ways to act as heroes for the very society that unjustly framed you as villains.

Loveless begins her book with a provocation she asserts is "central to research-creation: *the crafting of a research question is the crafting of a story that is also the crafting of an ethics*" (24). She returns three chapters later to "reconfigure that opening gambit to propose our research questions as, in fact, our *driven given symptoms*… setting up a dialogue with the world" (95). My given symptoms are driven by that youthful exclusion-confusion, which led first to my identification with the mutant metaphor, and later to my fascination with the conundrum of anti-vaccine sentiment. Decades after I stopped collecting comics, that poignant tagline – "feared and hated by the world they have sworn to protect" – came back to rhyme with my research and inform its question.

"What's generating the anti?"

An Apprenticeship in Pathos-Generation

In the summer after my first year of university, I landed an internship at Marvel Comics in New York City. I wanted to learn how to craft stories like the ones that spoke so powerfully to me in my teens. It was an incredible opportunity even in 1987, long before the watershed 2000 release of the first *X-Men* movie, when superheroes began to migrate en masse from comics to cinema. I spent a couple of months absorbing all I could while slaving over a hot photocopier, writing

fan mail for series that couldn't fill their letter columns, and correcting the Olde English grammar of *Conan the Barbarian*.

But once the glamour wore off, working in the editorial office of a publishing house didn't feel close enough to the action. As countless young creators do, I wanted to be in the room where it happens. Unfortunately, even if you could watch a writer work by standing over their shoulder (which you really shouldn't), you're not going to pick up much dramatic craft that way. This desire for more immediacy led me from comics to theatre.



Figure 4. The author as a Marvel intern. Sketch by Rodney Ramos (1987).

Legendary theatre director Ariane Mnouchkine once remarked that

> The theatre is the art of the "symptom". The actor is one who knows how to show the symptoms of all the diseases of the soul. He is charged to suffer them in his body and to show them. There the spectators recognize their own passions. In order to find the symptoms, the actor accepts to have the fever. The tragic characters are in anguish right down to their entrails. (Aslan 1996)

I wanted to learn to create that kind of intensity, so, detecting the roots of superhero soap operas in classical drama, I directed and acted in productions at Wellesley College's Shakespeare Society, then moved to England after graduation to apprentice as an assistant director.

In the *Poetics,* Aristotle uses the term *pathos* for a key part of a tragedy's plot: "an action which causes destruction or pain" within the world of the play, and which "arouses pity and fear" in the audience (Rees 1972, 4). In the *Rhetoric,* by contrast,
Aristotle sets *pathos* alongside *logos* and *ethos* as a means of persuasion, analyzing emotions including "anger, friendliness, fear, shame, kindliness, pity, indignation, envy, [and] emulation," and identifying these *pathē* as "feelings which influence human judgment or decision-making and which are accompanied by pleasure or pain" (Brinton 1988, 208).

The *Poetics* sort is the pathos I sought when starting out as a storyteller. I don't think I aimed to influence much "judgment or decision-making" early in my career – as far as I can recall, I was too busy digging through drama's toolbox for giving the audience *all the feels* (to use the modern vernacular). Still, as a theatregoer, I continued to take advantage of stories as an opportunity to study social dynamics and communication, and to decode how the characters onstage affected *one another's* feelings. In the same way I'd earlier been attracted to superhero teams rather than individual characters, I found large-cast plays more interesting for their complex choreography of connection and conflict.

All this adds up to a lifelong study of how emotion – both negative and positive – is evoked through storytelling. Let's broaden the research question, then, from "What's generating the anti?" to "What's generating the pathos?"

Research-for-Creation: How to Design an Alternative Fact

As I apprenticed first in theatre and then in television drama, one of the activities I enjoyed most was research. Whether as an assistant director helping to remount a modern classic from the era of kitchen-sink realism, or as an art department coordinator for a supernatural television series, it was my job to find and refine historical information and audiovisual inspiration to support my colleagues as they learned about and built the world of a story.

"Cherry-picking" is a dirty word in scientific research, connoting an intellectually dishonest approach that starts with a desired conclusion and disregards all data that does not support it. But the kind of hunting and gathering we do for a drama production is open and unapologetic cherry-picking. The script gives us a recipe for the pie we are going to bake, and as with hundreds of other creative choices along the way, the goal of any research we do is to find the juiciest cherries to entice the audience to suspend their disbelief in our fiction.

Anti-vaccine activists are often accused of cherry-picking, misrepresenting, or reinterpreting evidence in order to frame vaccines as dangerous (Kata 2012, 3781). Another of their rhetorical strategies is to encourage their audience to "Do your own research." Hughes et al. (2021) explain how this technique "States a conclusion and then urges the reader to research the reasons why," avoiding the need to engage in debate, while providing clues that lead "inquiring minds to build their own arguments in favor of a predetermined position" (7556). The advantage of this approach is that when someone feels they have come to a conclusion under their own power, not only are they likely to have homed in on the specific evidence that works best for them, but the exhilaration of being an active researcher rather than a passive recipient of information gives them a sense of ownership of the conclusion.

In these creative and participatory approaches to "scientific inquiry", I find resonances with my own experience of researching towards the preordained conclusion of a scripted drama. What could we learn by thinking of these anti-vaccine activities as a form of research-creation? In the realm of academic practice, Chapman and Sawchuk (2015) outline "four different modalities in which research and creation are linked." Three of these modalities are distinct, and the fourth brings them into conversation both with each other and with a wider conversation on research methodology:

> 1. "**Research-for-creation**," the gathering of materials, practices, technologies, collaborators, narratives, and theoretical frames that characterizes initial stages of creative work and occurs iteratively throughout a project.
>
> 2. "**Research-from-creation**," the extrapolation of theoretical, methodological, ethnographic, or other insights from creative processes, which are then looped back into the project that generated them.
>
> 3. "**Creative presentations of research**," a reference to alternative forms of research dissemination and knowledge mobilization linked to such projects.
>
> 4. "**Creation-as-research**," which draws from all aforementioned categories, an engagement with the ontological question of what constitutes research in order to make space for creative material and process-focused research-outcomes. (49)

The last of these, "creation-as-research", is the *methodology* of my dissertation. The first, "research-for-creation," is also one of its *objects*. In the following section I will explore how research-for-creation in the dramatic arts is paralleled by a similar real-world activity in which storytelling is weaponized – in one case, quite literally.

Research for Kitchen-Sink Realist Theatre

Mere weeks after graduating from college, I was on a plane to London, determined to apprentice in the British classical theatre. My first two assistant-directing jobs were for directors who had come to the theatre through studying English as undergraduates – Katie Mitchell at Oxford and Stephen Unwin at Cambridge – and who were committed to deep, rigorous research-for-creation.

In *The Director's Craft: A Handbook for the Theatre,* Mitchell writes that research "clarifies the world you will be building," but specifies that its purpose is not historical reconstruction "like those stale period room displays in museums. Rather, you are collecting information that will help the actors to say and do everything they have to say and do in the action of the play" (15).

I assisted Mitchell on a 1993 revival of John Arden's *Live Like Pigs* (1958) at the Royal Court Theatre, whose publicity leaflet (Figure 5) described the play as follows: "Two cultures collide. A gypsy family is settled on a new housing estate which leads to explosive results. Who are the real pigs?"

In that pre-World Wide Web era, research tasks delegated to an assistant director included running around London and phoning around the UK to "go-fer" books of photography, audio cassette tapes, and films on VHS (see Figure 6). I also spent weeks in the British Library's fabled round Reading Room, combing printed sources to compile tailored information packs for the cast (Figure 8).

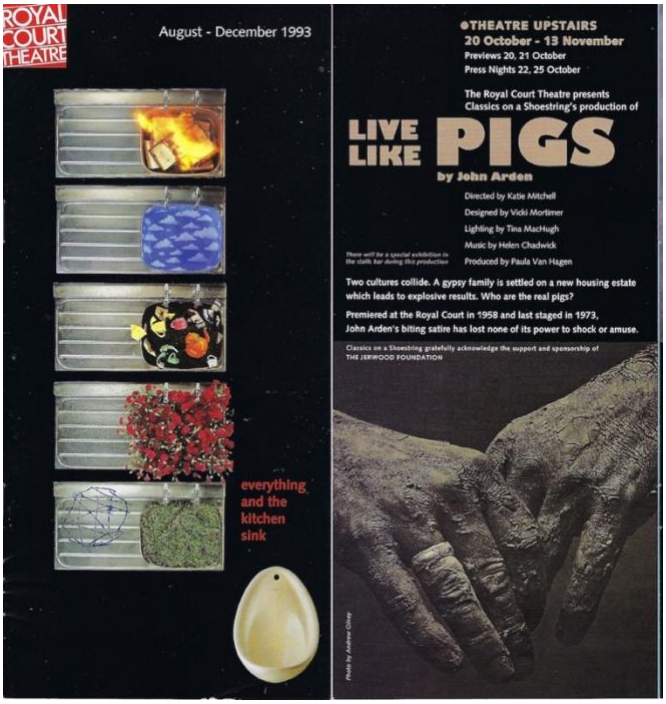


Figure 5. "Everything and the kitchen sink." 1993 Royal Court Theatre publicity leaflet featuring *Live Like Pigs* by John Arden (1958).

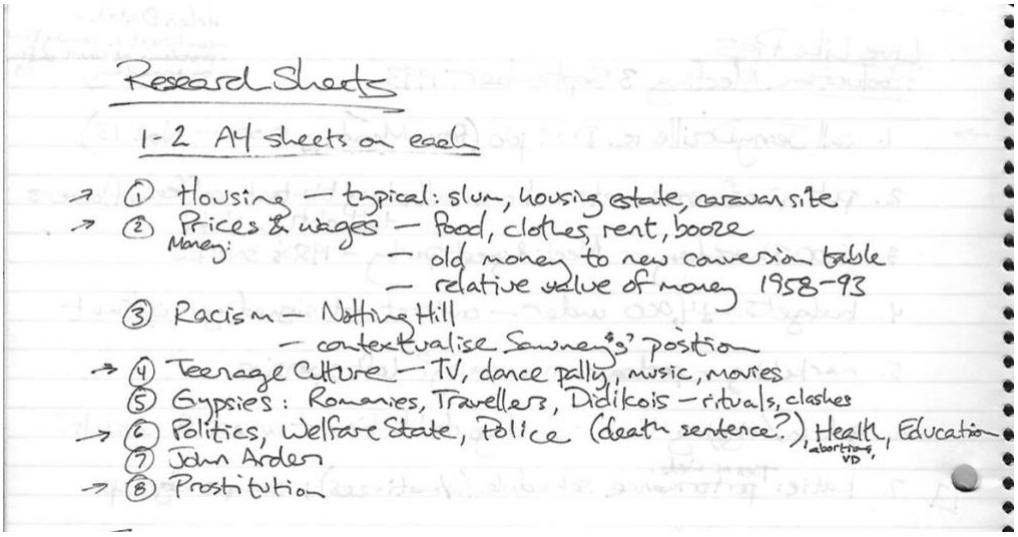
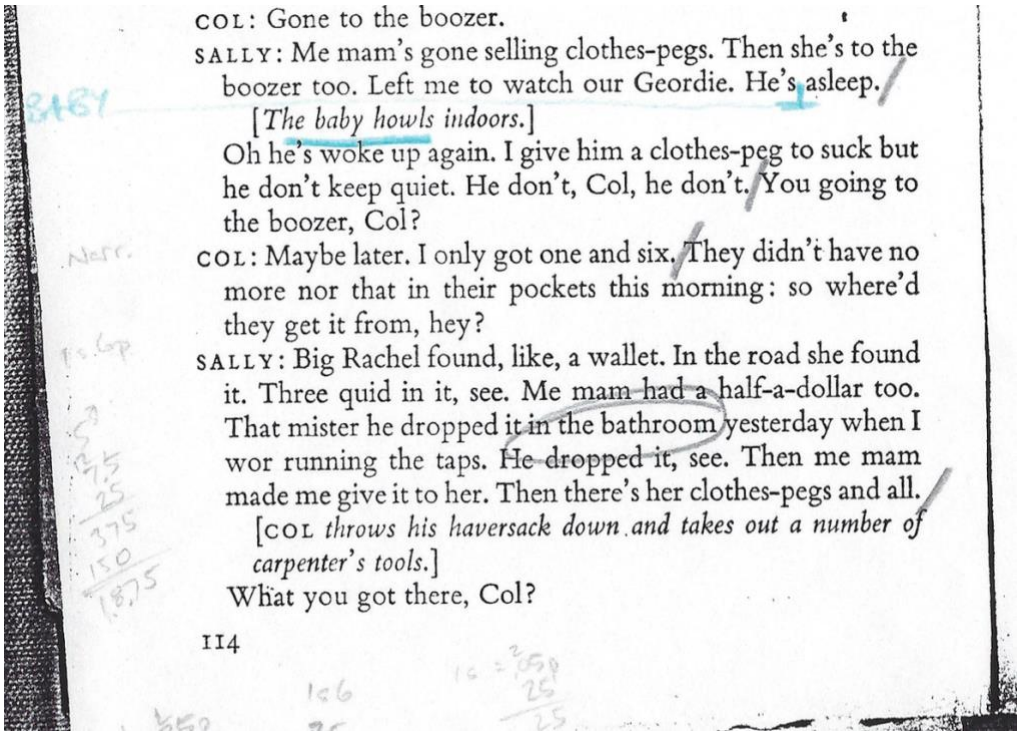


Figure 6. Assistant director's notebook with assignment to create research sheets for housing, prices & wages, racism, teenage culture, etc. for 1993 production of *Live Like Pigs* (1958), directed by Katie Mitchell, Royal Court Theatre.



COL: Gone to the boozer.

SALLY: Me mam's gone selling clothes-pegs. Then she's to the boozer too. Left me to watch our Geordie. He's asleep.

[*The baby howls indoors.*]

Oh he's woke up again. I give him a clothes-peg to suck but he don't keep quiet. He don't, Col, he don't. You going to the boozer, Col?

COL: Maybe later. I only got one and six. They didn't have no more nor that in their pockets this morning: so where'd they get it from, hey?

SALLY: Big Rachel found, like, a wallet. In the road she found it. Three quid in it, see. Me mam had a half-a-dollar too. That mister he dropped it in the bathroom yesterday when I wor running the taps. He dropped it, see. Then me mam made me give it to her. Then there's her clothes-pegs and all.

[COL *throws his haversack down and takes out a number of carpenter's tools.*]

What you got there, Col?

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Figure 7. *Live Like Pigs*, scene 3, featuring pre-decimalization British currency (1958).

For example, British currency switched to the decimal system in 1971, before our actors Lizzie McPhee and a pre-breakout Jude Law[1] were born. So to play this scene (Figure 7), Jude needed to know not only that "one and six" meant one shilling and sixpence, but more importantly, what it could buy his character at the pub (Figure 8).

Research-for-creation is not, however, confined to kitchen-sink realism.

Average expenditure on food, soap and essential materials for one family (with children) in 1957 Leeds: 29/- per week.

Grocery prices (1952):

potatoes	2d per pound
butter	4/- per pound (rationed until 1954)
milk	7d per pint
meat	2/- per pound (rationed until 1954)
bacon	4/- per pound (rationed until 1954)
tea	2/6 per pound
cigarettes	1/4 for ten
beer	1/2 per pint

Figure 8. Assistant director's research sheet on 1950s money for *Live Like Pigs* rehearsals (1993).

[1] Jude Law would go on to play Alan Krumwiede, one of popular culture's most memorable anti-vaccine conspiracy theorists, in the 2011 film *Contagion*. See image at criticalcommons.org/view?m=71wPi5Zq7.

Research for Supernatural Television



Figure 9. "Niger, Africa": The opening shot of *Veritas: The Quest* episode 3, "Skulls", the penultimate aired before its cancellation by ABC (2003).

Veritas: The Quest, a 2003 supernatural action-adventure series for Touchstone Television by the writers of the 2001 film *Lara Croft: Tomb Raider*, followed a globe-trotting team of Indiana Jones-style archaeologists on their search for the secrets of ancient civilizations.

The show was as outlandish in its pseudoarchaeology, Hollywood science and Orientalism-of-the-week as it was unabashed in its cheesy plotlines. As art department coordinator on the Toronto production, part of my job was to find visual reference for the production designer and his team, including the art directors, costume designer, set decorators, prop builders and graphic designer. I also created handwritten props like diaries and field notebooks, an airmail envelope written in Tibetan script, or a gifted child's crayonings in multiple languages. I had fun researching ancient and modern writing systems

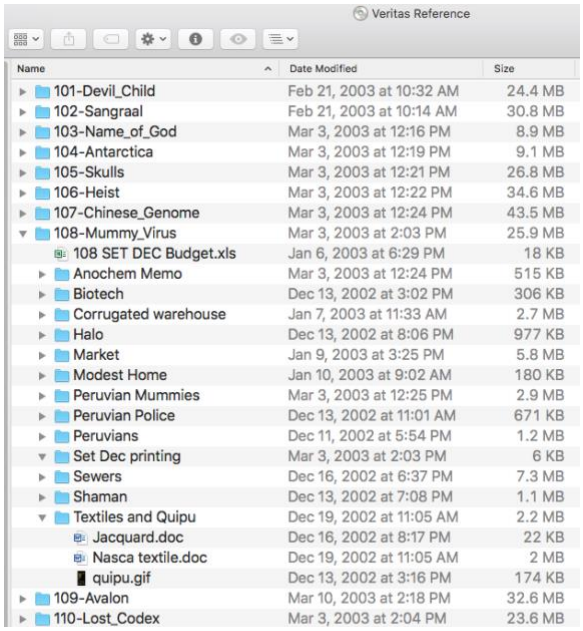


Figure 10. Art department coordinator's research files for *Veritas: The Quest* (2003).

for these and other props, including the supernatural artifacts sought by our heroes in the show's eponymous "quest".

My toughest research-for-creation challenge came in episode 7, "Mummy Virus," where, as the *IMDb* listing puts it, "The discovery of a pre-Incan mummy leads to the release of an ancient virus which a pharmaceutical company tries to use for their own nefarious purposes" ("Veritas"). An early script outline had the team deciphering mysterious "hieroglyphic characters" that they found on an "ancient panel" and in "an inscription on the head of the mummy bundle." However, I hit a quick brick wall with the discovery that the Inca Empire had no known written language.

I proposed to the writers that we substitute the Inca *quipu* (or *khipu*), knotted cords used for record-keeping – perhaps blending this concept with the fact that the Jacquard loom was a forerunner of the computer. The production designer sent me off to the gift shop of the Textile Museum of Canada to find Andean-looking components for the prop builders. The script was changed to make the mummy "pre-Incan" to give us some historical deniability, and because a real quipu reads onscreen a bit like a string mop, the final hero props were more like patterned weavings with a long, knotted fringe.

In the first clip from the finished show, the character Juliet explains the concept of the quipu – while mispronouncing the term, alas – to Solomon and Maggie (youtu.be/D7WuJSkxCI8). In the second clip, Solomon and Vincent discover that the pharmaceutical company funding their research has nefarious motives (youtu.be/XH1BfY9djF8). In the third clip, Maggie, whose intelligence is being supercharged by the virus even as it mummifies her body, cracks the code woven into the ancient textiles (youtu.be/p4wzM3t3k6Y).

By this point, the show has long since traded fact for affect, but *Veritas* (Latin for "truth") never pretended that it was anything but a fantasia on mythology and legend. By contrast and coincidence, when ABC cancelled the series, it was replaced by a narrative that used some similar dramatic devices while presenting itself as *actual* truth.

Research for Dramatizing the Case for a Real-Life War

Had ABC not put *Veritas* on indefinite hiatus after four episodes, "Mummy Virus" would have aired at 8pm on Monday, 17 March 2003. The eeriest coincidence should have been that on that day, the World Health Organization established an international network of laboratories in ten countries to research the "worldwide health threat" of severe acute respiratory disorder, the older cousin of the SARS-CoV-2 coronavirus behind the COVID-19 pandemic. But there was an

even more disturbing resonance with the alternate *Veritas* universe.

What would have been the "Mummy Virus" time slot that night instead saw US President George W. Bush address the nation to present his case for war against Iraq, followed by a three-hour *ABC News Special* titled "When Diplomacy Fails." Two days later, the United States invaded Iraq.

Members of the Bush administration reportedly began their research-for-creation of this war on September 11, 2001. Within hours of the 9/11 attacks, Secretary of Defense Donald Rumsfeld was ordering an aide to seek evidence of Saddam Hussein's involvement. The aide's notes say:

> "'Hard to get good case. Need to move swiftly…. Near term target needs - go massive - sweep it all up, things related and not…. Best info fast. Judge whether good enough [to] hit SH at same time - not only UBL [Pentagon shorthand for Usama/Osama bin Laden]…. Tasks. Jim Haynes [Pentagon lawyer] to talk with PW [probably Paul Wolfowitz, then Mr Rumsfeld's deputy] for additional support … connection with UBL." (Borger 2006)

That night a request was relayed from Wolfowitz to the Defense Intelligence Agency:

> From DepSec Def, Hot!!! Tasking: Providing information, paper format, history and assessment of Iraqi involvement in terrorism since Gulf War. (Draper 2020, 17)

The research tasks had been assigned.

A year and a half later, on February 5, 2003, US Secretary of State Colin Powell addressed the UN Security Council, holding up a model vial of anthrax (Figure 11) and stating,

> This is just about the amount of a teaspoon – less than a teaspoon full of dry anthrax in an envelope shut down the United States Senate in the fall of 2001…. UNSCOM estimates that Saddam Hussein could have produced… enough to fill tens upon tens upon tens of thousands of teaspoons.

Powell assured his audience, "This is evidence, not conjecture. This is true. This is all well-documented." He followed his theatrical prop with detailed computer-generated images of "biological weapons factories on wheels and rails" (Figure 12) that he said were created from eyewitness testimony by an Iraqi chemical engineer. "What we're giving you are facts and conclusions based on solid intelligence" (Powell 2003).



Figure 11. U.S. Secretary of State Colin Powell holds a model vial of anthrax at the United Nations on 5 February 2003, arguing that Iraq is likely to possess weapons of mass destruction. Public domain, via Wikimedia Commons.

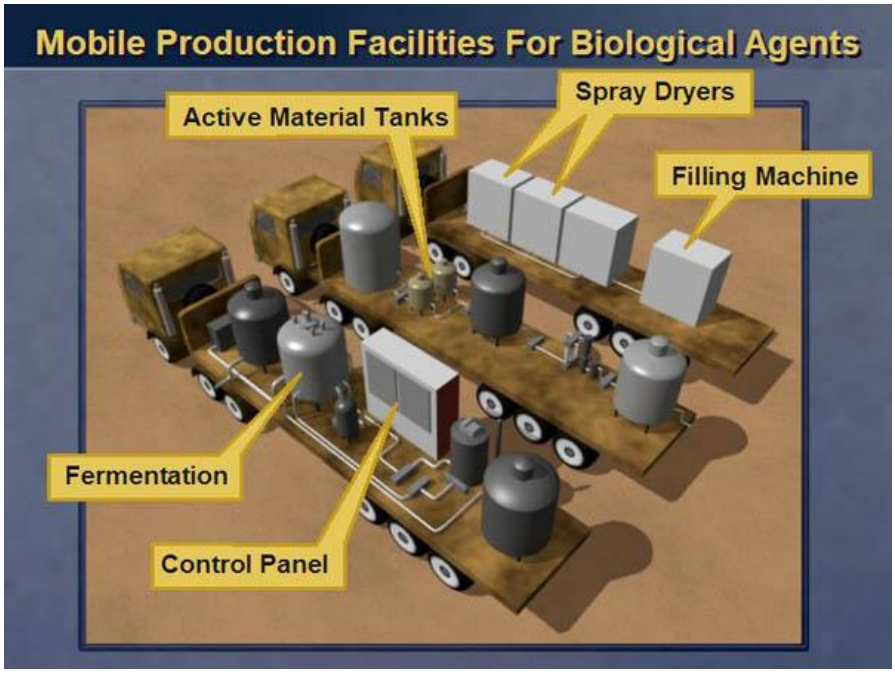


Figure 12. Computer-generated image of alleged mobile production facility for biological weapons, presented at the United Nations on 5 February 2003. Public domain, via Wikimedia Commons.

This was the research-for-creation that the US president used to justify his decision to invade Iraq the following month (Figure 13). Another month later, Bush claimed that "We have found the weapons of mass destruction" (WMD), with the discovery of two small trailers that his

vice president was asserting as late as September were "mobile biological facilities that can be used to produce anthrax or smallpox." However, these trailers turned out to make hydrogen for weather balloons (Warrick and Stanton 2006), and the anonymous "eyewitness" who had provided the lynchpin evidence for Powell's dramatic presentation to the UN (Rafid Ahmed Alwan al-Janabi – codename: "Curveball") admitted to reporters in 2011 that "Everything he had said about the inner workings of Saddam Hussein's biological weapons programme was a flight of fantasy" (Chulov and Pidd).

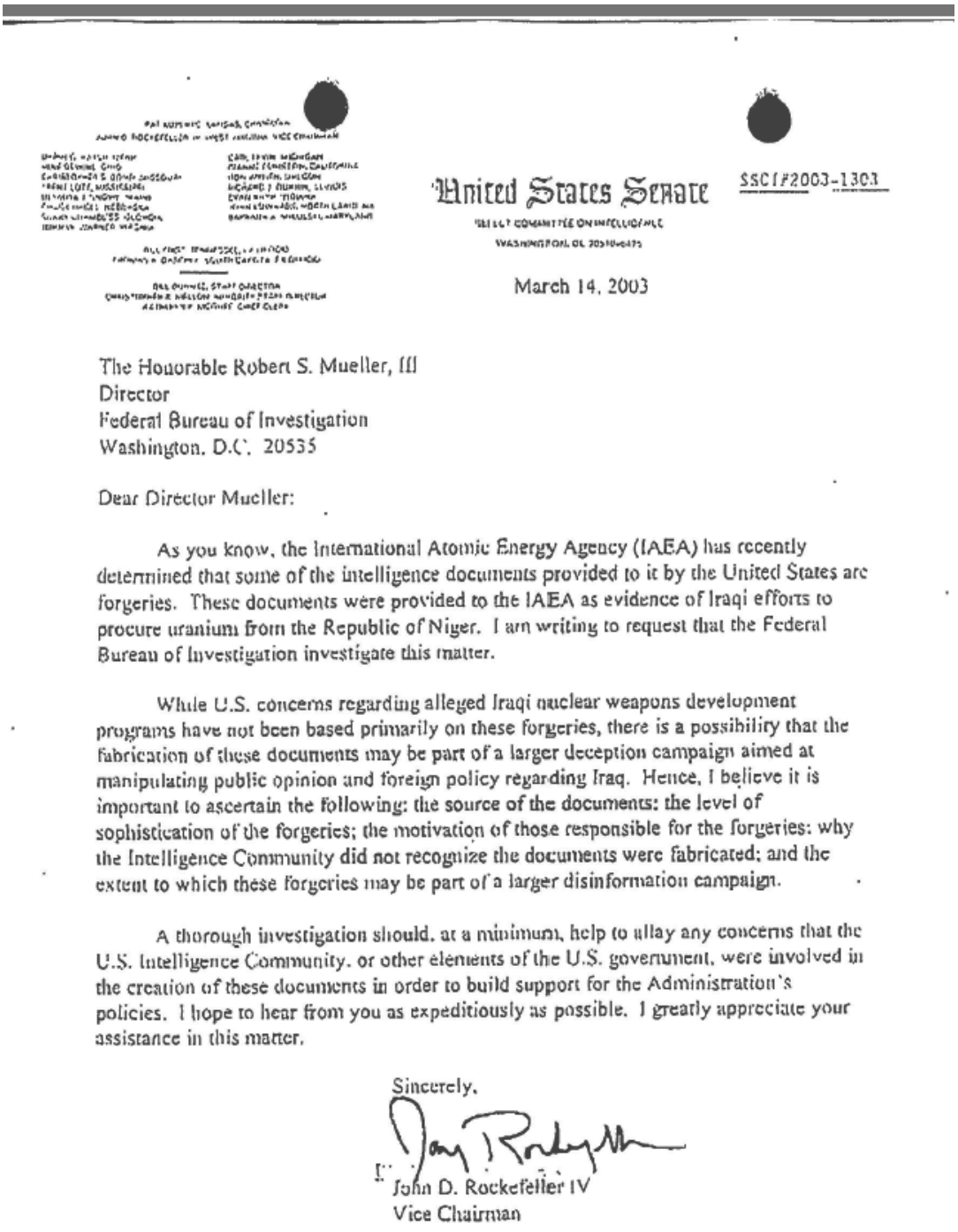
The UK government had its own entangled embarrassment over a dossier it published in September 2002, which became the basis for Bush's claims in his January 2003 State of the Union address that Iraq had sought to buy uranium from Niger. According to a since-retired CIA officer,

> "The White House attributed the charge to the British because the CIA wouldn't vouch for it." … But administration officials, he said, viewed the unconfirmed charge as "juicy" and easy to understand. "The public says, 'Saddam is buying uranium?'" That has simplicity and appeal (Drogan and Hamburger 2006).

A BBC correspondent reported in May 2003 that the UK government had "ordered [the dossier] to be sexed up, to be made more exciting" (PBS NOW). The senior intelligence official in charge of the dossier's creation was later discovered to have written a memo to the prime minister's foreign affairs adviser, suggesting that editing the evidence it presented would have "the benefit of obscuring the fact that in terms of WMD Iraq is not that exceptional" (Ames 2011).

Prop vials of poison, computer-generated fantasy bio-labs, juicy stories, and sexed-up editing – the research begun on 9/11 had fed all kinds of creative production dramatizing the case for war, and none of these fictions was presented as anything but fact.

Like the rest of the riveted global audience, I knew none of this at the time, but days after Bush's televised address, I emailed a friend about the irony of ABC's cancellation of *Veritas: The Quest:* "A show about a team of American adventurers travelling to far-off countries to dig up mythological devices of power was looking pretty timely."



United States Senate

SSCI#2003-1303

SELECT COMMITTEE ON INTELLIGENCE
WASHINGTON, DC 20510-6475

March 14, 2003

The Honorable Robert S. Mueller, III
Director
Federal Bureau of Investigation
Washington, D.C. 20535

Dear Director Mueller:

As you know, the International Atomic Energy Agency (IAEA) has recently determined that some of the intelligence documents provided to it by the United States are forgeries. These documents were provided to the IAEA as evidence of Iraqi efforts to procure uranium from the Republic of Niger. I am writing to request that the Federal Bureau of Investigation investigate this matter.

While U.S. concerns regarding alleged Iraqi nuclear weapons development programs have not been based primarily on these forgeries, there is a possibility that the fabrication of these documents may be part of a larger deception campaign aimed at manipulating public opinion and foreign policy regarding Iraq. Hence, I believe it is important to ascertain the following: the source of the documents; the level of sophistication of the forgeries; the motivation of those responsible for the forgeries; why the Intelligence Community did not recognize the documents were fabricated; and the extent to which these forgeries may be part of a larger disinformation campaign.

A thorough investigation should, at a minimum, help to allay any concerns that the U.S. Intelligence Community, or other elements of the U.S. government, were involved in the creation of these documents in order to build support for the Administration's policies. I hope to hear from you as expeditiously as possible. I greatly appreciate your assistance in this matter.

Sincerely,

John D. Rockefeller IV
Vice Chairman

Figure 13. The Niger Uranium Forgeries. On March 14, 2003, the US Senate Select Committee on Intelligence asks FBI Director Robert Mueller to investigate documents forged "as evidence of Iraqi efforts to procure uranium from the Republic of Niger…. [F]abrication of these documents may be part of…manipulating public opinion and foreign policy regarding Iraq." Source: irmep.org/foia/niger/

Science Fiction and Alternative Facts

In 2004, *New York Times* journalist Ron Suskind[2] quoted an anonymous aide in the Bush administration as telling him that

> guys like me were "in what we call the reality-based community,' which he defined as people who "believe that solutions emerge from your judicious study of discernible reality." [...] "That's not the way the world really works anymore," he continued. "We're an empire now, and when we act, we create our own reality."

Hagopian et al. (2011) estimate that roughly a quarter-million violent deaths were attributable to the Bush administration's war on Iraq, and more than half that number again of excess deaths from war-related causes such as the collapse of infrastructure. "Research-for-creation" of a fictional danger justified a real war – one that cost real lives.

A decade and a half later, after a senior White House aide coined the phrase "alternative facts" at the dawn of the Trump administration, Gordon Merseth of Southeast Portland wrote a letter to the editor (2017) claiming,

> Alternative facts are not new. In fact, they are necessary when creating an alternative universe, a universe where the natural laws we know no longer apply.... The most common place to find these alternative universes and their supporting facts is in the very popular genre of science fiction.

Legendary science fiction author Ursula K. Le Guin, whom Merseth's letter had mentioned, wrote a rebuttal (2017) the next day:

> A recent letter in The Oregonian compares a politician's claim to tell "alternative facts" to the inventions of science fiction. The comparison won't work. We fiction writers make up stuff. Some of it clearly impossible, some of it realistic, but none of it real – all invented, imagined – and we call it fiction because it isn't fact....
>
> Facts aren't all that easy to come by. Honest scientists and journalists, among others, spend a lot of time trying to make sure of them. The test of a fact is that it simply is so - it has no "alternative." The sun rises in the east. To pretend the sun can rise in the west is a fiction, to claim that it does so as fact (or "alternative fact") is a lie.
>
> A lie is a non-fact deliberately told as fact. Lies are told in order to reassure oneself, or to fool, or scare, or manipulate others. Santa Claus is a fiction. He's harmless. Lies are seldom completely harmless, and often very dangerous.

Le Guin did not live to see the Trump administration's disastrous pandemic response, in which "alternative facts" – wishful statistical projections, miracle cures, "China flu" villains, a heroic anti-mask "liberation" movement – proved so dangerous that nearly a quarter-million Americans died of COVID-19 by election day 2020, the highest per-capita confirmed death rate

[2] (Coincidentally, the same Ron Suskind who wrote about his autistic son's Disney affinity.)

in the world at that point (Roser et al., 2021).

In the early days of this doctoral project, I observed that many vaccine deniers engage in storytelling in which the (often fictional) risks of vaccines outweigh the risks of diseases, people who promote these dangerous products are profit-motivated villains, and anti-vaccine activists are the heroes protecting children and unwary adults from becoming their victims. These emotionally-charged stories are designed to move their audiences to action – whether that action is, strictly speaking, the inaction of choosing not to vaccinate themselves or their children, or the next step of becoming vocal vaccine deniers in turn.

While I agree with Le Guin's argument, I nonetheless sense something in these vaccine-denialist stories that resembles not just storytelling but science fiction, in particular its superhero sub-genre. If "alternative facts" – vaccine misinformation and disinformation – are "research-created" for optimal participation by a popular audience, could participatory science fiction lend insight into how they generate the pathos that makes them so compelling? Could it even somehow help to counteract them?

Research-from-Creation: Isolating the Anti-Gen

As noted above, Chapman and Sawchuk identify three modalities of research-creation, plus a fourth that incorporates the other three. We have explored the first modality, "research-for-creation," through a comparison of the research that goes into producing drama with that for dramatizing a case for war. Over the course of this project, I have also worked in the second modality, "research-from-creation," defined as "the extrapolation of theoretical, methodological, ethnographic, or other insights from creative processes, which are then looped back into the project that generated them." During the process of building participatory science fiction drama around the phenomena of vaccine hesitancy and denialism, one of the insights that emerged as "research-from-creation" was a theoretical framework to hold the relationships I was seeing between evidence, emotion, fiction and "alternative facts."

This model plays metaphorically with a concept at the heart of vaccine science: the *antigen*.

A pathogen is a microorganism, like a virus or bacteria, that causes disease. It derives from the ancient Greek *pathos*, "suffering, feeling, emotion, passion" (OED 2021), sharing a root with words like sym*pathy*, em*pathy* and anti*pathy* – feeling with or against. So while the word pathogen is normally used in a strictly medical sense, if devolved to its component parts it could become a *patho-gen*, a feeling-generator.

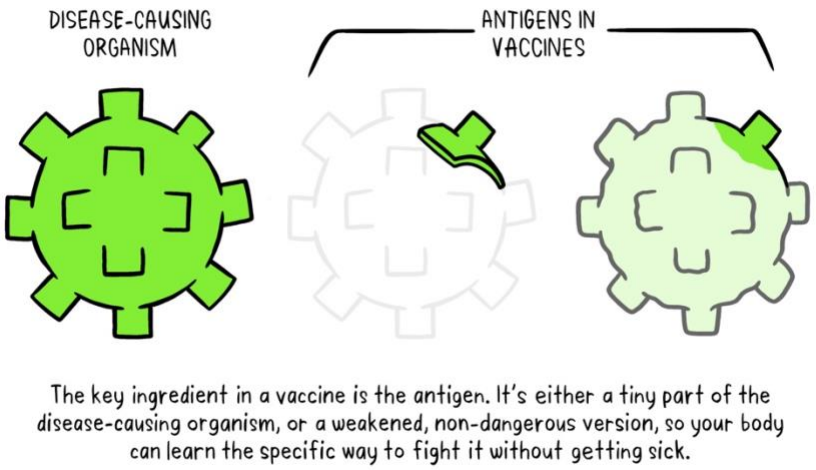


Figure 14. Illustration by Toby Morris of a pathogen and two vaccine antigens for World Health Organization explainer "How Are Vaccines Developed?" (2020).

An antigen is a key piece of a pathogen, and the two words share the suffix "-gen", meaning to cause or generate. An antigen is the specific piece of a pathogen that our immune system recognizes and latches onto to generate an immunological response. Its medical etymology is *anti(body)-gen:* that which stimulates the production of antibodies (OED 2021), but I am carrying it across into the realm of emotion as an *anti(pathy)-gen:* a feeling-against-generator.

In a study of the myriad strong and weak varieties of anti-vaccination feeling, I needed a word for "that which causes the feeling against" something. To use a theatre example, what is it that makes an audience want to boo the villain of a melodrama? That cause, that antipathy-generating factor, is what I am calling the *anti-gen*.

In the model that evolved during this project, I have isolated four different anti-gens, which can be divided into two sets of two, according to their place in the research-for-creation process. The first pair of anti-gens can be *found* ready-made through some form of research, while the second set of anti-gens is distinguished by the fact that they must be *created*.

Evidence and the "Ev-fact"

The first researchable anti-gen, which Le Guin illustrates with the example "The sun rises in the east," is what I am calling an ***ev-fact***. This is the kind of fact supported by direct evidence.

The Oxford English Dictionary (OED 2021) traces the etymology of *evidence* through the Anglo-Norman for a "legal document supporting a claim," and the Latin for "manifest to the senses." The definition speaks of "grounds for belief," "information (in the form of personal or

documented testimony or the production of material objects)," and "the available body of information indicating whether an opinion or proposition is true or valid."

I thus use the coinage *ev-fact* to denote what is commonly understood by the term "fact".

An example of an ev-fact in this model would be the infamous "Tuskegee Syphilis Study", in which the United States Public Health Service unethically observed the untreated progression of syphilis in hundreds African-American men over the four decades between 1932 and 1972, telling them they were receiving free health care when in fact the study did not inform its participants of their diagnosis, nor treat them when penicillin became known as an effective treatment for the disease as early as 1943 ("The Tuskegee Timeline").

The Tuskegee Study is a well-documented historical fact, and it is this evidence that makes it an ev-fact. It is the appalling immorality of the study that makes it an anti-gen.



Figure 15. Blood draw during the "Tuskegee Study of Untreated Syphilis in the Negro Male," U.S. Public Health Service. Centers for Disease Control and Prevention, n.d. Public domain, via Wikimedia Commons.

Affect and the "Af-fact"

Alongside the ev-fact is a second researchable anti-gen, the ***af-fact.*** Whereas an ev-fact is oriented toward external evidence that generates "feeling-against," an af-fact faces inward, focusing on *the fact of the feeling*, regardless of whether any direct evidence can or cannot be found to justify it. If I am afraid of monsters under my bed, that fear is an af-fact, whether or not the monsters are an ev-fact.

I derive the term from the word *affect*, whose definitions in the OED (2021) include "to influence emotionally, to move, touch," or, of a disease, "to act on… or attack (a person, organ, etc.) contagiously." Other senses are "to be attracted to or prefer," and "to feign or pretend." The terms *affect* and *affection* are used in a physical sense by Deleuze and Guattari in *A Thousand Plateaus* (1987, xvii), where their translator Massumi notes that neither "denotes a personal feeling." *L'affect "*is an ability to affect and be affected… implying an augmentation or diminution in [the] body's capacity to act." while *l'affection* is "an encounter between the affected body and a second, affecting, body (with body taken in its broadest possible sense to include "mental" or ideal bodies)."

Kant (1799, xlvii) describes *affects* as "belong[ing] to feeling, so far as it, preceding reflection, renders it [reflection] more difficult, or even impossible." In other words, the af-fact's relationship to the ev-fact is uneasy in more ways than one.

In coining the term af-fact, I acknowledge that beliefs and feelings can be formed by direct, empirical evidence, but also by similar but unrelated first-hand experiences, or by resonant second- or third-hand stories, or even by sources and forces we can't identify. The af-fact is where epistemology meets emotion: regardless of *why* we feel something, that feeling is a fact that affects *what* we believe and *how* we act.



Figure 16. "Black Lives Matter" by Taymaz Valley is licensed under CC BY 2.0.

An example of an af-fact springing from an encounter with the ev-fact of the Tuskegee Study (and of first-hand experiences with racism in the present-day medical system) might be a person's mistrust over whether Black lives matter to White vaccine proponents, and a resulting reluctance to believe evidence presented by the latter that vaccines are safe and effective. Padamsee et al. (2022) write that

> Black individuals in the US are cautious in their use of novel medical technologies for good reason—the history of abuse by medical and research communities is real—but they are just as likely as White individuals to embrace vaccination once they are convinced that vaccines are safe, effective, and necessary. Vaccine mistrust grounded in community experiences of racism might therefore be characterized not as resistance to protective health behavior but instead as an expression of commitment to protective health behavior.

Such a feeling of mistrust is an af-fact, an anti-gen that can be researched by listening to the person who feels it.

Alternative Facts as "Con-fects"

Having looked at the researchable anti-gens I'm calling the ev-fact and the af-fact, both of which can be found "in the wild," we now turn to a third type of feeling-against-generator – one that must be created "in the lab," usually drawing on ev-facts and af-facts through the kind of research-for-creation that pretends it is not creating.

In the mid-1980s, the KGB rolled out a disinformation campaign, now known as Operation InfeKtion, to convince the world that HIV/AIDS was created by the US government as a biological weapon. This unfounded conspiracy theory drew much of its power from the residual af-fact of the public's feelings about the real conspiracy of the Tuskegee Study, exposed just one decade earlier. Despite being thoroughly debunked (Ellick and Westbrook 2018), the story that the United States created AIDS has believers to this day.

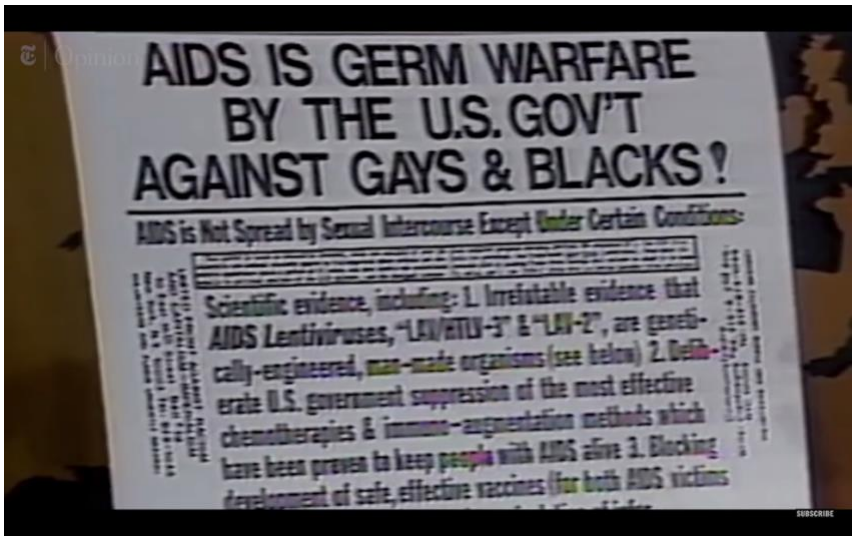


Figure 17. "AIDS Is Germ Warfare": Pamphlet circa 1986, from the documentary "Operation InfeKtion: How Russia Perfected the Art of War," New York Times, 2018. youtu.be/tR_6dibpDfo?t=689

I draw my third anti-gen to distinguish such disinformation from both facts and fiction. In Le

Guin's words, "We fiction writers make up stuff… and we call it fiction because it isn't fact.… A lie is a non-fact deliberately told as fact."

In my model, this lie is a ***con-fect***.

The coinage draws on the word *confection: "*Making or preparation by mixture of ingredients… making up, manufacture. Sometimes especially the making of preserves or confectionery… a preparation of fruit, spices, sugar." Another, now-rare sense is "A medicinal preparation compounded of various drugs… a prepared poison" (OED 2021). However dangerous, a con-fect is constructed to be deliciously tempting in some way.

The term is also meant to evoke the *confidence trick* of the *con artist*, both of which have roots via the English *confidence* in the Latin *fidere*, to trust. A con artist creates a fiction with the goal of convincing their audience to trust it as fact.

Creating Science Fiction: The "Re-fract"

Like the con-fect, the fourth and final feeling-generator of my model is also created, but unlike the con-fect, this one is not presented as fact. This created anti-gen is a fiction of the type Le Guin calls "clearly impossible," set in what her interlocutor Merseth calls "an alternative universe… where the natural laws we know no longer apply."

A ***re-fract*** is an entity in a science fiction storyworld that is a conceptual translation from a corresponding entity in real life.

This coinage comes from the OED (2021) definition of *refraction* as "The phenomenon whereby a ray of light… is diverted or deflected from its previous course in passing from one medium into another."

Whether the original entity is an ev-fact or an af-fact, once it has been "refracted" into the fiction, the re-fract is recognizable both as "clearly impossible" and as a transformation of its source fact. Unlike a con-fect, which is designed to blur the boundaries between the researched and the created, there is little danger that the audience will mistake even an affecting re-fract for real evidence. In fact, much of the audience's delight comes from an appreciation of the artfulness with which the researched has been transformed into the created.

The seven-part Marvel Comics limited series *Truth: Red, White & Black* (Morales and Baker 2003) contains a re-fract of the Tuskegee Study, telling the story of a previously unknown, tragic chapter in the experimental research that produced the superhero Captain America. This comic was one of the inspirations for the Marvel Studios television series *The Falcon and the Winter Soldier* (Newby 2021). See sample panels of a US Army nurse administering an

experimental "super soldier serum" to Black soldier Jefferson Jamison in Part III, "The Passage," at criticalcommons.org/view?m=fdmQ420yB.

I should also note that I distinguish both conspiracy-theory *confection* and science-fictional *refraction* from realistic *fiction* like Gyasi Yaa's "Bad Blood" (2019), a short story about the shockwaves of distrust in doctors that the Tuskegee Study sends through the generations to a new mother in the present day.

Attenuation and Estrangement

In this model, both confection and refraction are ways to create fiction from facts, but they differ in intent. Confection takes its researched ev- and af-facts and makes them stronger so the resulting con-fects can be put to work or weaponized. As Le Guin puts it, "Lies are told… to fool, or scare, or manipulate others." Whether its target is an Iraqi or US government, or a COVID-19 vaccine, the goal of confection is to amp up the antipathy.

Refraction does the opposite to its anti-gens. A science fiction story may transform an ev-fact into an even more sensational or outrage-inducing re-fract, but any such amping-up the creator does is counteracted by the damping-down effect of the audience's awareness that *this is a story*. Le Guin notes that fiction writers "call it fiction because it isn't fact," and many sci-fi writers would have a hard time blurring that line even if they wanted to – a hallmark of the genre is that at least one element in any story is clearly not of our present reality.

Darko Suvin (1972) defines science fiction as "the literature of cognitive estrangement" (372), a genre "whose main formal device is an imaginative framework alternative to the author's empirical environment" (375). He quotes Bertolt Brecht on the "estrangement effect" (*Verfremdungseffekt*): "A representation which estranges is one which allows us to recognize its subject, but at the same time makes it seem unfamiliar." The goal of this for the dramatic artist is to prevent "the spectator from losing himself in the character completely, i.e. to the point of giving up his own identity" (Brecht 1964; 93) and "wear[ing] down his capacity for action" (37).

If we imagine these two anti-gens being designed in a lab, we might say the re-fract has been weakened through cognitive estrangement, similar to a pathogen being attenuated (see Figure 18) to make a vaccine. The con-fect, by contrast, has been strengthened to help it overwhelm the recipient's defences and make it go viral.

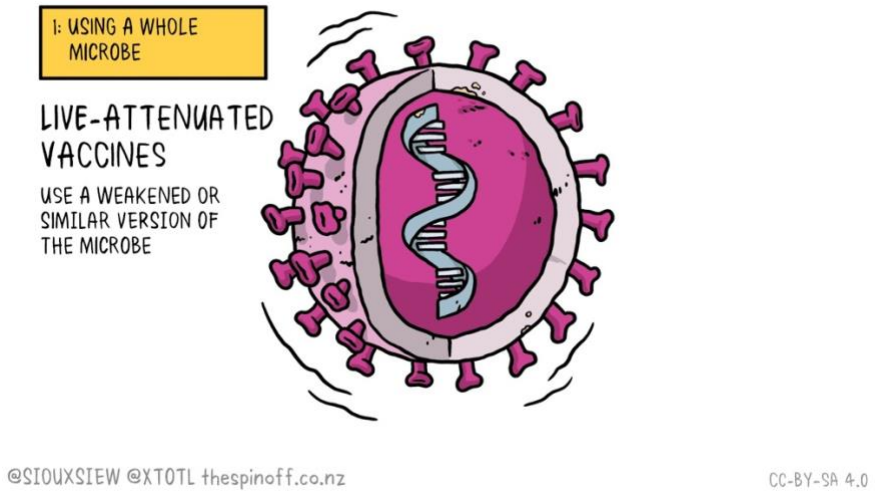


Figure 18. "Live-Attenuated Vaccines." Still from animated GIF "There Are Three Main Strategies for Making a Vaccine" by Siouxsie Wiles & Toby Morris. Licensed under CC BY-SA-4.0.

Creation-as-Research: Visualization, Dramatization and Reflection

Chapman and Sawchuk's fourth modality, "creation-as-research," draws from the other three to "make space for creative material and process-focused research-outcomes."

Creation-as-research is the methodology of my doctoral project *Shadowpox*. The following chapters will focus on the process of developing the re-fracts of its science-fictional storyworld, share insights this process generated into the con-fects of mis- and disinformation, and document the creative material my participants, my collaborators and I produced as part of our experimentation.

In chapter 4, I will return to the dramatic arts and to the concept of the anti-gen, but first, chapter 3 will lay the groundwork by introducing the project's core re-fracts for virus, vaccine, and inoculation.

Chapter Three: Mixed Reality as Inoculation: Graft and Glyph

Inoculation theory springs from the medical definition of *inoculation*, but the deeper roots of the word allow us to trace a conceptual relationship to augmented or mixed reality.

Our modern sense of the term originated in the early 1700s, when inoculation referred specifically to "the intentional introduction of the virus of smallpox in order to induce a mild and local attack of the disease, and render the subject immune from future contagion" (OED 2021). The technique was documented in China and India centuries before it was brought to England from Turkey by Lady Mary Wortley Montagu, which in turn was almost eighty years before Edward Jenner publicized the process of using cowpox, a related pathogen that is less virulent in humans, to induce immunity – a much safer method than variolation with smallpox.

Jenner coined the term "vaccination" in 1798 from *vacca*, the Latin for "cow". The term "inoculation" had previously evolved from a much older usage in horticulture: "The insertion of an eye or bud [an oculus] (Figure 19) of one plant under the bark of another for the purpose of raising flowers or fruit different from those of the stock" (OED 2021).

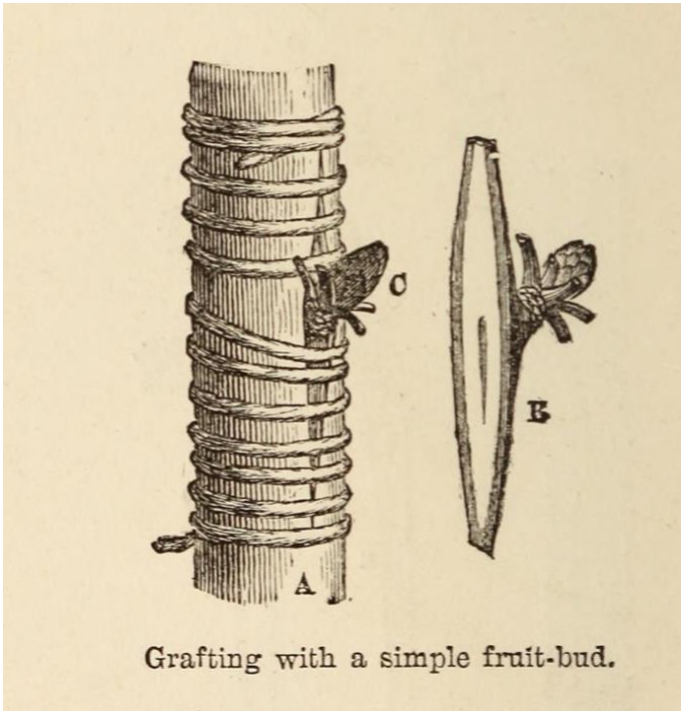


Figure 19. An oculus grafted to a stock.
From *The Art of Grafting and Budding*, p. 141 (1879).
https://archive.org/details/artofgraftingbud00balt/

Thus inoculation's root image is of grafting one entity (the oculus) onto and into another (the stock), with a third entity (the fruit) growing out of this "mixed reality."

Petroglyphs, used as media for oral teaching and storytelling by some Indigenous peoples of the Americas (Garcia 2019), follow a similar pattern, with one entity (the glyph) carved onto and into another (the rock), supporting the creation of a third entity (the story). Garcia notes the "close

association between icon and oral performance" in pictographic writing: "A mnemonic system based on visual cues, it leaves ample room for improvisation to meet the needs of a given moment" (11).



Figure 20. The Anishinaabe consider the petroglyphs at Stoney Lake a sacred site, calling it Kinoomaagewaapkong: "the rocks that teach" (Rahtz and Roach 2015). Photo: "Gitchi Manitou, the Great Spirit. From Petroglyphs Provincial Park near Peterborough, Ontario" by Lone Primate on Flickr. Licensed under CC BY-NC-SA 2.0.

Debajehmujig Storytellers use petroglyphs as visual cues for oral performance in both traditional Odawa Midewin teachings sessions and performance projects (Figure 21).



Figure 21. Joseph Osawabine uses petroglyphs as part of Debajehmujig Storytellers' performance project *The Global Savages* at the International Community Arts Festival, Rotterdam, 2014. Photo: Ron Berti.

The *Shadowpox* project employs its interactive digital effects in a similar way – it grafts a glyph onto the participant's body, and invites them to grow a story out of that mixed reality. The primary glyph is a circle of shadow, representing a virus. Its vaccine is a shadow crescent, a weakened version of that circle. These two glyphs are the visual foundation of the whole *Shadowpox* project:



Figure 22. Two glyphs: Shadowpox circle (virus) and toropox crescent (vaccine).

The project started out using expensive hardware (Microsoft Kinect motion sensor, high-definition projectors) and custom software to generate interactive visual effects and projection-map them onto the body. (We might even call these "projectro-glyphs".) But the core concept – a kind of "stone soup" participatory storytelling cued by mixed-reality glyphs – has mutated over the life of the project through multiple experimental workshops using a wide variety of media, both high-tech and low:

- motion-tracked, projection-mapped digital effects using openFrameworks and Unity (Figure 23)
- augmented reality filters for social media using Spark AR (Facebook/Instagram) and Snap AR (Snapchat/Zoom) (Figure 24)
- transparency sheets and sunlight (Figure 74)

The *Shadowpox* project's mixed reality is thus both multimodal and informed by traditional glyph-based storytelling knowledge practices.

The glyph began with the ev-fact of smallpox.

The story began with the re-fract of shadowpox.

The design began with a Dream.

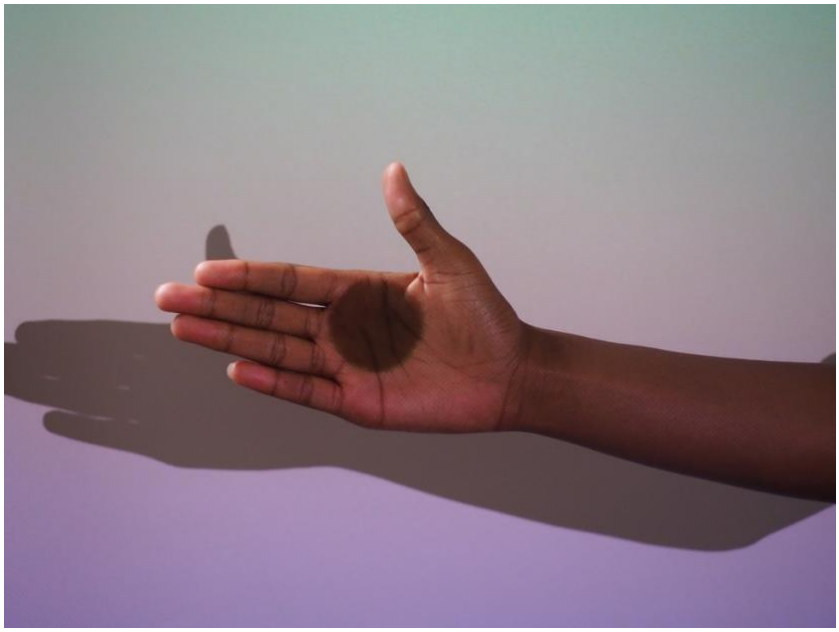


Figure 23. Single shadowpox projected on the hand of Bongo Mavi, DTHF, 3 March 2019. Photo: Jenn Warren.



Figure 24. Spark AR “toropox” eye-crescent – an experimental social media augmented reality filter by Lalaine Ulit-Destajo, modelled by the author, 1 November 2018.

Virus Design

The glyph began with the ev-fact of smallpox.

Smallpox is a contagious viral disease whose name derives from the characteristic sores ("pock" lesions, plural: pox – see Figure 25) which cover the body during the contagious phase, starting as a rash and developing into pustules which then scab over and often scar. Between 20% and 35% of those infected used to die from smallpox, and survivors could suffer serious eye disease and blindness (Figure 26). After an unprecedented international vaccination campaign lasting more than a dozen years, the World Health Organization declared smallpox eradicated in 1980.

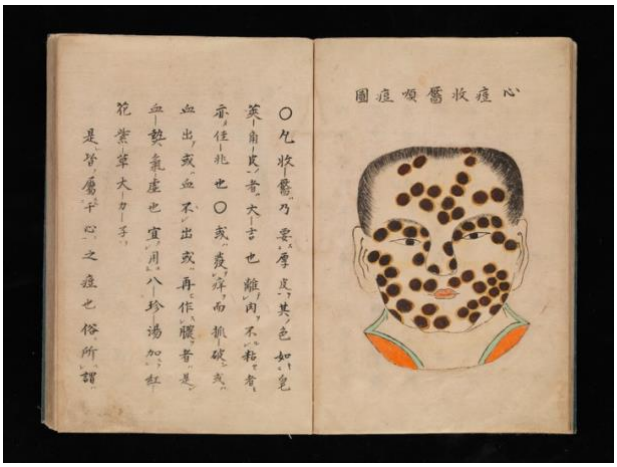


Figure 25. Smallpox illustration, Japanese manuscript, c. 1720.
Source: https://wellcomecollection.org/works/nz6hqb8j



Figure 26. "If you do not want to be blind and frail, please inoculate smallpox."
1930s poster, Turkmenistan. Source: https://wellcomecollection.org/works/kpx2mmqc

The story began with the re-fract of shadowpox.

In our science-fictional storyworld, *shadowpox,* a new disease caused by the nyctovirus[3], is a mysterious novel pathogen with a poorly-understood origin in dark matter. The tabloids were originally keen on the headline "The New Black Death," but the nickname that sticks is one that bubbled up from the collective subconscious. Shadowpox.

Its "pox" are circles of viral shadow that grow from a single pixel to roughly two inches in diameter, multiplying and spreading across the surface of the body. These shadows operate not unlike black holes, siphoning light and heat from the victim, and dissipating this energy across the worldwide viral network. As the pox spread, they induce a kind of reverse fever: a deep-space cold that leaves the victim fighting to maintain core body temperature.



Figure 27. Actor Skye Hallam in Shadowpox workshop at the Royal Academy of Dramatic Art, 24 June 2016. Still by author from videography by Simon Eves.

[3] "Nyct-", meaning night or darkness, derives from the Ancient Greek "núx", or night.

One-third of those infected become completely “eclipsed” and die slowly of hypothermia. Another third go blind when the virus reaches their eyes, stealing all light before it can hit their retina. The last thing they see is a momentary glimpse through another victim’s eyes, stolen light ricocheting unpredictably through the viral network.

Shadowpox is transmitted through shadow contact. When an infected person’s shadow falls on the body of another, the shadowpox virus can spread to the new host. The virus cannot survive on surfaces, in the air, or in non-human hosts.

During its incubation phase, the virus is invisible within the infected person’s shadow, during which time they are contagious but asymptomatic. During the next phase, individual pox begin “budding”, detaching from the edge shadow and migrating into the lighted area of the victim’s body. (This refracts the process by which enveloped viruses, such as smallpox, HIV and SARS, are released from an infected cell after replicating inside it.)

When shadowpox first emerged roughly two decades ago, its invisible incubation phase was brief, making carriers easier to identify and isolate. (This refracts the reason that smallpox is one of only two human diseases to have been eradicated worldwide: the telltale pox of its infectious phase are easy to spot on the face and hands.) Still, with no medical precedent or treatment for a virus made of shadows, contact-tracing and quarantine were the only available strategy, and it took 15 months to bring the terrifying initial pandemic under control.

In the last year, however, the nyctovirus has mutated to incubate for a longer period, making it harder to detect and therefore easier to spread. This new, highly contagious shadowpox has brought about a new pandemic, and a new urgency in the worldwide quest to find a vaccine or a cure.

The design began with a Dream.

The graphic and interaction design for the shadowpox visual effects was initially inspired by motion-tracked, live-animated digital effects created for my theatre directing MFA thesis production of *A Midsummer Night’s Dream* at York University in March 2013. Shadowpox technical director Lalaine Ulit-Destajo was part of a team of students from York’s digital media program who created the code and orchestrated the technology producing this extraordinary digital fairy magic live on stage.

In particular, two black-and-white Processing sketches from early workshops for the *Dream* visual effects were part of the inspiration for the shadowpox visual effects. See youtu.be/zRskV9pzQlA for early visual effects experiments in an August 2012 technical

development workshop, featuring handheld infrared wand-waving by Rhys Mendes and "Orbit" VFX created by Sine Gadot with Processing.org.

Three years later, with the support of Caitlin Fisher's Immersive Storytelling Lab and Graham Wakefield's Alice Lab for Computational Worldmaking at York University, Ulit-Destajo created the first generation of shadowpox code (see appendix for design brief) in preparation for a week-long workshop in June 2016 with nine graduating third-year actors at the Royal Academy of Dramatic Art (RADA) in London, England.

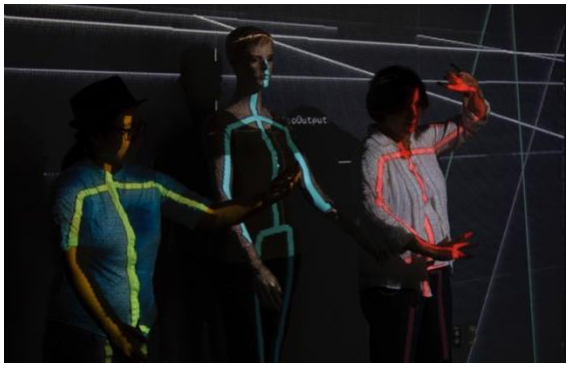


Figure 28. Lalaine Ulit-Destajo, Maggie the Mannequin and the author, Alice Lab, York University, 20 May 2016. Photo by Wesley Moir.

Ulit-Destajo's effects code drew data from the Microsoft Kinect V2 motion sensor into the open source C++ toolkit openFrameworks, and calibrated skeleton-tracking via Rulr for projection-mapping on the body with a BenQ MH741 high-definition projector (Figure 28).



Figure 29. Developing shadowpox effects in the Alice Lab, York University, 31 May 2016.

In a field of white light, circles of black were generated in real time and projection-mapped onto the actor's chest, arms and head, tracking with their movements as they "fought the virus." Given the brief lag from tracking to projection, we thought the actors would need to perform this fight slowly and deliberately, like *t'ai chi*, but this did not turn out to be essential.

Ulit-Destajo coded a control panel (Figure 30) for variables including maximum pox count, maximum pox size, budding rate, growth rate and migration speed, as well as for the size of radius around a hand that counted as a grab, all of which could make the fight easier or more difficult. We needed to be able to adjust on the fly in the workshop as we experimented with these very new effects.

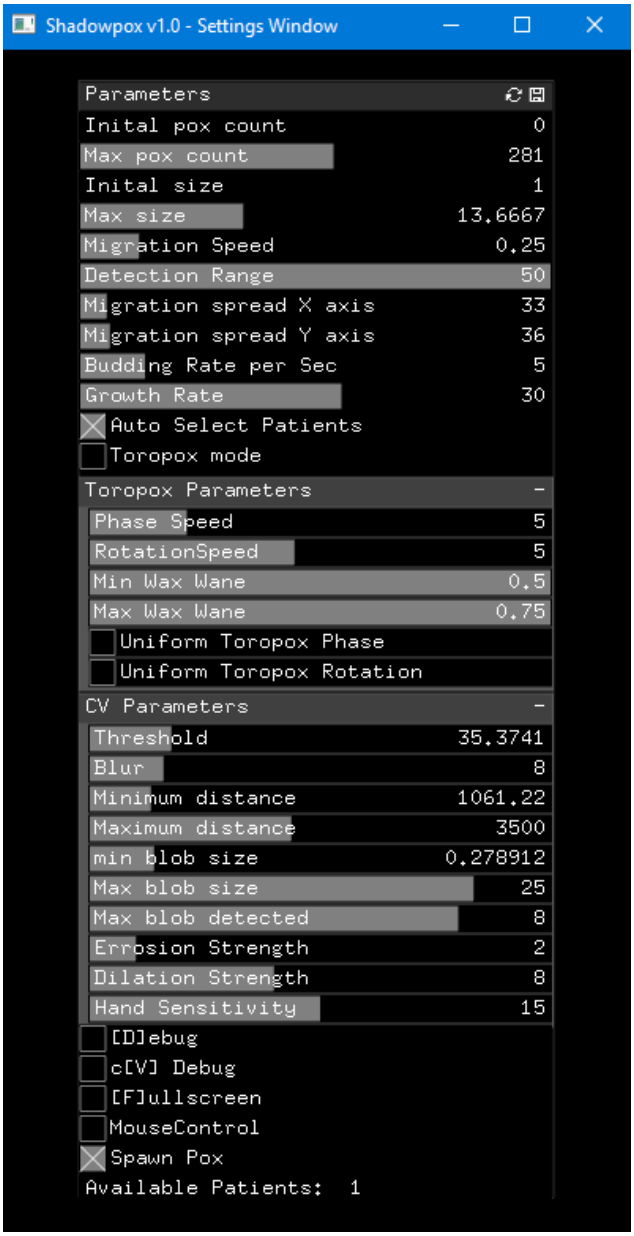


Figure 30. Shadowpox 1.0 code settings control panel, 2016.

Vaccine Design

Just as the fictional shadowpox refracted the factual smallpox, our vaccine refracted the first-ever vaccine, cowpox.

Dubbed “toropox” after its bull’s-horn crescent form (Figure 32), our re-fract was a weakened form of the shadowpox virus, an attenuated version of its circle (from *tenuis*, Latin for “thin”).

In our initial interaction design for RADA in 2016, vaccination allowed the actor to fight the disease by “grabbing” the proliferating pox and dragging them off their body, trying to keep from being engulfed in shadow.

This interaction design is a visual metaphor for the fact that an antibody’s two arms end in hand-like binding sites (Figure 31) which allow them to grab onto matching molecules called antigens on the outside of an invading pathogen. Once an antibody grabs onto the specific antigen for which it is designed, it can block a virus from entering a cell, and summon other elements of the immune system to destroy it.

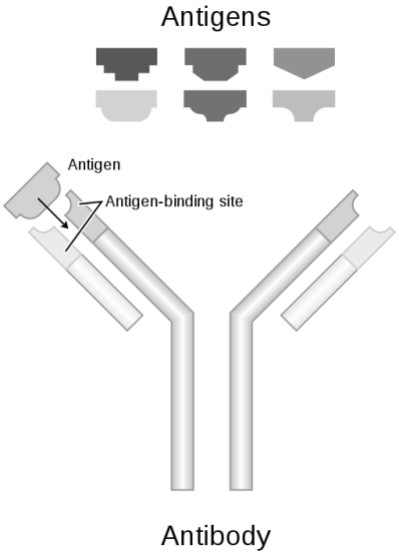


Figure 31. Schematic diagram of an antibody showing hand-like antigen-binding sites. https://commons.wikimedia.org/wiki/File:Antibody.svg

Our refraction of “fighting the virus” allowed the actor to grab and drag pox off the body, thanks to the Kinect’s ability to detect a hand opening and closing. Once a hand closed, any pox within a certain radius would be “grabbed”, at which point the shadow circles would deform into crescents, and could be dragged off the body.

Once these dragged pox reached a certain distance from the central spine, they would begin a death sequence: breaking, curling, shrivelling, and falling to the ground. To make this effect visually compelling, I sourced vector art of curling animal horns, while Ulit-Destajo put a sine wave on each fragment’s y-position and a cosine wave on its x-position to give it a unique arc as it spun, shrank, and fell to the bottom of the frame.



Figure 32. Toropox vaccine design: a crescent-shaped “attenuation” of the circular shadowpox virus, resulting in a bull’s-horn (“toro”) shape.

Setting the Stage

A week before the RADA workshop, I visited the Oxford Vaccine Group, which later became famous for co-developing the Oxford-AstraZeneca Covid-19 vaccine, the first shot I got during the pandemic. Research nurses Maria Moore and Sarah Loving shared valuable insights on how a real-life vaccine trial is run, and shared materials from a typhoid vaccine trial.

I adapted these when writing the *Shadowpox* backstory website (adding the small-print disclaimer, "This is a work of fiction. Any resemblance to actual viruses, live, attenuated or inactivated, is entirely coincidental"). The site invited participants

> to take part in a study to test the human response to new shadowpox vaccine TPX-41. The study will be open June 20-24, 2016 at the Wolfson Gielgud Laboratory, 18 Chenies Street, London WC1E 7PA [the address of our rehearsal studio at RADA]….
>
> The World Health Organization has declared the current outbreak a Public Health Emergency of International Concern, and is supporting extraordinary efforts in research to find an effective cure or vaccine. The purpose of this study is to assess a new shadowpox vaccine candidate, TPX-41, at different doses.
>
> The study will enable us to assess the safety of the vaccine and the extent of the immune response in healthy volunteers. We will do this by giving volunteers one or two vaccinations, taking full-spectrum light meter readings and infrared scans, and collecting information about any symptoms and contacts that occur after vaccination. All experiments and interviews will be professionally recorded by the laboratory videographer.

In addition to giving the trial volunteers the Shadowpox origin story, the site linked to the article "Sentimental Medicine: Why we still fear vaccines" by Eula Biss (2013) as "an introduction to the deep-rooted personal and social conflicts around vaccination." It also hosted two TED-Ed videos on the origin and biology of vaccines, and two videos on the testing of a new Ebola vaccine in the UK and in Guinea.

RADA Workshop Week

The first day of the workshop introduced the nine participants to the Shadowpox storyworld, the basics of motion capture, and the specific interactive effects we would be using for Shadowpox. Epidemiologist Conall Watson joined us from the London School of Hygiene and Tropical Medicine right next door to RADA, to share his experience working on an Ebola vaccine trial in Guinea the previous year. (He also helped control a zombie epidemic in Edinburgh in 2013.) We discussed potential dramatic themes raised by vaccination, including risks vs. benefits, collaboration vs. resistance, fears, rumour, prejudice, black-market snake oil "cures",

herd immunity, and metaphors and resonances for light and shadow. This was followed by some initial character-devising to brainstorm individual backstories within the global shadowpox pandemic. The day wound up with an uproarious session playing around with the shadowpox effects. For video from the RADA workshop, see youtu.be/Lek8wHVyQV8.

From Tuesday to Friday, actors came back to the studio for individual sessions in which their vaccine trial volunteer character was interviewed about:

- What they've heard about shadowpox, including myths about who does or doesn't get the disease, rumours about how it spreads, and folk remedies to prevent or cure it;
- Personal experience – while they must be uninfected to participate, many will have friends or family touched by the pandemic; and most importantly,
- Real or imagined fears about participating in the vaccine trial, and what motivated them to overcome those fears and volunteer as one of the first to test a vaccine that could save millions of lives.

Following the in-character interview, the volunteer received the inoculation and fought the virus. Finally, the actor was interviewed out-of-character about the concept of "rehearsal" (including their thoughts on this as a metaphor for vaccination), and about the themes of light, shadow, fear, risk and courage in their own work as an artist.

I'd also had an initial idea that the volunteers could keep an in-character text or video "lab journal" throughout the rest of the week to record any symptoms or side effects, as well as their own reflections on the experience, and positive or negative reactions from other people in their lives. (Some real-life vaccine trial participants encounter misconceptions that they are now carriers of the disease). Because the actors were all in the final month of their last year at the school, only one ended up having the time to record a couple of video diary entries, but the idea would bear fruit in later workshops.

At the end of the week, we held a group feedback session to hear everyone's thoughts on *Shadowpox* and suggestions on the overall workshop experience.



Figure 33. RADA feedback session, 24 June 2016. Photo: Lalaine Ulit-Destajo.

Infection Design

Six weeks after the RADA workshop, I traveled to Geneva for the second gathering of the multi-year interdisciplinary project <ImmuneNations>. Thanks to Natalie Loveless's call for a last-minute replacement, Caitlin Fisher and I had joined the project at its inaugural workshop in August 2015, weeks before I started my PhD at York University. It proved a serendipitous chance to collaborate with a thoughtful and talented group of scientists, artists, and policymakers on "a speculative exhibition about the constructive role that art can play in global political discourse around life-saving vaccines" (<ImmuneNations> 2020).

We convened in Geneva at the beginning of August 2016, partly to scout the soaring glass-walled foyer of the UNAIDS building where the exhibition would be installed the following summer, May-July 2017, with an opening event planned as part of the World Health Organization's 2017 World Health Assembly. Those beautiful glass walls presented a technical challenge for the *Shadowpox* team, given that sunlight would interfere with infrared motion-tracking and wash out projected shadows (Figure 34).



Figure 34. Sunlight logistics for <ImmuneNations> exhibition at the UNAIDS building, Geneva, Switzerland.

But the larger challenge was how to design a *Shadowpox* experience in an exhibition setting. As fascinating as watching the RADA actors' work might be, simply watching them on video couldn't fully convey that experience to a gallery-going public.

Shadowpox is a participatory project, one that asks participants to grow their own story out of a glyph grafted onto their body. Could we find a way to give the exhibition visitor the same experience the RADA actors had – that visceral sensation of fighting a disease made of shadows, spreading across their own skin? Could we create an intensity of physical and emotional affect that would heighten their sense of connection not just to the work, but to the community context of their own future vaccination decisions?

After long discussions with teammates Caitlin Fisher and Steven Hoffman, an idea started to germinate about a full-body video game that could embed the interactive effects in a brief, casual experience – not a week-long drama workshop, but a walk-up installation that encapsulated the story and effects in two minutes. It was a tall order, and one that would consume me over the coming months, derailing the dramatic side of the Shadowpox project in favour of the first video game I had ever designed.

The Procedural Rhetoric of Infection Design

As I returned to Toronto and worked on designing a *Shadowpox 2.0* in video game form, I kept returning to Ian Bogost's concept of procedural rhetoric: "the practice of authoring arguments through processes" ("Rhetoric of Video Games" 125). Bogost quotes Janet Murray's definition of procedural authorship: "writing the rules for the interactor's involvement, that is, the conditions under which things will happen in response to the participant's actions" (122).

As an artistic creation, a game's world is the sum total of artistic choices that include rules of in-game physics, biology, and social behaviour, just as much as colour palette and soundtrack composition. Computer programming uses rule-based "if/then" procedures that govern how actions trigger consequences. For example, in the kids' game "The Floor Is Lava," *if* you touch the floor, *then* you're dead. In Pac-Man, *if* the player guides Pac-Man over a power pellet, *then* he can eat a ghost to earn bonus points. These invented rules, in games or science fiction, become what I call "the local laws of gravity."

Bogost believes that "videogames are particularly useful tools for visualizing the logics that make up a worldview (following Gramsci), [or] the ideological distortions in political situations (following Žižek)" (*Persuasive Games* 74–75). In the process of designing this new *Shadowpox* game, some logics and distortions in my own thinking came into view.

When I showed the original RADA-era visualization of "fighting a virus" to Natasha Crowcroft – a sci-fi aficionado, then chief of applied immunization research at Public Health Ontario, and one of the project's first scientific advisors – her response put the first tilt on my perspective. After first admiring the visual concept, she said simply, "But I would be concerned about infection control."

That comment struck deep and stayed with me for months. In all my focus on the figure, I had ignored the ground (Figure 35, Figure 36). What makes a communicable disease different from, say, diabetes or cancer or even tetanus (a vaccine-preventable infectious disease that is not transmitted from human to human) is that the affected individual, as they fight a virus, can inadvertently pass it along to others.



Figure 35. Maisie Robinson fights the virus in the RADA workshop, 22 June 2016. Still from videography by Simon Eves.



Figure 36. Infecting neighbours while fighting the virus in the game *Shadowpox: The Antibody Politic*, 2017.

Crowcroft's comments were reinforced in October 2016 when I visited Debajehmujig Storytellers on Manitoulin Island in northern Ontario, to discuss a possible Shadowpox workshop. Bruce Naokwegijig, then artistic director of outreach and education, asked whether the design could be expanded to accommodate more than one actor in the scene, in order to explore the fundamentally relational nature of contagion.

With the help of Naokwegijig's and Crowcroft's insights, I came to realize that my initial interaction design had incarnated the economic concept of *externalities* – a cost or consequence of some economic activity which affects a third party without this cost being acknowledged or factored into the equation. I was paralleling what Reich (2014) terms the ideology of individualist parenting, which she argues "prioritizes individual choice for one's own children over community obligation, [and] ignores how some families with fewer resources have fewer options, but face increased risk of illness" (12). Our society's focus on the individual is equally reflected in policy efforts to increase vaccination uptake, which Kitta and Goldberg (2016) argue "suffer from methodological individualism, which emphasizes the individual as the agent for behavioral change," ignoring the upstream structural factors, "belief formation, risk and risk communication, fear, legend, and folklore" that determine those behaviours (1–2).

The Shadowpox effects quite literally embodied the idea that anything outside the outline of the actor's own individual body did not matter. When a pox got far enough from the actor's centre, it died (Figure 37). The game seemed to presume that no one else was affected, or if they were, they were so far from the centre of attention as to be out of sight and mind. Turning a blind eye to externalities in this way was, in Bogost's terms, an ideological distortion coded into our game's procedural rhetoric.

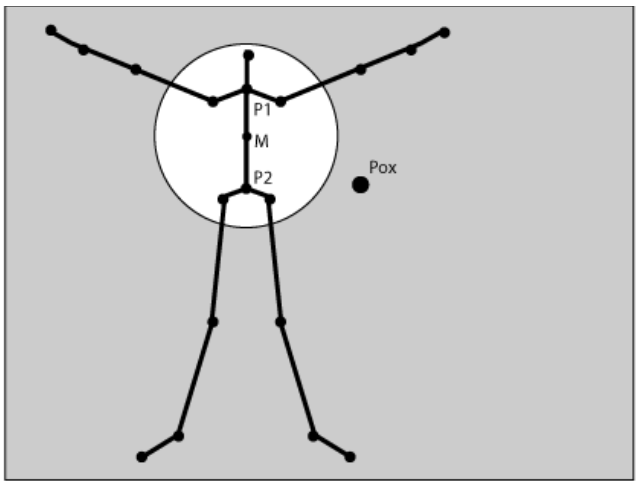


Figure 37. Diagram by Lalaine Ulit-Destajo showing Kinect skeleton-tracking and the radius beyond which a pox's death is triggered, 2017.

Esposito (2011) keys the principle of immunity to the "boundary between self and other—between us and them" (151). In stopping my imagination at that border, I had re-enacted the process that most of us use when we make immunization decisions: we think only about how a vaccine might protect or, in extremely rare cases, harm us as individuals. I had left the community who surround me—family, friends, colleagues, and strangers—completely out of the picture. I had forgotten that when I choose to "get the vaccine" or "risk the virus," I take all of them along with me in that choice.



Figure 38. 99 neighbour sprites surround the player's avatar in the game *Shadowpox: The Antibody Politic*, 2017.

The game found its focus the instant the individualistic frame widened to help the player imagine community immunity. *Shadowpox: The Antibody Politic* added 99 other figures to the previously blank field around the player. At that moment, fighting the disease was no longer a solo activity conducted in a vacuum, but became the amassing of an "Infection Collection" or "Protection Collection" of one's fellow humans, depending on whether or not the player chose to vaccinate their character at the start of the game.



Figure 39. "My 99 and I…" stickers designed by the author for the *Art and Science of Immunization* symposium at Jackman Humanities Institute, University of Toronto, April 13, 2017.

Shadowpox: The Antibody Politic

Shadowpox: The Antibody Politic, which premiered as part of the <ImmuneNations> exhibitions in Trondheim, Norway, in March 2017, and Geneva, Switzerland, in May 2017, is a game-based interactive installation that renders visible the forces that our immunization decisions exert not just on our personal health but on the health of others. Part fact, part science fantasy, this mixed-reality immersion combines real-world statistical data with motion-tracking, live-animated digital effects to imagine a vaccine-preventable disease composed of viral shadows. (See youtu.be/FgDa6xuAhcw for a video of the game in Geneva.)

The interactive shadowpox effects are projected not only on the player's own body, but also on the digital avatar that mirrors the player's movements on-screen, and on the members of the 100-strong animated population of which that avatar is a part. As the player fights the disease, moving their hands to expel the pox from their body, they discover that each handful of virus they shed has the potential to infect their 99 neighbours. The odds of infecting these animated sprites are based on real-life statistics, and the player's score mounts with each victim.

At the end of the game, a coded web link leads players online to meet their unique "Infection Collection" or "Protection Collection." Here, the abstract statistic of their score is translated into a series of 99 individual trading cards sporting quirky pictograph and text portraits. Under this macroscope, seemingly private choices are revealed to have public reverberations, while population-level health statistics are broken down into their component parts: five-score individual yet interconnected human stories. The affective arc of the game traces a connection from the personal to the political and back again.

This is how you play.

Imagine you are standing in the lobby of the UNAIDS building in Geneva. Before you is a square, light-grey tent. Even before you step inside, you see rear-projected on the tent walls a punning, recombinant title animation[4] that teases the three phases of the game:
Pox On Me, Pox On 'Em, Poxémon.

Phase 1: *Pox On Me* – The Individual's Choice
In which fear and courage incarnate, as the pathogen is projected onto the player's own body.

You enter the playing area and stand facing one screen, with your back to another. A Microsoft Kinect sensor above the front screen detects your movements, giving you control over a real-time animated avatar. Two opposing projectors shine this avatar onto the front screen, and in reverse, onto your own body.

The Kinect bounces infrared light off the player, tracking the position of key skeleton joints. Technical director Lalaine Ulit-Destajo's 2000+ lines of openFrameworks code draws circles and rectangles around those points to build a simple avatar. The avatar's gestures are recalculated 120 times per second, so fast that the player feels like they are looking at themselves in a black-and-white pictograph mirror.

[4] The *Poxémon* title sequence was animated by Jos Humphrey, two-time Emmy Award nominee and the little brother with whom I shared many of my earliest experiences of vaccination.

The visual language of the game is inspired by the design and spirit of ISOTYPE, the International System of Typographic Picture Education developed by Austrian sociologist Otto Neurath between the world wars.



Figure 40. Pictograph: Otto Neurath, *Great War 1914-18* (1930s).
Published in a traveling, folding presentation portfolio for the Mundanaeum in London, 1930s.
Image courtesy of Otto and Marie Neurath Isotype Collection, University of Reading.

Vossoughian (2008) explains that ISOTYPE's elementary infographic language (Figure 40, Figure 41) was designed to "make statistical data legible and accessible to non-specialized mass audiences," and to encourage people to "think of themselves and the world around them in terms of patterns, relationships and systems of organization" (79).

Neurath's earliest exhibit, at the 1925 Vienna Hygiene Exhibition, featured a diagram demonstrating that "the smaller the income-level of a group of people, the higher the likelihood that tuberculosis will sicken and kill" (79). *Shadowpox: The Antibody Politic* is similarly designed to enable players to think of their own actions as part of a wider pattern of community relationships.

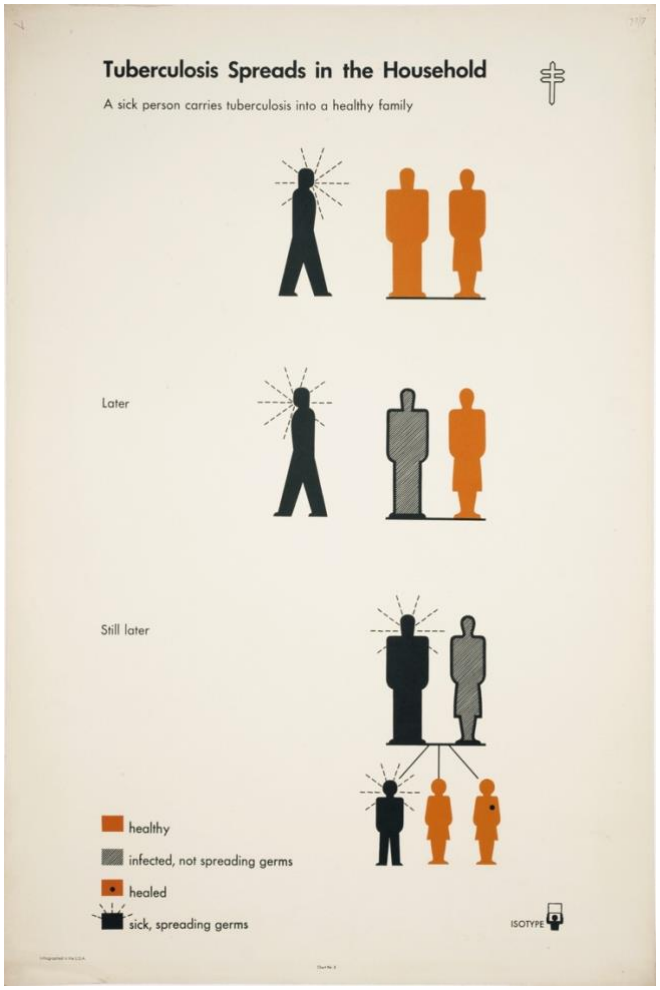


Figure 41. Pictograph: Otto Neurath, Tuberculosis spreads in the household (1938).
Chart from the 'Fighting Tuberculosis' exhibition produced for The National Tuberculosis Association in the USA.
Image courtesy of Otto and Marie Neurath Isotype Collection, University of Reading.

The Shadowpox game begins with two choices that determine how your actions will affect the world around you. An arrow-cursor appears over your avatar's right hand. You gesture at a map to choose which of 193 countries your avatar hails from. The game shows you the "shadowpox vaccination rate" in that country, derived from real-world statistics (see next section, below). Your second choice is whether to "Get the Vaccine" or "Risk the Virus". Depending on your choice, your country's vaccination rate climbs or falls by 1%.

If you choose to risk the virus, the game informs you that you have caught the disease, and that in the process of fighting it, you risk passing it along to others. Your "infection score" tracks the number of people who catch the virus from you. On the other hand, if you choose the vaccine, the game explains that you now have the chance to practice fighting a weakened form of the virus without the risk of infecting others. Your "protection score" is the number of people you would have infected, had you been fighting the actual disease rather than rehearsing with

the vaccine. After a brief explanation of how to fight the disease by moving your hands to push the small, round, shadowy pox off your body, the game begins.

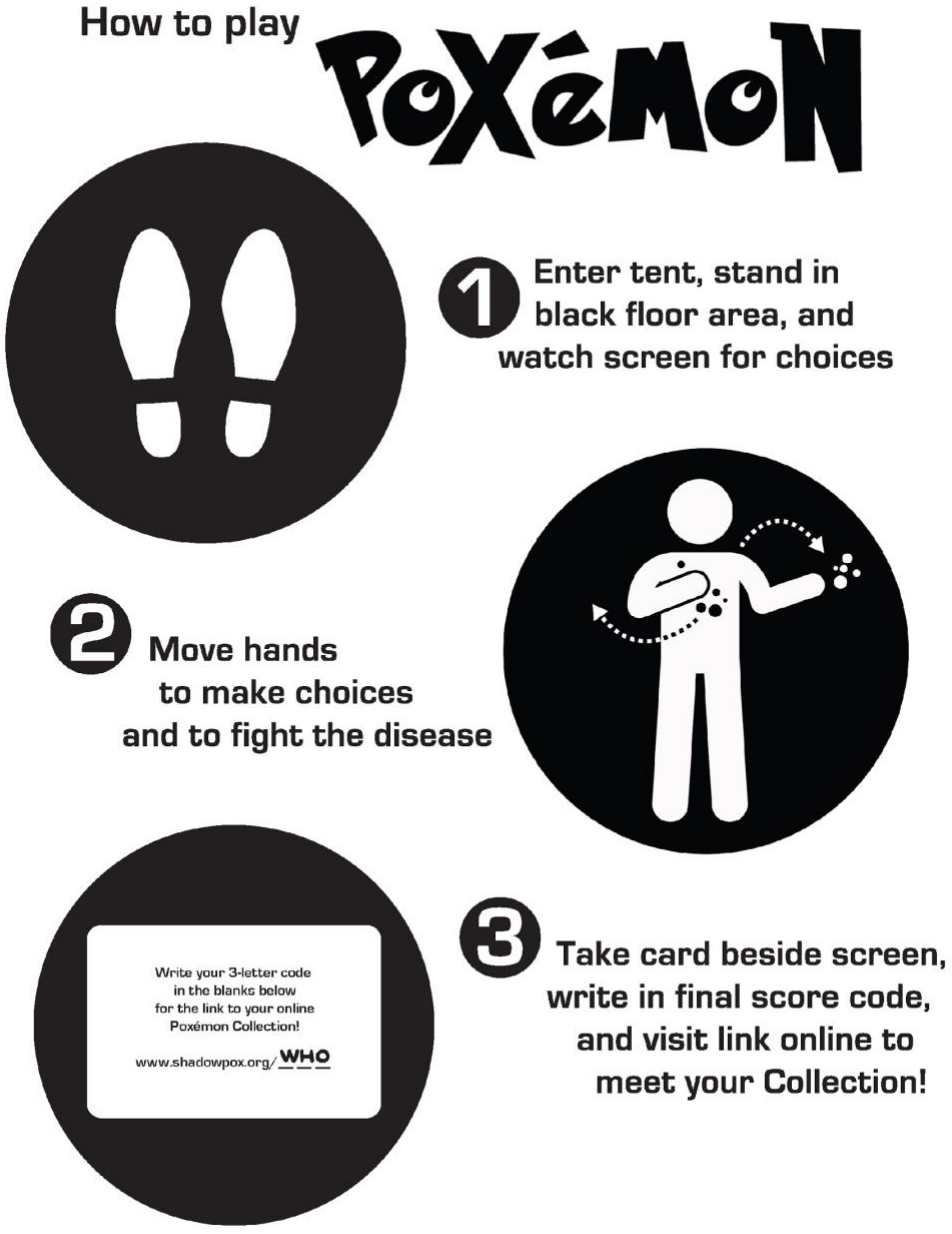


Figure 42. Shadowpox game instructions signage designed by the author for the <ImmuneNations> exhibition at UNAIDS, Geneva, 2017.

Phase 2: *Pox On 'Em* – The Community Impact

In which risk and the individual immunization decision are cast in a wider light, as the player sees the power they have to protect or infect 99 others around them.

Underlying the game is a real-world population-level statistical model, a powerful reminder that countries have different levels of resilience in dealing with vaccine-preventable disease. The model was created by epidemiologist Susan Rogers Van Katwyk and Steven J. Hoffman, then scientific director of the Canadian Institutes of Health Research Institute of Population and Public Health.

As you fight the disease, throwing pox off your body, some of the virus will come in contact with one of the 99 other people around you. The odds of your neighbour becoming infected depend on your choice of country at the beginning of the game—not simply on its shadowpox vaccination rate, but a more complex calculation that reflects structural inequalities between nations.

Rogers Van Katwyk explains the underlying statistical model:

> Each country's fictional maximum severity score—how severe a shadowpox outbreak could be at 0% vaccination—was calculated starting by ranking every country against each other by education, wealth and health, based on real-world statistics for:
> – Average Years of Education for Women,
> – Gross Domestic Product per capita (purchasing power parity), and
> – Health Expenditure as a percentage of GDP.
>
> We used a simple equation to combine these three factors into a score, and subtracted from 100% to create the maximum severity score. So, for example, the worst possible outbreak in Afghanistan is 95% while the worst possible outbreak in New Zealand is 78.6%.
>
> We also calculated a starting vaccination rate, the starting point from which people's decisions increase or decrease the vaccination rate. To make this a semi-realistic illustration, we borrowed the measles vaccination rates from 1997, and divided them in half. (The 1997 rates for measles vaccination reflect several decades of public health efforts, so we imagined a novel disease like shadowpox would not yet have reached such high levels of coverage.)

Each player who chooses not to vaccinate will reduce the rate by 1%. These changes mirror the real world by persisting throughout the exhibition. For example, when First Lady of Namibia Monica Geingos chose her home country (Figure 43), the shadowpox vaccination rate was 55%. Since she chose to vaccinate herself, the rate rose to 56%, and the next person to play for Namibia would start with that number.

Each increase in the vaccination rate causes a decrease in the severity score. So, for example, when Canada's Minister of Health Jane Philpott played the game, she raised her

country's shadowpox vaccination rate by 1%, thereby decreasing Canada's severity score by 0.957 and making her community less susceptible to infection.



Figure 43. First Lady of Namibia Monica Geingos plays Shadowpox, <ImmuneNations> opening, UNAIDS, Geneva, May 23, 2017. Photo by Steven Hoffman.

Rogers Van Katwyk adds, "We decided that the vaccination threshold for shadowpox herd immunity was 80%" — for polio it's 80 to 85%, for measles 95% — "so any increases in vaccination rate above 80% won't make a change in disease severity."

The final ingredient in the statistical recipe was the case fatality rate. When I asked Hoffman to suggest a reasonable rate for shadowpox, he answered, "Ebola was an average of 50%. Smallpox was 30%. Depends on how dramatic you want to be!" While I was concerned not to over-dramatize, as a dramatist I know it's possible to under-dramatize as well. Players have more fun when their actions have high stakes.

In the end, we settled on a fixed case fatality rate of 20%, drawing again on real-world statistics from measles, whose rate is 0.2% in the United States, but up to 25% in some developing countries. I thought perhaps we should make this a variable too, but Rogers Van Katwyk explained that there was no need to vary the case fatality rate given that the severity rate

already varied by country. As a statistics neophyte, I remained confused despite her explanations (and still slightly concerned about overdramatizing), but I went with the fixed rate out of respect for her expertise. Cross-disciplinary collaboration requires a willingness to ask what feel like stupid questions, and when good answers still go over one's head, it requires respect for and trust in others' expertise. This kind of trust in experts is a crux of vaccine confidence, as well—its erosion can lead to hesitancy, denialism, and, in extreme cases, conspiracy theories.

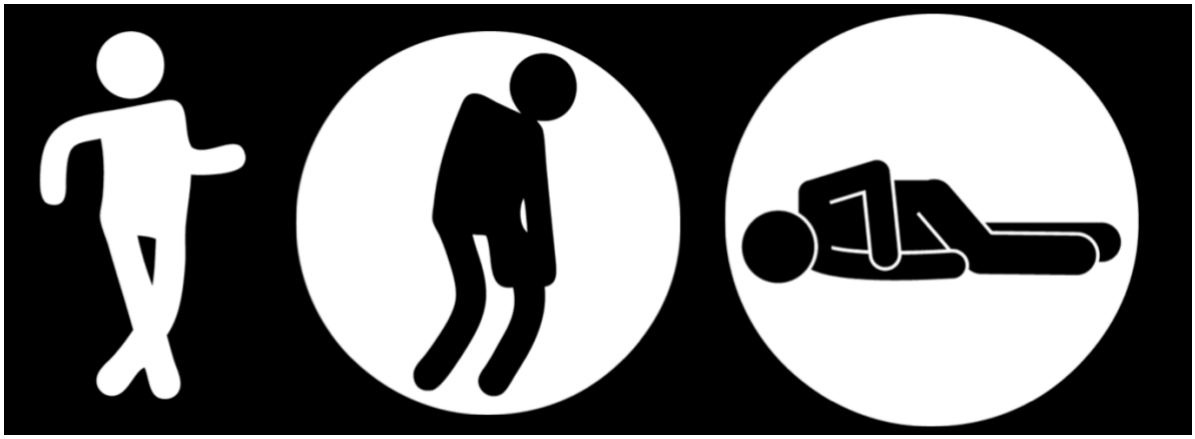


Figure 44. Pictographs for healthy, sick and dead neighbours in the game *Shadowpox: The Antibody Politic*.

Phase 3: *Poxémon* – Faces in the Crowd

In which the player's final score is unpacked into an online "Infection Collection" or "Protection Collection," a community composed of unique individuals.

At the end of the game, you are given a final score representing the number of people you infected, and the number of these who died (or the number you protected from those fates, if you chose the vaccine). This score is translated into a three-letter code,[5] which you write on a card to complete its web link: "shadowpox.org/___ ___ ___."

When you visit the *Poxémon* website, abstract statistics transform into singular humans. Whereas in the game, the people in your community are without names or any other distinguishing features, once you venture online, this identical population blooms into individuality. Slovic and Slovic (2015) attest to the difficulty of making human drama out of

[5] The coding behind this three-letter code, created by "Poxémon deckhand" Sean Sollé, was itself a work of art.

data: “Even the most mathematically gifted human beings are psychologically limited when it comes to attaching feeling to numerical information” (7).

Your online “Infection Collection” or “Protection Collection” riffs on the *Pokémon* trading card series, each virtual card depicting a single individual whose life you have touched—for better or worse—giving them a name, a “nano-story” written by Caitlin Fisher, and a unique pictograph designed by Leremy Gan (Figure 45). See shadowpox.org/ZZZ for the full set of 99 cards.

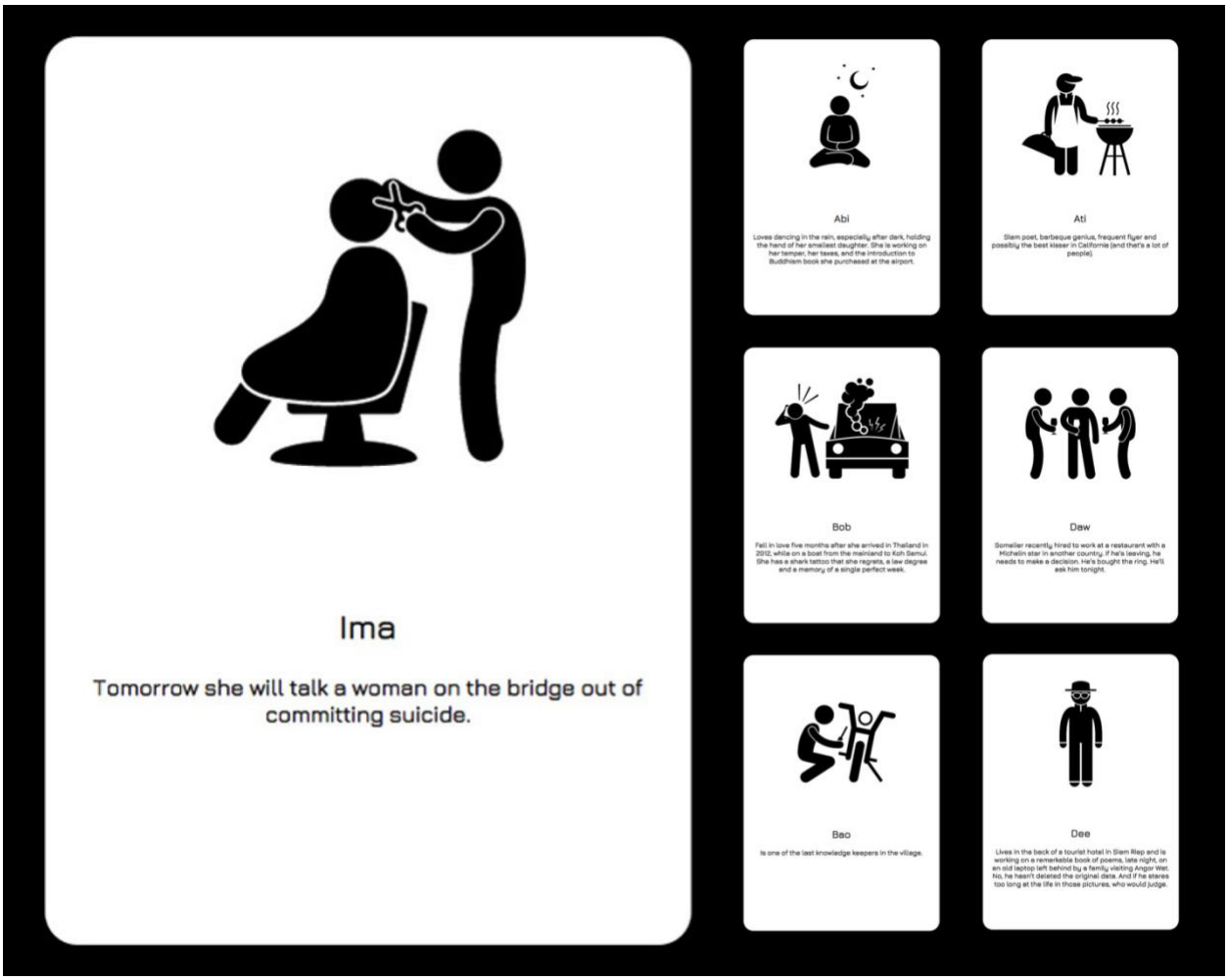


Figure 45. *Poxémon* card: “Ima. Tomorrow she will talk a woman on the bridge out of committing suicide.” Caitlin Fisher (text) and Leremy Gan (pictograph). *Shadowpox: The Antibody Politic* (2017)

Ofri (2008) points out one strength public health can borrow from the arts, while explaining the *Journal of Public Health*’s decision to name a new column Chekhov’s Corner, after a famous Russian playwright and doctor:

> Public health, after all, deals with populations; it eschews the individual except as it forms one of a group. The creative arts, however, deal almost exclusively with individuals. Literature, in particular, always has a protagonist, and the protagonist is never 'Irish alcoholics with pancreatitis,' or 'female prisoners receiving hepatitis B vaccination' [...] A protagonist is an individual. (205)

In the Covid-19 pandemic, when the death toll in the United States hit 100,000, the *New York Times* marked the milestone by filling its front page with 1,000 of the people who had died as of 24 May 2020. But as an assistant editor on the Graphics desk explained, "Putting 100,000 dots or stick figures on a page "doesn't really tell you very much about who these people were, the lives that they lived, what it means for us as a country" (Grippe 2020).

To each name in the list, they added a brief descriptive phrase taken from an obituary, which the *Shadowpox* team recognized instantly as the same humanizing instinct that motivated our fictional Poxémon "nano-stories". The feature's online version ("U.S. Deaths Near 100,000") took another step closer to our game by adding tiny human pictographs, multiplying the storied representatives into the full hundred thousand dead (see vimeo.com/802456081 for video of the mobile version).

In March and April 2020, we, too, came together to create a response to the pandemic that had turned our fiction to fact: an online version of *Shadowpox: The Antibody Politic* reworked to acknowledge that while there was as yet no vaccine against Covid-19, each individual still had the power to make choices that could protect or infect those around them.

Shadowpox: #StayHome Edition

The original installation *Shadowpox: The Antibody Politic* opens with the choice to "Get the Vaccine" or "Risk the Virus." One of the creative challenges the team didn't feel we cracked in 2017 was how to visualize vaccine protection effectively. If you choose the vaccine, you gather a "Protection Collection" of the neighbours you didn't infect, but at first glance, this looks almost identical to the "Infection Collection" you rack up if you choose to risk the virus. It's a design conundrum: How do you show things *not happening?*

On 8 April 2020, we released *Shadowpox: #StayHome Edition* (shadowpox.org/game), an online reinvention of *The Antibody Politic,* coded in JavaScript and submitted to the United Nations Covid-19 Response Creative Content Hub, that gave us the chance to revisit that question. The team pulled the game together in just two weeks, changing the worst outcome from death to hospitalization, reflecting the call to #FlattenTheCurve so as not to overwhelm the healthcare system, and shifting the original focus on vaccine decision-making.

Instead of the previous choices, Sean Sollé suggested the game start with two buttons: “Distancing” and “No Distancing.” In the latter world, all 99 of your neighbours are making their own decisions not to physically distance, and if you let your character leave home and pass the virus to one of them, your infection score goes up not just by one, but by as many other neighbours as they pass it along to in turn.

If, on the other hand, you choose to make your character #StayHome, *nothing will happen,* and you will earn the winning score of zero. As Steven Hoffman observed when he suggested this reversal, “No one else gets infected. It’s boring—like staying at home—but that’s the point.” (See youtu.be/4yAdgiR5DwA for draft gameplay recorded 8 April 2020 for a feature by CTV health reporter Pauline Chan. Note that the opening choices are “Stay Home” and “Go Out”, while in the final version of the game they are “Distancing” and “No Distancing”.)

There’s another choice at the start of the 2017 game that took on even more powerful resonance as the pandemic unfolded. You choose which of 193 countries your character lives in, and the game’s algorithm draws on real-world statistics for that country to determine how susceptible your neighbours are to infection.

But a year after the mRNA miracle dawned, while wealthy nations like Canada focused on convincing a shrinking minority of our citizens to “Get the Vaccine” from the lion’s share of doses we had bought up, the majority of people in the majority of nations still had to “Risk the Virus” whether they chose to or not.

So perhaps another design conundrum is how to pose the question: *Who is my neighbour?*

Circling Back

In Canada*, Shadowpox: The Antibody Politic* premiered at the symposium The Art and Science of Immunization at the Jackman Humanities Institute on 13 April 2017. It enjoyed its longest run at the exhibition *Public Notice* at the Robert McLaughlin Gallery from September 2018 to January 2019 (youtu.be/pjOwJLhw4Vw) – where I also gave a talk at the Ideas Digital Forum (youtu.be/lpl5x6yFsxc). After a pandemic delay, the McMaster Museum of Art hosted the third and final <*ImmuneNations*> exhibition from September to December, 2021 (youtu.be/HdThPCKJxQU).

Thanks to these opportunities, the *Shadowpox* games were a hugely successful adaptation of the storyworld to a new medium, grafting the circle and crescent glyphs onto

hundreds more participants than I ever anticipated. The glyphs and games were effective in visualizing the *results* of the choice to vaccinate or not. But what about its *causes?*

Shadowpox began as a storyworld, developed a whole second life in game form with *The Antibody Politic*, then circled back to pick up the narrative threads left hanging after the RADA workshop with a new storytelling framework, *The Cytokine Storm*, which aimed to explore exactly that.

Chapter Four: Science Fiction as Attenuation: Antigen and Agon

Where *Shadowpox: The Antibody Politic* explored how to visualize the individual in the wider context of the community, *Shadowpox: The Cytokine Storm* examines how a community's defenses can become a threat to its own wellbeing through the spread of irresponsible rumours designed to inflame outrage.

Controlled encounter with the Other is the conceptual heart of vaccination, and the belief that it is better to seek safety by excluding rather than encountering the Other lurks behind much vaccine denialism (Reich 2014, Esposito 2010). The superhero science fiction subgenre offers imaginative paths through this conflict, as traced by Fawaz's (2016) comic book cosmopolitics, and Dudenhoeffer's (2017) embodied array of actants requiring constant negotiation.

The Cytokine Storm is a co-created, networked narrative reimagining vaccination as an acquired superpower, and enabling participants to explore vaccination both as a real biological process and as a metaphor for our interconnected social wellbeing. Participants create their own characters who, having volunteered for the first-ever trial of a new vaccine, find themselves the target of social media outrage. The six-scene story framework is designed to spark emergent drama from the tensions between feeling and thinking, individual and community, participation and resistance, vigilance and trust.

From Labyrinth to Laboratory

As mentioned in chapter 2, my earliest notes toward the Shadowpox storyworld reimagined the Greek myth of the Minotaur, in which the heroine Ariadne helped Theseus and thirteen of his fellow Athenian youth, trapped in a labyrinth of her own parents' making, as they learned to fight a creature out of nightmare.

In this refraction, the labyrinth became "The Lab", and the fourteen young women and men, sent as unwilling sacrifices to King Minos by a plague-afflicted Athens, became young volunteers willing to test an experimental vaccine to save a pandemic-afflicted world.

In that early notebook entry from July 2013, I contemplated building on a motion-capture

VFX experiment for my March 2013 MFA production of *A Midsummer Night's Dream:*

> projections & interactive media – 'Orbit' Processing sketch from *Dream* as virus? Fighting those dots as visualization of antibodies fighting virus – 'Sword Dance and Shadowgraph,' but with a story that makes more real-world sense.

The Minotaur was eventually refracted into *shadowpox*, a disease I described in my 2015 PhD proposal as

> living, independent, viral shadows, flocking across surfaces and around a space like starlings or sunfish, as responsive to movement as a bull to a matador's cape, and capable of inflicting a piercing pain leading to a slow, gravitational death.

In the laboratory, the vaccine trial volunteers would learn to dance with the darkness like matadors in the ring, shadow*boxing* with an opponent they cannot touch, learning how to fight it through deadly trial and error. The 2015 proposal imagined the process as follows:

> The volunteer enters a white-box room. Their antagonist is released into the space with them: specks of darkness flocking, flowing, flitting across the walls and floor, responding to movement, feinting, attacking, retreating, and gathering intelligence on its opponent just as the volunteer is trying to do.
>
> If the shadows make contact with the test subject's body, contagion begins, darkness spreads, and death will swallow the victim in a matter of hours.
>
> Humanity's hope hangs on the courage and choreography of these young volunteers….
>
> The word 'plague' comes from the Greek 'plege', meaning a stroke or blow. In this sense, vaccination is a kind of fight rehearsal, a learned immunity in which our bodies practice creating antibodies in stage combat with blunted weapons.
>
> It's a secret service, but it's not a solo one. We rely on the majority of our fellows to voluntarily rehearse this fight so that we can protect each other, and especially the most vulnerable, the youngest and oldest and sickest, from disease.
>
> The hope of this project is that we might better value our web of mutual protection if we can make the dramatic conflict of acquired immunity vibrantly, viscerally visible.

Though the VFX and interaction design evolved, the story has been set from the start in a Phase I vaccine trial. Anyone who decides to become immunized—even with a vaccine used by millions for decades with extremely rare side effects—is not just protecting themselves, but committing an act of heroism to benefit both loved ones and strangers. For those who volunteer to test a new vaccine candidate in a Phase I trial, the risk/benefit ratio increases the heroism exponentially.

Vaccine hesitancy is always understandable, but when a new vaccine candidate is moving from *in vitro, in silico* or animal testing to a "first-in-humans" trial, the justification for fear is at its peak. So, therefore, is the courage required to overcome it.

These were my first steps toward designing a scenario that frames vaccine choice through a superhero metaphor.

Screen and Scenario

From the beginning of my PhD, I felt the need to clarify why my dissertation belonged in the Department of Cinema and Media Arts, one floor down from York's Department of Theatre, where I did my MFA. But even there, my thesis production of *A Midsummer Night's Dream* had caused similar transdisciplinary confusion. It was a thrilling collaboration with the Department of Digital Media (including future ***Shadowpox*** technical director Lalaine Ulit-Destajo, an undergraduate at the time), in which our team experimented with real-time, mixed-reality VFX, projected on scrim and cyclorama. Gesture-driven particle effects augmented the verbal confrontations between Titania and Oberon and, most notably, one of the world's first on-stage uses of facial mocap animated a 3D donkey head for Bottom.

Those experiments sparked questions for further research. What else could mixed reality do for drama beyond digital décor and mask work? We had fun with our pixelated projectiles for supernatural spats, but what kind of conflict could make generative code an actor in its own right? And as technologies of motion-tracking and projection-mapping became more accessible to dramatic artists, what new stories could be told by turning the body itself into a screen?

In the first term of my PhD, I got the sense that my new department drew a clearer line between live and recorded drama than I usually bothered with. My focus had always been on the fiction and the performance, not whether there was a lens between actor and audience. I loved the way Julie Taymor reimagined the animated film *The Lion King* (1994) for a stage musical (1997), bringing it full circle from its inspiration in Shakespeare's *Hamlet*. I was planning a project where participants would improvise with digital VFX and record their scenes on video – wasn't this enough to qualify it as "media arts"?

Then I read Diana Taylor's *The Archive and the Repertoire* (2003), which unlocked a new way of understanding the disciplinary rift between "the 'archive' of supposedly enduring materials (i.e. texts, documents, buildings, bones) and the more ephemeral 'repertoire' of embodied practice/knowledge (i.e. spoken language, dance, sports, ritual)." (13) In contrast to an unchanging text, even a play like *Antigone* which "might be performed in multiple ways," Taylor argues that performance and theatricality sustain a *scenario,* "a paradigmatic set-up that relies on supposedly 'live' participants, structured around a schematic plot, with an intended (though adaptable) end." (13)

This concept reminded me of the serial storytelling tradition of the superhero genre, where generations of creators have made new works by drawing on a shared cultural understanding of the embodied dynamics of superpowers and the interpersonal dynamics of hero and villain characters. Douglas Wolk read every one of the 27,000-odd Marvel superhero comic books published since 1961 for *All of the Marvels* (2021), and describes them as

> the longest continuous, self-contained work of fiction ever created: over half a million pages to date, and growing. Thousands of writers and artists have contributed to it. Every week, about twenty slim pamphlets of twenty or thirty pages apiece are added to the body of its single enormous story. By design, any of its episodes can build on the events of any that came before it, and they're all (more or less) consistent with one another. (1)

By applying Taylor's framework to the Marvel Universe, I saw a method by which creators used a repertoire of *scenarios* to generate an ever-expanding archive of *texts*. This in turn transformed the way I envisioned my own storyworld.

My 2015 Vanier Scholarship application originally argued that "Both the ancient Greek dramatic chorus and modern mythologies like the *Hunger Games* and *X-Men* franchises have an active, collective pedagogical function," and proposed a two-part transmedia project in the same vein. The first part was to be a science fiction stage play following the first cohort of volunteers testing an experimental shadowpox vaccine, which would serve as a "framing narrative" for each participant to "devise original video journals and choreograph their shadow-dance experiments."

The second part of the storyworld was to be built online, in the "web portal of a fictional International Shadowpox Research Network," to which participants would upload the videos created during the production of the stage play. The goal was "conceptual contagion," so that as each student's micro-narrative added to the online storyworld, their videos would "join a growing repository of individual reports telling a collective story: a world pulling together to prevent a pandemic from ripping it apart."

Over the course of the project, however, my early proposal for a stage-play framing narrative evolved into a more experimental form. In the spirit of Taylor's *scenario*, the *Shadowpox* story framework was eventually comprised of an introductory backstory plus six creative prompts, which would produce a narrative arc playing out over six video scenes in the form of in-character interviews, journal entries and lab reports. This approach replaced fixed script with generative suggestion, a kind of messenger RNA that each new participant could use to conceive their own character's story and birth it into recorded form. Taylor notes that "Performances also replicate themselves through their own structures and codes. This means

that the repertoire, like the archive, is mediated" (20-21). With *Shadowpox,* it seemed we could have our repertoire cake and archive its performances too.

Just as the form of the *Shadowpox* story evolved, so did its focus. In my 2015 Vanier application, I had a generalized vision that the project's participants "will not only inspire reflection and debate in the audience of their peers, but will actually generate and disseminate new insights into one of the thorniest political dilemmas of public health: the individual's voluntary participation in the collective good." I believed in "the potential for online choral co-creative storytelling to serve not just as a vehicle for dramatizing public health messages or capturing multiple stakeholder perspectives and fears, but also as a framework for global creative brainstorming." Yet I had only the vaguest vision of what kind of scenario could elicit that brainstorming and those insights.

Taylor suggests that "scenarios exist as culturally specific imaginaries – sets of possibilities, ways of conceiving conflict, crisis, or resolution" (13) that make "visible, yet again, what is already there: the ghosts, the images, the stereotypes" (28). This was exactly what I was to discover as I worked with waves of participants to explore multiple ways of conceiving the conflicts around vaccination.

I may have created the *Shadowpox* scenario, but it was the participants' creation within it that brought these imaginaries, ghosts, images and stereotypes into the light.

Luthor's Fault

Early in the story's evolution, I conceived of the antagonist as the virus itself. This was not to last.

In the inaugural 2016 workshop at the Royal Academy of Dramatic Art, participants created vaccine trial volunteer characters, but there was no particular scenario. I asked them a loose set of questions as part of an in-character interview, followed by the inoculation experiment where they "fought the virus" of the shadowpox VFX, and finally another interview out-of-character.

One of the many things I learned from that first workshop was that I needed to give participants a clearer story arc for their character, with a conflict more engaging than simply "learning to fight the virus." The superhero genre contains plenty of instances of protagonists saving people from non-human threats and natural disasters (not to mention the accidents from which our heroes frequently get their powers in the first place), but the most dramatically-satisfying stories have some core of human conflict. While the climax of the 1978 film *Superman* sees him saving millions on the West Coast from a devastating earthquake, the screenwriters heightened the drama by framing the disaster along San Andreas as Lex Luthor's fault.

This is a core function of the supervillain: to give a human face to an amorphous societal fear (Bainbridge 2019) or random stroke of fate. *X-Men* writer G. Willow Wilson describes pitching a story about how the weather-controlling mutant Storm might react to climate change, and being reminded by her editor to "Give them something to punch" (Edidin and Stokes 2015). Similarly, the Greek tragedy *Oedipus Rex* wouldn't have such staying power if the king had searched for the cause of the plague of Thebes and discovered it was caused not by his own moral transgressions, but by a zoonotic bacterium (Kousoulis 2012).

This was brought home to me at the end of the RADA week, when one of the participants in the final group feedback session made an observation that changed the way I thought about the scenario. Abraham Popoola said that it would be interesting to know, as a writer:

> What does the audience know that potentially the participants don't know?... Does the government know how this thing started? Is there life outside of the Shadowpox [scenario], where shadowpox is the aftermath of a prior event? Because then that might frame how people writing inside it, creating inside of it, might gear their things.
>
> There could be some drama or tragedy involved, because we know– If you're someone who's really gullible, and if I know that the shadowpox, the whole thing is actually some sort of like, government conspiracy sort of thing, then I could write something very dramatic or tragic in light of that.

At the time, my heart sank to hear this comment. I replied that he'd made a great point, and that I'd been thinking about this a lot, because it felt like the go-to story, the default setting for any screenwriter: a government conspiracy, or an evil corporation, who's trying to make money off people, so they engineer a disease and then they engineer a cure, and they make money off both. (The *Veritas: The Quest* episode "Mummy Virus" mentioned in chapter 2 was my touchstone for this.) I told Popoola I'd actually spent time trying to think how I could possibly set things up so that we *don't* go there.

But afterward, I realized my knee-jerk response had squelched a vital creative insight he was bringing to the discussion. Like the rest of his RADA cohort, Popoola was finishing three years of intense study – on top of a lifetime as an audience member – learning what makes stories compelling. These dramatic artists were as expert in their forms of patho-gen as epidemiologist Conall Watson, who had come round the corner from the London School of Hygiene and Tropical Medicine on Monday to talk about testing an Ebola vaccine in West Africa.

While I missed the chance to ask him to unpack how a character's lack of knowledge would allow him to write something "tragic", Popoola was doubtless invoking the concept of *anagnorisis*. Sometimes translated as "recognition" or "revelation", the term refers to the moment at the climax of a drama when a character suddenly gains knowledge that turns

their world upside-down. In the *Poetics*, Aristotle identifies *anagnorisis* as one of the essential elements in Greek tragedy.

The classic example is the moment Oedipus realizes not just that an old man he killed in a long-ago fit of road rage was the previous king of Thebes, but also that by doing so, he fulfilled the prophecy that he would kill his own father. The moral pollution of Laius' unavenged murder is the cause of the city's plague – to use Popoola's words, the disease is "the aftermath of a prior event" – and what makes it "dramatic or tragic" is that the protagonist doesn't know what the audience suspects. The dramatic irony even extends to a pun in Oedipus's name: the Greek *oida* means "I know," from the etymology "I have seen" (Goldhill 2012). Although Oedipus is often viewed as earning his fate through the tragic flaw of *hubris* (his prideful and impulsive killing of an old man at the crossroads, his arrogant treatment of the seer Tiresias), he can also be seen a victim of misunderstood and missing information.

In 2016, neither Popoola nor I had experienced a real plague, but we both knew audiences. His insight anticipated conspiracy theories rushing in to fill the information vacuum from the earliest days of the novel coronavirus. As with Luthor's fault, a great many people needed a human villain to blame for this global disaster, so the "lab leak" theory and its more sinister cousin, the suggestion that the virus was intentionally engineered and/or unleashed on the world, all found adherents unwilling to believe it was just a natural spillover in a Wuhan wet market (Achenbach 2021). Humans' storytelling instincts prompt us to look for the story-behind-the-story, the information that will be revealed at the climactic moment of *anagnorisis*, so at least the natural disaster of the plague won't be compounded with the tragedy of discovering we've been ignorant, gullible victims of a human conspiracy, too.

Popoola's comment was the first of many times a *Shadowpox* participant's creative choices or insights caused me to think more deeply about the design of the scenario and how it resonated with real-world attitudes toward vaccines, viruses, and scientific research.

How to Generate the Anti

So Shadowpox needed a story arc, and the superhero genre more or less demanded a human antagonist. But I was determined not to facilitate participants coming up with the kind of cardboard-cutout corporate or government villains that populate conspiracy theories.

Vaccine denialists have long denounced Big Pharma as nefarious profiteers and accused individuals or governments promoting vaccines as being in their pocket – an accusation known as the "pharma shill gambit" (Kata 2011). In 2019, when a Washington state committee was considering the elimination of personal and philosophical exemptions for childhood

vaccinations in the midst of a measles outbreak, one pro-vaccine health practitioner who testified in support of the bill saw his Facebook page "flooded with one-star reviews calling him everything from a 'disgrace' and a 'pedophile' to a 'Nazi pharma shill' and 'scumbag shilling for infanticide'" (Wong 2019). The con-fect that vaccines cause autism invents a human face to blame for a neurodevelopmental condition that science still can't completely explain. And once a person has been framed as such a villain, true believers can see themselves as heroes for attacking them.

With the advent of the Covid-19 pandemic, Nazi and Holocaust imagery continued to be invoked by the most extreme anti-vaccine activists, including threats of Nuremberg-style trials for those who promote vaccination (McCarthy 2022). Prominent anti-vaccination conspiracy theorist and entrepreneur Mike Adams posted an article on his *Natural News* website titled, "It's time to arrest, prosecute, and EXECUTE researchers who use human children for covid vaccine medical experiments" (Gorski 2021).



Figure 46. Mike Adams calls for execution of vaccine researchers on his website *Natural News* (2021)

As surgical oncologist and longtime health misinformation critic David Gorski observes,

> …if you really believe that provaccine scientists and physicians, along with government public health officials and pharmaceutical companies, are truly injecting a toxic experimental gene therapy brew into millions of people, including children, in a massive unethical human experiment that is killing lots of people, then a violent response can seem justified.

Gorski shares numerous examples of violent memes, speeches and posts, and warns that "leaders of the antivaccine movement are playing with fire in the form of violent rhetoric in the explosive warehouse full of antivaxxers and QAnon supporters. I fear that one day that combination is going to result in a disastrous explosion." Given the long history of deadly attacks on abortion providers in the US and Canada (Stack 2015) or the more concentrated violence on January 6th, 2021 incited by Trump's election-denying rhetoric (Pilkington 2021), it would be hard to call Gorski's fears unfounded.

From a storytelling perspective, creating a doctor character who claims to be promoting health, but who is in fact secretly causing harm, is a compelling creative choice. Journalism famously favours attention-grabbing stories where "man bites dog," and health misinformation prefers the equally surprising headline "doc bites man." Surprise is one of several "high arousal emotions" like disgust, fear and anger, that make it more likely for falsehoods to be shared online (Vosoughi et al. 2018).

As noted in chapter 2, Aristotle's *Poetics* describes *pathos* as an essential part of tragedy, along with *anagnorisis* (discovery or realization) and *peripeteia* (reversal of fortune). In this context, he defines *pathos* as an "action bringing pain or destruction," and explains that if a tragedy is to "arouse pity and fear" for maximum impact, such actions should occur between friends or blood relations (*philoi*) – for example, Oedipus unwittingly killing his own father (Rees 1972). A doctor breaking the Hippocratic oath to do no harm could also be seen as an "action bringing pain" within a relationship of friendship or trust, so this *pathos* is part of what makes anti-vaccine misinformation dramatically powerful.

Aristotle uses the concept of *pathos* in a different sense in the *Rhetoric,* where it refers to "those pleasant or painful dispositions that lead men to change their minds." He defines eight pairs of *pathē* including fear and confidence ("pain at the appearance of imminent evil to oneself" versus "absence of the pain of fear"), or pity and indignation ("pain at the appearance of another person's undeserved bad fortune" versus "pain at the appearance of another person's undeserved good fortune"). Aristotle emphasizes that *pathē* are founded on belief, and argues that "the task of the *rhētōr* is to initiate a reflection on the unreflective elements that constitute an underlying belief," in order to shift an audience from one emotion to another and thereby change their judgement of a situation (Green 2001).

The Anti-Vaxx Playbook from the Center for Countering Digital Hate (2020) decodes a pandemic "'master narrative' composed of three key messages: 1. Covid is not dangerous. 2. Covid vaccines are dangerous. 3. Vaccine advocates cannot be trusted." Through an Aristotelian lens, this rhetoric is designed to shift an audience from the *pathos* of gratitude (for vaccines

averting the imminent evil of Covid) to indignation (at the "undeserved fortune" paid for unnecessary vaccines), fear and anger (at the imminent evil of dangerous vaccines and the perfidy of their bearers).

Throughout the development process of the Shadowpox scenario (and my first comprehensive exam essay on story as a rhetorical form), I looked for ways to attenuate the "anti" by countering the *pathos* of fear and anger generated by vaccine denialist rhetoric with a very different kind of *pathos* – the fear and pity aroused by tragedy.

From Vilification to Agon

Although I was disturbed by the worst excesses of vaccine denialists vilifying their scientific, corporate and government targets, I was determined not to simply flip the script and make them into two-dimensional villains in turn. I needed another way to think about the clash of opponents in my superhero metaphor.

One of the most successful aspects of the *X-Men*'s classic run from 1975 to 1991 under writer Chris Claremont was the evolution of the character Magneto from a bombastic supervillain to a thoughtful antagonist and finally a challenging ally. As early as 1982, Claremont explained to an interviewer that he and artist Dave Cockrum "deliberately spent time making Magneto a credible foe.... It involves taking care, taking trouble, and taking time to think about the who, what, where, when, and why of your villains as intensely as one does about the heroes" (Sanderson 1982). Unfortunately, Marvel editor-in-chief Jim Shooter was more inclined to see villains as valuable intellectual property who needed to be maintained as unchanging, uncomplicated foils for the heroes. To launch a line of toys licensed by Mattel, Shooter wrote Marvel's first big crossover event, *Secret Wars* (1984), in which Magneto "was again reduced to a violent ideologue," shuffled back into a deck of "bad guys [who] were all either thugs or megalomaniacs" (Howe 2012).

Decades later, shortly after rebooting the *X-Men* franchise in 2019, writer Jonathan Hickman gave a webinar in which he argued against "preachy narratives" that offer only a "one-point perspective." He suggests an alternative approach to comic book characterization:

> You can have these [two] amazing ideological ideas [opposed to one another], and these good people who are kind of standing up for the epitome of those ideas. And bad actors for those good ideas on both sides. That's a phenomenal story, with zero villains, right? Then when you add villains to it, then you're operating with a triangle of characters, with dual sets on each end point....
>
> It makes for books where people have polarizing opinions but everybody is narratively involved. So instead of being exclusionary by being didactic and [offering] a one-point

> perspective, it's actually asking the hard questions, but it's cohesive because of the shared experience that you have when reading it. (Hickman 2020)

Hickman's determination to build stories as a shared space for the clash of perspectives resonates with the *agon* of ancient Greek tragedy or comedy, the scenes of debate where characters spar with opposing viewpoints, and even litigate intimate domestic conflicts, through formal speeches that would not be out of place in a courtroom. For audiences in fifth-century Athens, watching drama served as a workout in the essential civic skill of judging a debate.

Given my preference for such uses of story, I was moved by Chantal Mouffe's (2013) argument for the importance of an "agonistic model" of democracy, in which "the others are not seen as enemies to be destroyed, but as adversaries whose ideas might be fought, even fiercely, but whose right to defend those ideas is not to be questioned." She asserts that "what is important is that conflict does not take the form of an 'antagonism' (struggle between enemies) but the form of an 'agonism' (struggle between adversaries)," and identifies as a central task of democratic politics the provision of "institutions which will permit conflicts to take an 'agonistic' form" (7).

In *Vaccine Hesitancy: Public Trust, Expertise, and the War on Science* (2021), Maya Goldenberg points out that "failing to communicate effectively" with hesitant members of the public "can harden vaccine-skeptical views, turning vaccine hesitators into vaccine refusers." She outlines the wide variety of factors that create vaccine confidence, hesitancy or refusal across continents and centuries, and points out the inadequacy of the dominant framing which sees hesitancy as springing from a "war on science," where medical experts are drowned out by celebrity influencers swaying an irrational and ignorant public. Goldenberg's book was written before the pandemic and focuses on the discourse around childhood vaccines, but many of her arguments map onto Covid-19. She sees the issue as a crisis of trust, and a proxy for conflicts over values "such as individual liberties vs. common goods, medical progress vs. 'natural' living, what duties we have toward others," and other questions that are more the province of democratic debate than of the scientific method.

Like Hickman and Mouffe, Goldenberg calls for a more agonistic approach – though in contrast with the inclusion of "bad actors" and "villains" in Hickman's triangle, she is not as interested in those who deliberately create and spread disinformation for profit or political gain. However, it was through reading the arguments of Goldenberg and others (Biss 2014, Goldacre 2010, Kitta and Goldberg 2016, Koski and Holst 2018) that I was reminded how vital it is to take into account the perspectives of vaccine hesitators and refusers, and tried to imagine myself into their shoes every step of the way as I designed the *agon* of the Shadowpox scenario.

How to Attenuate the Anti

Science fiction is sometimes blamed by scientists for stoking unfounded public fears – an argument Kitzinger (2010) dubs "the sci-fi alibi." More often, it is mobilized for its power to win hearts in schools (Spiegel et al. 2013, Braund 2015, Wilson 2019) and to change minds in the wider culture (White 2021, Sasaki 2018), as in this immunization poster from around the release of the first *Star Wars* film (Figure 47).

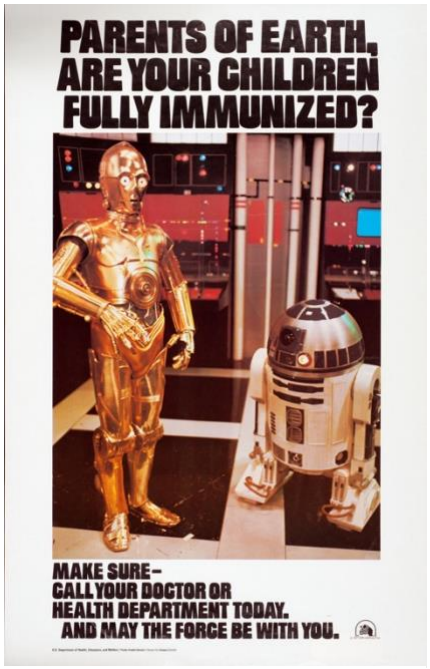


Figure 47. Star Wars immunization poster. Center for Disease Control, c. 1977. Public domain. http://resource.nlm.nih.gov/101437666

However, these "poisoned candy" and "chocolate-covered broccoli" framings both risk discounting the audience's agency, which is why I prefer to use science fiction in the spirit of Suvin's (1972) "cognitive estrangement", weakening a metaphoric anti-gen just as a literal pathogen is attenuated to create a vaccine.

Superhero science fiction offers several ways of thinking about how one might "attenuate the anti" in the conflict around vaccines. The first angle of approach begins with recognizing that, like the X-Men, vaccines are uncanny. In contrast with typical medical interventions, they work by bringing into the body a piece of the very threat we fear.
If our preferred defense is to build a wall between ourselves and the Other, then vaccines feel counterintuitive, even dangerous.

The best superhero storytelling invites its audience to reconsider this Other-as-enemy instinct. In *The New Mutants: Superheroes and the Radical Imagination of American Comics* (2016), Ramzi Fawaz traces the postwar evolution of an "affective orientation toward otherness and difference" – an ethos he calls "a comic book cosmopolitics." Larrie Dudenhoeffer's *Anatomy of the Superhero Film* (2017) imagines a similar dynamic inside the body, where superhero movies "feel [their] way into the noumenal qualities of radical otherness." Dudenhoeffer defines these characters' superpowers as "an array of animal, vegetal, chemical, energetic, mechanical, significatory, and anthropomorphic forces or 'actants' that require constant negotiation."

Viewed through this kind of frame, vaccines' uncanny identity as a pathogen-medicine feels less threatening. It's a dance with difference through which we build skills in self-defense,

but also practice distinguishing between genuine enemies and the kind of Others who don't necessarily equal danger.

A second angle of approach is to apply Thomas King's phrase "Want a different ethic? Tell a different story" (2005), using it to view anti-vaccine misinformation as a story with a particular ethic, and asking how telling the story differently might change the ethic it carries. David Hyman notes in *Revision and the Superhero Genre* (2017) that the serial superhero storytelling form is an endless procession of "reboots, retcons, and re-envisionings" by successive generations of artists and writers. Some of the most effective superhero retcons involve returning to a key scene in a well-known story, but from a new perspective or zooming out to reveal new context, creating a meta-narrative reveal – an *anagnorisis* for the audience, rather than the protagonist.

This zooming-out is the basis of the approach I like best, one articulated in Arthur Frank's *Letting Stories Breathe: A Socio-Narratology* (2010). Frank explores the two ways that stories engage with human troubles: first, "stories present models of dealing with different kinds of trouble," and second, stories themselves can make trouble.

As an illustration of the latter, he describes a tectonic origin story for the island of Ireland which is told, not as a scientific theory in a geology class, but during a paramilitary indoctrination session. There, it is understood as "a fable explaining what the Irish would call The Troubles. The origin story will then cause all manner of Troubles for both those whom it calls to act and those against whom this story justifies violence." This chilling anecdote recalls not just the extremist anti-vaccine disinformation Gorski collects, but also the way myths, fictions, histories and even scientific facts can be mobilized by any group to justify violence against another.

Thankfully, Frank offers a practical suggestion: "One way to deal with a troublesome story is to resituate it within a different story… in which the force of the original story is transformed." This strategy became my touchstone in building the Shadowpox *agon*. I decided to see if it was possible to transform the force of anti-vaccine misinformation and disinformation stories by resituating them within a different story – a scenario inspired by the *X-Men* tagline "Feared and hated by the world they have sworn to protect."

Participants in *Shadowpox: The Cytokine Storm* create characters who are stepping up to test a new vaccine candidate, taking a risk for the benefit of their community. This altruistic action frames them as heroes in the classic sense. However, given the nature of the shadowpox inoculation process, they also become a personification of the vaccine itself, which makes them uncanny heroes, an easy target for misinformation. The troublesome stories of this

misinformation are resituated within a wider story that transforms their force: whereas the misinformers see themselves as courageously denouncing villains, the audience might come to see them as unfairly vilifying heroes.

This unfair vilification evokes Aristotelian tragedy as an action bringing pain or destruction within a relationship between friends. Misinformation can thus be framed as a tragic *pathos* that should arouse pity and fear.

Profit and Other Motives

One challenge in applying Frank's suggestion to "resituate [a troublesome story] within a different story… in which the force of the original story is transformed" is that the resituating story needs to be as convincing as the troublesome one. A protagonist and antagonist both need clear and believable motivations in order for their *agon* to ring true. Part of what makes vaccine misinformation so convincing is that it taps into the audience's existing prejudices. It's much easier to argue that vaccine proponents are purely profit-driven than it is to question the motivation of vaccine denialists.

The pharmaceutical industry has had some frankly appalling skeletons fall out of its closet over the decades. Based on those ev-facts, the con-fect that vaccines are another thalidomide or OxyContin practically writes itself. The "pharma shill gambit" uses guilt by association to tar any proponent of vaccines with the same brush, claiming they must also be so profit-motivated that they have no compunctions about causing autism to make a buck. As Eula Biss (2012) observes, "That so many of us find it entirely plausible for a vast network of researchers and health officials and doctors worldwide to willfully harm children for money is evidence of what capitalism is really taking from us." The profit motive looms so large in our collective imagination that it's difficult to shift this framing.

One could point out the hypocrisy in leading vaccine denialists playing the role of altruistic Davids fighting the venal Goliaths of Big Pharma, when they front a for-profit anti-vaccine "industry with annual revenues at least $36 million," and a "social media following of 62 million [that] could be worth up to $1.1 billion to social media platforms" (Center for Countering Digital Hate 2021).



Figure 48. The Daily Bugle (2019) viral marketing campaign for the film *Spider-Man: Far From Home*.



One could also note that the founder of this modern David-and-Goliath myth was former doctor Andrew Wakefield, who published a fraudulent study in 1998 claiming to have found a link between the measles-mumps-rubella vaccine and autism, but hid the fact that he received £435,000 plus expenses from a personal injury lawyer looking to build a case against vaccine manufacturers, as well as the fact that he himself had secretly filed a patent for a rival "safer" single measles vaccine the previous year – conflicts of interest that Wakefield denies to this day (Deer 2011).

There is also plenty of story material in the fact that by undermining public trust in "mainstream medicine," misinformation merchants like Mike Adams or Alex Jones can redirect that trust to their own online stores. Court records from one Sandy Hook defamation trial revealed that Jones's InfoWars store made $165 million in sales from 2015 to 2018 by hawking dietary supplements and survival gear (Marks 2022). More recently, Jones took advantage of public panic in the early days of the pandemic to make the false but doubtless profitable claim that his line of colloidal silver products (SuperSilver Whitening Toothpaste, ABL Nano Silver Gargle) "kills the whole SARS-Corona family at point-blank range" (Marantz 2020).

A viral marketing campaign for the film Spider-Man: No Way Home (Figure 49) parodied Jones's misinfo monetization with the character J. Jonah Jameson taking a break from "Spider-Menace" rants to promote his own BioBugle® brand supplements ("The Daily Bugle" 2022).

Figure 49. The Daily Bugle (2022) viral marketing campaign for the film *Spider-Man: No Way Home*.

However, I wasn't interested in a resituating story that simply turned the profit-motive accusation around. A more nuanced scenario, I felt, was one that questioned the assumption that vaccine denialists are always "punching up," a phrase that originated in comedy to describe jokes that make fun of people or groups who are more powerful than the comedian, in contrast with those that "kick down" at those less powerful. Before the pandemic, I could sense an attitude even among some people in my own circle that while they might not agree with the specifics of the vaccine-denialist cause, they admired its "fight the power" ethos. I wanted to complicate that perception.

As much as vaccine denialism presents itself as punching up, its misinformation leads to indirect harm of the most vulnerable when enough people opt out of community immunity and pass along infection to elders, those too young to be vaccinated, and the immunocompromised. Covid misinformation has also inspired an increase in harassment, threats and attacks against healthcare workers, to the point where the federal government amended the Criminal Code in 2021 to protect them (Weeks 2022).

Through a conspiracy-theory lens, any vaccine proponent is automatically more powerful by virtue of their membership in a secret plan to rule the world, or depopulate it, or defraud it, and is therefore a fair target for "punching up." Even for those who don't imagine them in league with the Illuminati, the medical profession has an aura of power. Centuries of arrogant words and deeds produce both ev-facts and af-facts for many women (Ehrenreich and English 2005) and members of marginalized communities (Levine 2013, Geddes 2017), though you don't need to be a member of any of those groups to have a healthcare encounter where you feel disrespected or belittled. There's a reason that "Doctors Hate Him/Her!" is such an appetizing clickbait title. It promises to reveal "One Weird Trick" that will fix whatever problem you have, while sticking it to the medical elites who will rage impotently when they discover that you've taken back control and defunded them in the process.

Revenge thus sweetens many a con-fect, and with this in mind, it's instructive to look at how the original Greek definition of *hubris* differs from our modern use of the term. Today we understand it as "an excess of presumption": for example, Oedipus' belief that he could foil an oracle's prophecy. However, the ancient Athenians applied the term to "the intentional use of violence to humiliate or degrade," as in Oedipus' road-rage killing of an old man (which ironically fulfilled the prophecy). In the *Rhetoric,* Aristotle wrote, "Hubris consists in doing and saying things that cause shame to the victim… simply for the pleasure of it. Retaliation is not hubris, but revenge" (Britannica 2022). Is an online threat or in-person harassment against a

vaccine proponent motivated by righteous retaliation against those perceived to be wrongdoers, or hubristic delight in cutting down those perceived to be powerful? Perhaps it's a mix of both?

William Flesch (2009) mobilizes the concept of "altruistic punishment" to explain the origins of the pleasure humanity takes in fiction. Because we are cooperating animals, we need to police one another to make sure no member of the community gets away with exploiting that cooperation. When justice is done for the collective, it sometimes involves a cost to the individual carrying it out. We admire people who act beyond their own self-interest, and we doubly admire people who act *against* their self-interest for the benefit of the larger community. Our admiration helps to compensate the hero for the costs of their heroism, and reinforces that the community values seeing justice served. Flesch believes this offers an evolutionary explanation for our enjoyment of stories: we "take pleasure in anticipating altruistic punishment" (50).

Aeschylus' Furies were "Avengers" 25 centuries before Marvel, and Flesch's theory explains an appeal of both the Greek tragedy *The Eumenides* and a particular kind of contemporary superhero narrative. The poignancy of "misunderstood" heroes like Spider-Man and the X-Men is that they carry out a prosocial function at cost to themselves – but without the compensation of public appreciation. A similar *pathos* infuses the thousand-year-old folktale of a beloved family pet – a mongoose in India, a dog in Europe – who saves a baby from a snake while the parents are away. When they return and see the loyal defender covered in blood, they kill it before discovering the dead snake and the living baby, and are left lamenting their error (Dickey 2013).

The *agon* design of Shadowpox, I decided, needed to include not just heroically-motivated protagonists who are framed as villains, but also antagonists whose own motives could be heroic, hubristic or a bit of both – or, given the anonymity of the internet, ultimately unknowable.

Antagonist Design: Chasing the Cytokine Storm

As early as 2013, I had jotted the term "cytokine storm" in my notebook, struck by the irony that young adults died in higher numbers during the 1918-19 influenza pandemic because their robust immune systems overreacted to the virus, creating an inflammatory spiral that literally drowned the victim's lungs with their own immune response.

Cytokines (from Greek *cyto-*, cell; and *-kinos*, movement) are small proteins that are especially important in the immune system. They are released by cells in order to signal to other cells and affect their behavior. A cytokine storm, also known as cytokine cascade or

hypercytokinemia, is a “systemic inflammatory syndrome” caused by “immune-cell hyperactivation” (Fajgenbaum et al. 2020): cytokines trigger inflammation which triggers the release of more cytokines, causing a potentially fatal feedback loop.

Divorced from the tragedy of its actual meaning, the phrase also just plain sounds cool (see Figure 50), so I was surprised to discover it had not yet been used in a science fiction context. I registered the domain names shadowpox.org and cytokinestorm.org in 2014, sensing that “The Cytokine Storm” held promise as a title, though I wasn’t yet sure what the story was or how the two would resonate. All I knew was that there was *pathos* in the *agon* of a body tearing itself apart.



Figure 50. “Pick a science word with badass mouthfeel” (2022).

That same year, journalist Max Seddon was the first to report on Russia’s new Internet Research Agency (IRA) “launching a million-dollar army of trolls” as part of a massive propaganda campaign to influence Western perceptions of the invasion of Crimea. He noted that legitimizing Russia’s aggression against Ukraine was only one part of the IRA’s mission. “Kremlin supporters’ increased activity online over the Ukraine crisis suggests Russia wants to encourage dissent in America at the same time as stifling it at home” (Seddon 2014). In 2014 the IRA also tested techniques to spread fear and chaos in the US by conducting a “highly coordinated disinformation campaign” about a chemical leak in Louisiana, and another sophisticated hoax about an Ebola outbreak in Atlanta (Chen 2015). It would be several years before the Russian troll farm came to broad public awareness for using a massive cross-platform social media campaign to manipulate American public opinion leading up to the 2016 US election.

Renee DiResta led a team researching “The Tactics and Tropes of the Internet Research Agency” (2018) at the request of the US Senate Select Committee on Intelligence (SSCI), using a massive data set submitted by Facebook, Twitter and Alphabet of social media posts by the IRA targeting American citizens between 2014 and 2017. They identified a range of Russian influence tactics leading up to the 2016 election, including targeting Right-leaning groups “to generate extreme anger and suspicion, in hopes that it would motivate people to vote” (83) and pre-emptively “delivering ominous warnings that the election would be stolen and violence

might be necessary" (81). Contrasting tactics aimed at Black communities stimulated anger and cynicism in ways designed to suppress voter turnout (8).

DiResta et al. warn us against "falling into the trap of treating this as a problem of false stories" that can be dealt with through counter-narratives (100). The picture they paint is of a multimillion-dollar information war "intended to reinforce tribalism, to polarize and divide." The Kremlin aimed "to exploit societal fractures, blur the lines between reality and fiction, erode our trust in media entities and the information environment, in government, in each other, and in democracy itself" (99). Nor do all such influence operations originate from Russia. The January 6, 2021 attack on the US Capitol and the February 2022 Ottawa blockade show how mis- and disinformation from any source can hammer wedges into existing divides in a democracy, sowing distrust and inflaming outrage to a level where it boils over into violence against the body politic and actual human bodies.

I watched the misinformation and rancour of the 2016 US election and its aftermath with dismay, seeing so many similarities with my own research on af-facts and con-fects in the vaccination sphere. As if to confirm that recognition, Broniatowski et al. (2018) later reported that Russian trolls had practiced weaponizing outrage on Twitter by stoking both sides of the vaccine debate, just one of many wedge issues they experimented with to see which got the most traction in promoting discord.

In February 2018, I read Dudenhoeffer's *Anatomy of the Superhero Film* (2017), which conducts an unusual thought experiment, offering a "metamorpho-physiological" reading of more than a dozen superhero films and proposing a distinct corporeal metaphor at work in each. For example, he suggests that the *X-Men* films "transcribe the mutative disposition" of chromosomes (194) in that they

> stimulate activating changes in our cultural imaginaries… and thus can alter our memories, our desires, our attitudes and the course of our decision-making. However, to do so, as the X-Men films suggest, requires first that we conceive of objects, including our own flesh, as socio-material actors, combining with one another, co-functioning to shape forth events…. (205)

My notebook entry for 22 February 2018 responds:

> What this is clarifying for me is that the focus of the shadowpox project is the metaphor of the cytokine storm. The current disorder of our signalling system, the inability to tell a vital warning from a crying-wolf, a friend from a foe…. No wonder the Russians are funding trolls – it's a very efficient use of resources… to start off a cytokine storm in the opponent's society….

For a long time, “The Cytokine Storm” was the name I gave not just to the scenario, but also to the story’s antagonists, the in-universe vaccine-denialist group. However, I was never quite sure the latter made sense. Was that really a name they would have given themselves? Even though it has echoes with the QAnon dream of a coming “Storm” that will sweep away all enemies, would the majority of this group really want to identify themselves with a life-threatening immune overreaction? That would suggest they were cynical purveyors of disinformation, deliberately spreading stories they knew to be systemically harmful.

It seemed more dramatically compelling for many of our antagonist group to be true believers, sharing denialist misinformation out of honest concern and alarm. While I wanted to make sure I did not downplay the harm these troublesome stories can do, I was also concerned not to demonize anyone who genuinely believed them. This conundrum felt not unlike facing bad-faith antagonists holding hostages who identify with them in good faith – if you engage with the antagonists, the hostages feel not just situationally but personally targeted.

Kate Starbird (2022) suggests a solution for information operations researchers: “Operationalizing the problem as ‘misleading’ content means not having to fumble around with the misinformation / disinformation terms and determining intent.” However, this strategy highlights another conundrum: even if you can show convincing evidence that content is “misleading”, how many people are willing to entertain the possibility they personally have been “misled”? As with victims of confidence artists, those who have trusted misinformation can find it hard to change their stance for fear of losing face. A related challenge for a dramatist is that “determining intent” and motivation is a key factor in building a character. I eventually decided to leave the scenario open for each participant to determine the intent of their own antagonists, and the latter’s online anonymity made it possible to leave those questions unanswered if they so chose.

I also decided to change the *Shadowpox* vaccine-denialist group’s name to Project Cytokine. While the rare malfunction of a cytokine storm can be fatal, cytokines themselves are vital to human health. Cells release these proteins to bind to receptors on other cells and trigger a wide range of responses – social media activism at the cellular level. In the immune system, pro-inflammatory cytokines raise the alarm to summon reinforcements to the site of an infection. It seemed to me that any activist would be happy to identify themselves with the critical function of the cytokine: warning the wider system of a perceived danger.

The cytokine metaphor thus allowed me to separate my antagonists’ intent from the effect of their actions. Naming the in-fiction organization “Project Cytokine” acknowledges that true activists (as opposed to sockpuppet provocateurs) are usually trying to do essential work by alerting society to threats they honestly believe to be real.

At the same time, naming the resituating *story* "The Cytokine Storm" acknowledges that even with the best intentions, when this vital human warning system misinterprets or overreacts, it can do more harm than the threat it perceives, bringing us back to the *pathos* of violence done not by or to an enemy, but within a relationship of friends.

Protagonist Design: Building the Firewall

If the Cytokines are the antagonists in this agon design, who are the protagonists? The short answer is the vaccine-personifying characters known as Torches, whose name comes from toropox, and also perhaps because the attenuated vaccine originated in the virus mutating in a TORCH infection.[6]

The longer answer is that the protagonist starts out as a vaccine trial volunteer, but does not become a Torch until halfway through the scenario, when they decide to get the inoculation. The first half of their story arc is an experience of misinformation from the outside – the hesitation and uncertainty felt by would-be volunteers who can't be sure what is true. The second half is an experience of misinformation from the inside – the harm and injustice felt by these new Torches as they are targeted by falsehoods.

However, the answer might be even more complex than that. In the original Greek sense, "-agonist" refers to the actor rather than the character. Protagonist literally means "first actor," in contrast to the deuteragonist (second actor), who might play the antagonist, or even a supporting confidante if the opposing role is given to a tritagonist (third actor). *Shadowpox* scenario participants devise their own protagonists and perform them, whether scripted or improvised. Participants also decide what their antagonists' anonymous messages will say. In this sense, the participant is both the first actor, and in their messenger-speech report of what the antagonist has written, a kind of second actor as well.

This dual role-play is fundamental to the design of *The Cytokine Storm*. Participants do not simply step into the shoes of a single character – they must also imagine themselves into their opponent's footwear. For Hannah Arendt (1992), "To think with an enlarged mentality means that one trains one's imagination to go visiting" (43). This training sounds almost like role-playing when Arendt describes forming an opinion "by making present to my mind the standpoints of those who are absent; that is, I represent them.... Political thought is representative" (1968, 241).

[6] The medical term for a pathogen passing from a mother to child in utero or during childbirth is a "vertically transmitted" infection. The mnemonic acronym TORCH originally stood for just four such infections, TOxoplasmosis, Rubella, Cytomegalovirus, and Herpes simplex virus, but has expanded to cover many other diseases including syphilis, hepatitis, HIV/AIDS, and Zika virus (Ford-Jones and Kellner 1995).

The *Shadowpox* scenario is designed so that participants have to imagine their own way into at least two opposing points of view, and then act out both sides of their *agon*.

In *Network Aesthetics,* Patrick Jagoda (2016) approaches "digital games as action-oriented media of thought" (160), drawing on another of Arendt's observations: the notion that "only the spectator but never the actor knows what it is all about" (we might add, at least until the *anagnorisis*, when the actor finally catches up to the spectator, at least in part). Jagoda observes that

> It appears, at least at first blush, that if 'theory' means 'to look at' (the Greek *theoros* is a 'spectator') then the engagement that games provide is fundamentally nontheoretical. Games, after all, proceed through action. And yet Arendt's analysis suggests that an actor is capable of a different type of philosophical and aesthetic engagement… [one that] entails a sense of interdependence—a quality that makes action especially appropriate for thinking through networks (161).

The Cytokine Storm's volunteer characters are enmeshed in two kinds of interdependent networks. The first is the social (media) network that they share with the Cytokines, where misinformation circulates about the vaccine and the Torches. The second is the de facto "superhero team" they join once they become Torches themselves. This network is informally known as The Firewall, and it personifies the networked phenomenon of community immunity. It took me a long time to develop this re-fract for herd/community immunity, and it remains the most complex concept in the scenario, but the most recent version updated in July 2022 goes something like this.

Before someone is inoculated, their immune system has to fight the shadowpox virus alone, slowly "fading up" the pox from shadow back to light. (In the drama, unlike in the game, "fighting" the virus does not involve grabbing or pushing pox with one's hands.) If an infected person doesn't have the strength, or the pox multiply too fast, shadow and hypothermia will overwhelm them. But when someone is inoculated as a Torch, they become part of a network of mutual "light support," which distributes any viral load, transforming the fight against an infection from an individual to a team effort.

The graphic below illustrates how this light support works (Figure 51 – see online for the animated version). If a Torch becomes infected with shadowpox, a number of other Torches in the worldwide network are randomly and involuntarily recruited. A single circular "graft" of light is pulled from each donor for each pox on the infected Torch, leaving behind a single shadowpox in the corresponding place on the donor's own body.

The light grafts eclipse the recipient's shadowpox into slender toropox crescents, making it easier to fight and clear the infection. Once in the clear, the recipient can start returning light support to the donor, eclipsing the latter's single shadowpox into a toropox that they can easily fade up in turn.

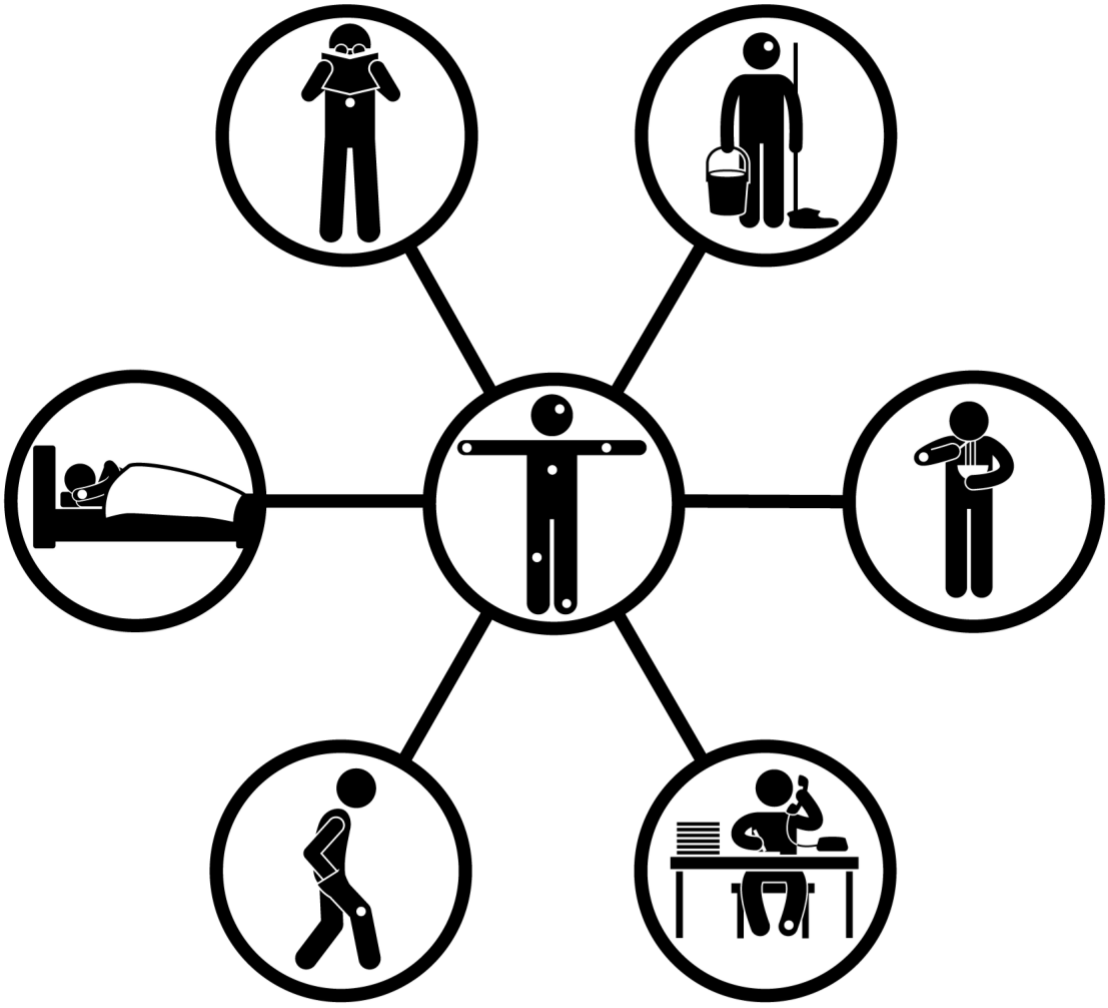


Figure 51. Still from animated GIF of "light support" community immunity.

Since this light-support dynamic is unique to Torches, the crescent shape of the toropox is a visual marker of their collective superpower in action. It becomes a symbol of the vaccine they embody in the public imagination, for better or worse. Some people view it as a badge of honour and service to the community. Others see it as a "mark of the Beast," a colourful vaccine denialism trope stretching from smallpox (Biss 2014, 154) to Covid-19 (Gleeson and Gilbert 2021). Still others see the random and involuntary nature of the light-support donations as a

loss of individual control and autonomy, a form of immunological taxation, conscription, socialism or even communism.

In *Communitas: The Origin and Destiny of Community,* Roberto Esposito (2010) traces this anxiety back to the Latin root word *munus,* a duty, gift or pledge that an individual member of a community owes to the whole. "From here it emerges that *communitas* is the totality of persons united not by a 'property' but precisely by an obligation or a debt; not by an 'addition' but by a 'subtraction'" (6). If participating in community immunity is the *munus* given by those who get vaccinated, then ironically, a vaccine refuser claims *immunitas* by opting out of this collective effort.

Opposition to vaccines (as to masks and other non-pharmaceutical interventions) is increasingly framed as a question of "consumer choice" or "health freedom," arguing that public health is an individual rather than a collective responsibility (Hughes et al. 2021). This ignores the unique way that infectious disease gives an individual's decisions an impact on those around them, especially the more vulnerable (Reich 2014). Those choosing not to get vaccinated are inevitably free-riding on the herd's protection, but to avoid any feeling of guilt, denialists often also deny this herd protection even exists. And if enough people opt out through such *immunitas*, they will indeed wipe community immunity out of existence. As Esposito puts it, "The 'immune' is not simply different from the 'common' but is its opposite, what empties it out until it has been completely left bare" (12). The "health freedom" left at the end of this process is the freedom of an atomized individual to take their chances with an aerosolized virus.

Jagoda unfurls Arendt's conception of freedom, revealing a richer understanding of the word. "In their role as actors, Arendt contends, human beings realize not their sovereign agency but rather their entanglement in a 'web of human relationships'—an intersubjective messiness… Arendt comes to associate freedom with nonsovereignty. The actor's lack of autonomy, in other words—the fact that she is a networked being—opens up the capacity for new forms of intimacy, forgiveness, and promise-keeping" (163). Action reveals connection, like a fly's movement rippling through a spiderweb.

A similar perspective on freedom may underlie Canada's greater emphasis on collective responsibility for health – in the long term through universal, publicly-funded healthcare, and in the short term through stronger Covid-control policies and higher vaccination participation. These helped Canada weather the first two years of pandemic with a nearly threefold lower death toll than in its nearest neighbour: 2,750 per million Americans died of Covid compared to 940 per million Canadians. In fact, apart from Japan, the only country in the G10 nations with fewer than

1,000 per million Covid-related deaths was Canada, an outcome researchers link to "the persistence of its social restrictions and the relative lack of antivaccine sentiment" (Dyer 2022).

Shadowpox participants start their story arc by devising "a memory and a motive," a story about a person in the volunteer's life whose death or blinding by shadowpox motivated their decision to risk signing up for a first-in-humans clinical trial. Even though an approved vaccine will be too late to help that specific loved one, the opening scene sets up a frame connecting the protagonist's actions to their wider community.

Shadowpox: The Cytokine Storm **as Story Choreography**

My 2015 PhD research proposal envisaged working with young people "to develop and test a new framework for civic engagement, combining online participatory creative culture with a pedagogical tool over two millennia old: the ancient Greek dramatic chorus." I quoted Plato's view of the chorus as "the specific place for the instruction of adolescents" (Calame, 2001), where in learning the sung mythology and choral movement of ritual performance, Greek youth also absorbed the norms and values that would integrate them into the adult community.

I was particularly intrigued by Simon Goldhill's (2007) analysis of one of the biggest culture clashes modern directors must overcome in staging Greek tragedy: how to handle the chorus. "Why does contemporary theater find the chorus so intractable?" he asks. "The first problem is the fundamental issue of collectivity. The chorus in ancient Greece emerges from and speaks to a society that is accustomed to collective institutions and, above all, to participating in them" (54). Citizens who were required to work together in the city's democratic assembly and its military forces could appreciate similarly coordinated action in their drama.

> Performance as a collective group, first of all, is central to the function of a chorus. One of the structuring principles of tragedy is the tension between the collective chorus and the individual hero. This is visually evident in the contrast between the lone actor on the stage and the group of dancers in the orchestra, but it also goes to the heart of the narratives of tragedy. (47)

Oedipus is a prime example of the individualism of the tragic hero who "is often destroyed – or destroys himself – in the pursuit of his own goals, [whose] passionate self-belief and self-commitment is set in juxtaposition to the cooperative virtues of the community" (47). How often does a modern, Western audience watch stories that dramatize the tension between the community and the individual in a literal dialogue between a group and a solo character? The communal voice of the chorus draws on traditional wisdom to warn an individual that sometimes a "hero's journey" can go too far. Many tragedies of the commons, from falling vaccination rates to antimicrobial resistance to the pollution of waters and skies, are made worse

by our inability to see the collective forest for the individual trees. We need our stories to help widen our view.

For a while, inspired by this example of the Greek chorus, I imagined the *Shadowpox* project might manage somehow to dramatize collectivity, even though the members of that collective would be individual characters devised by individual creators. In one sense, I didn't end up anywhere near that goal. The recorded scenes that emerged from the workshops are actually fairly cellular, with characters appearing one at a time, speaking to camera rather than to anyone else on screen. But in another sense, the structure of the participatory storytelling form I built did enable a communal voice in the parallel play of multiple individual story arcs all following a common pattern, producing a chorus of another kind.

The *Shadowpox* story framework is a scenario in Taylor's sense of a "sketch or outline of the plot" (2003, 19), the kind of "formulaic structures" that can serve both as "repertoires of cultural imaginings" and "meaning-making paradigms" (28). I originally built the story using the "rungs" framework of Amnon Buchbinder's *The Way of the Screenwriter*. During development I played with calling them "codons", since the things I was writing were less like rungs on the ladder of a fully-scripted screenplay, and more like half-rungs of a split helix of genetic code on which a participant builds their own script. I eventually suspected I was over-egging the the metaphorical pudding (this was long before mRNA vaccines hit the headlines), and went back to calling them "scenes".

Coming back full circle to Goldhill's chorus, I also feel this scenario fits his redefinition of "choreography": "the way in which the chorus moves through a performance – not in the sense of its specific dance steps, which are almost entirely lost to us, but in the sense of the emotional, intellectual, and physical transitions enacted by the chorus through the course of the drama" (2013, 82). *Shadowpox: The Cytokine Storm* is designed as cognitive choreography that each participant can embody in their own way.

This story choreography evolved through workshops at Debajehmujig in December 2018 and the Desmond Tutu HIV Foundation Youth Centre in March 2019, and finally a courseplay at York University in January-April 2021.

In the final section of this chapter, I present the six scenes of the scenario in their 2021 York courseplay form.

Scene 1: A Memory and a Motive



Figure 52. Pictograph for scene 1.

Summary: Show and tell about a loved one affected by the virus.

This first scene is small and simple. Please show and tell about an object that belonged to a loved one who was blinded by or who died from the shadowpox virus.

Through what you say about this object, we learn your character's origin story: their personal relationship with the disease, and the motivation that led to their joining the vaccine trial.

Scene 2: Anonymous Warning

Summary: Write the anonymous message your character receives, and record a video journal entry of their reactions to its warning.



Figure 53. Pictograph for scene 2.

Your character receives an anonymous message from a group calling themselves **Project Cytokine**. (In biology, *cytokines* are proteins that raise the alarm to summon immune cells to a site of infection.) Project Cytokine claims that this new vaccine is in fact more dangerous than the virus it is designed to prevent. They tell your character to trust no one, and invite you to join a resistance movement to warn the world against the vaccine.

You **create the message** your character will receive. Does it contain a plausible caution or a wild conspiracy theory? Does it tell you there are side effects the researchers won't tell you about? Does it warn that the lab has a hidden agenda, or links to a shadowy organization? Does it make accusations against Torches? Does it tell you there have been coverups of previous experiments? Does it claim that the shadowpox virus itself was deliberately engineered in order to create a demand for the vaccine, or for purposes of ethnic or global depopulation?

Next, **record a private video journal entry** (in character) reading out the message you received, and describing your reactions. Do you believe it? How does it affect your thoughts about what to do next?

Scene 3: Informed Consent

Summary: Video journal entry following a meeting with a researcher and a vaccine donor.

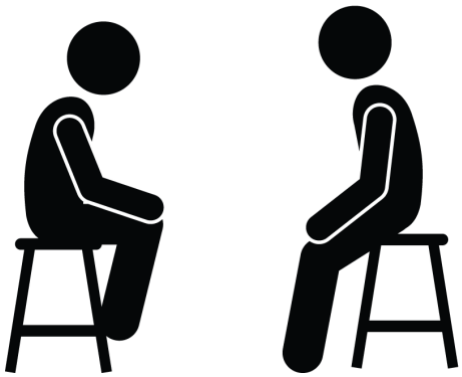


Figure 54. Pictograph for scene 3.

The Torches are about to donate to the volunteers the toropox that gives them their immunity. Before they do, the researchers running the vaccine trial want to make sure that all the volunteers' questions are answered.

Earlier today, you had your meeting with a researcher and the Torch who will be donating the vaccine to you. Now you are recording a video journal entry about that experience.

This was probably the first time you've ever met a toropox carrier in person, though you'd heard a lot about them. Their uncanny collective immunity has been the subject of intense rumour and speculation since the shadowpox virus first appeared two decades ago.

What question(s) did you ask the researcher and the Torch? How did they reply?

How do you feel now?

SCoLaR INFORMED CONSENT FORM

How the Procedure Works

The vaccine against the shadowpox virus is transmitted from the donor by casting a shadow into the recipient's eyes.

Because the attenuated shadowpox virus (called "toropox") in the vaccine is so weak it is almost impossible to transmit, the toropox carrier (or "Torch") must cast their shadow directly onto the most light-sensitive cells in the recipient's body: the rods and cones of the retina. The inoculation device (the "torchlight") features a highly-specialized light source in order to protect the recipient's eyesight, while keeping the toropox viable during transmission.

If you decide to get the vaccine, you will be asked to close your eyes. The Torch who is your donor will hold up their hand between the torchlight and your face. When the torchlight is turned on, it will cast the Torch's shadow over your closed eyes. You will be asked to open your eyes, being careful not to look directly into the light source. The shadow of the Torch's hand will carry the toropox vaccine into your system through your eyes. As a recipient of the toropox vaccine, you will become a new Torch – one of the first in the world.

After the Inoculation

During the period immediately following the inoculation, you may experience a unique visual side effect, called a "Glimpse".

A momentary flash of vision through someone else's eyes, the Glimpse is the result of the light stolen from one person's retina by the shadowpox virus, being bounced to the eye of another infected person somewhere in the worldwide viral network. The Glimpse carries no sound, and lasts a fraction of a second – more like a still photograph than a movie scene.

For a non-inoculated person with a shadowpox infection that has spread to their eyes, this Glimpse can be the last thing they see before they go blind. For an inoculated Torch, however, the loss of sight caused by a shadowpox infection is momentary – a "Blink" – before the virally stolen light is reflected back to them by another, unknown Torch somewhere in the world.

You should expect to experience one or more Glimpses over the week or two after your inoculation. After that initial period, research suggests the toropox goes dormant and the Glimpse/Blink visual side effect becomes extremely rare.

Because this is a Phase I (first-in-humans) vaccine trial, the researchers will be working with you to closely monitor your experience, in order to learn more about how the toropox vaccine works. The insights gained through your participation in this research may even lead one day to a cure for the shadowpox virus itself.

Scene 4: Visual Side Effects

Scene summary: Inoculation decision and report of side effects.

You decide to proceed as a participant in the vaccine trial. After receiving the toropox vaccine through the procedure described in the SCoLaR Informed Consent Form (above), you have become a new Torch – one of the first in the world.

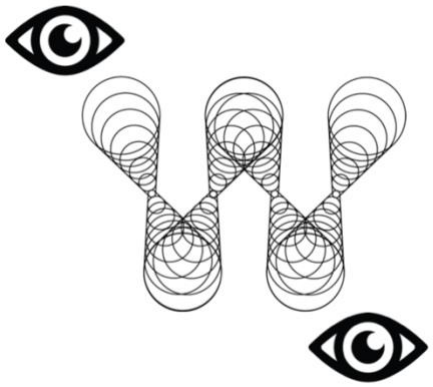


Figure 55. Pictograph for scene 4.

Visual Side Effect #1: The Glimpse

As described in the Informed Consent Form, during the period immediately following the inoculation, you may experience a unique visual side effect, called a "Glimpse", a momentary flash of vision through someone else's eyes. A Glimpse carries no sound, and lasts a fraction of a second – imagine a still photograph, not a movie scene.

When this happens, please make a note of what you saw. As soon as possible thereafter, record a description of your Glimpse in a video lab report.

These reports are a vital part of the research of this vaccine trial. They will go into a Database of Visual Side Effects on the SCoLaR website. The database is a contact-tracing effort to match each Glimpse to its source, mapping the connections between Torches in the global network to learn more about how the toropox vaccine works. These insights may even lead one day to a cure for the shadowpox virus itself.

Visual Side Effect #2: The Blink

You may also experience the flip side of the Glimpse, a momentary loss of sight called a "Blink". When this occurs, please make a note of what was happening and what you were looking at, at the moment you lost vision.

As soon as possible thereafter, look through the Database of Visual Side Effects, and find another person's Glimpse report that matches what was happening at that moment you had the Blink.

(In real life, you're looking for a Glimpse described by someone else that inspires you, and that you want to claim as your character's own vision. By creating your Blink out of the other Shadowpox participant's Glimpse, you're collaborating across time and space in a kind of call-and-response co-creation.)

Record a Blink video lab report, describing the full context of what was happening when you had the Blink. The person who got their Glimpse from you had only a brief fragment of insight – what did they miss or misunderstand because of their outside perspective? What will they be surprised to learn once they see your video report in the database and get the complete picture?

Scene 5: The Cytokine Storm

Scene summary: Create a public anti-Torch message from Project Cytokine featuring your character, and record a video journal entry talking about it.



Figure 56. Pictograph for scene 5.

Your character has made a disturbing discovery. A photo of you (either lifted from the web or taken from an angle that suggests covert surveillance) has been turned into an anti-Torch post, meme or video, and distributed widely online for the whole world to see.

Project Cytokine has outed you as a Torch, framing you as a direct threat to the public. They claim to have evidence that your motives are suspect, that you are dangerous, and that a wider conspiracy is concealing the terrible truth about the shadowpox vaccine. They warn the world: "Open Your Eyes!"

Record your character's private video journal entry analyzing the techniques used by the message, and talking about how it makes you feel.

Notes:

As with the anonymous message sent to your character in scene 2, you create the words and visual(s) for the anti-Torch post/meme/video in which you have become the new poster child for Project Cytokine's conspiracy theory.

Perhaps unlike the scene 2 message, though, this one really hits home. Whoever created it is a pro. They know just how to embed a kernel of truth in their mis/disinformation about you to make it convincing to the world. If you didn't have first-hand knowledge, you might even have been swayed by this yourself.

Re-read the Informed Consent Form to remind yourself of the details of how the vaccine against shadowpox works. Then think about ways people might misunderstand – or deliberately misrepresent – the vaccine, the inoculation procedure, the visual side effects, or any other aspects of shadowpox immunization.

Consider, too, what a person who was born or has become a Torch represents. Toropox immunity can only be transmitted directly by a carrier casting a shadow into a recipient's eye. So in one sense, a Torch *is* the vaccine. Project Cytokine isn't just deploying tactics against a science communicator or health provider. They're using internet vigilantism to fight a personification, an embodiment of the vaccine itself.

Finally, remember that in biology, cytokines normally perform a vital role: raising the alarm to summon immune cells to a site of infection that threatens the body. To Project Cytokine, the Torch/vaccine is the villain of the story, and they themselves are the heroes.

Scene 6: A Torch in the Firewall

Scene summary: A message to the world, especially to potential future Torches.

Social media outrage and the misinfodemic are like a virus. But unlike a virus, they are not necessarily transmitted without our knowledge. They need us to make the active choice to spread them from person to person.



Figure 57. Pictograph for scene 6.

As a Torch, you are part of the Firewall. Your toropox inoculation means that if you become infected with the shadowpox virus, you will not pass it along to the next person.

Will you do the same to stop the spread of the outrage and disinformation that Project Cytokine stoked in scene 5? A cytokine storm is a spiral of harmful inflammation. You have the choice to be a pro-inflammatory or an anti-inflammatory force in this storm.

Watch the John Cook video "How to Debunk Misinformation" (youtu.be/6I37HD444aI) and read the World Health Organization report "How to Respond to Vocal Vaccine Deniers in

Public" (2017). Then choose one of these three-step procedures (Cook's fact/myth/fallacy or the WHO's technique/topic/response) to structure your response around.

Scene 6 is a public video – a message you are sending out to the world. You can choose to respond directly to Project Cytokine and debunk their message explicitly, or you can choose not to feed the trolls by acknowledging them, while still addressing the topic(s) they raised.

As the WHO guide points out, your real audience is not the vocal science denier (whom you're less likely to convince), but rather all the other people listening to the exchange who might have valid questions that the denier is exploiting.

And remember that among your audience are the next potential volunteers, and all the Torches-to-be around the world who, once the trial is over and the vaccine is approved, will need to decide to join the Firewall and build herd immunity to stop the pandemic.

You might end your video with a direct address to them, imagining that just as you had questions back in scene 3 ("Informed Consent"), you are now the donor Torch answering the unspoken questions of someone out there who's trying to decide whether to get the inoculation.

What do they need to hear in order to trust you as the embodiment of the vaccine?

How will you pass the torch?

Chapter Five: Storyworld as Assay: Refraction and Reflection

In January 2023, after having dodged the virus for nearly three years of the pandemic, I finally came down with Covid-19. Ironically, I was infected right around the time I got my Omicron bivalent booster, so the side effects of the vaccine blended seamlessly into the symptoms of the disease. When I realized I wasn't bouncing back 48 hours after the shot, I cracked open a box of rapid antigen tests, stuck a swab up my nose, and watched as the telltale two lines appeared in the window.

My disappointment at the result was balanced by my delight at the device itself, however. Covid-19 rapid self-tests have introduced millions worldwide to the technology of the *immunoassay* (or *immunochromatographic assay*), "a technique using antibodies for identifying or quantifying a substance" (MeSH 1967). This biological test takes advantage of the fact that antibodies fight by grappling: each antibody's receptors are exclusively keyed to grasp a specific antigen.[7]

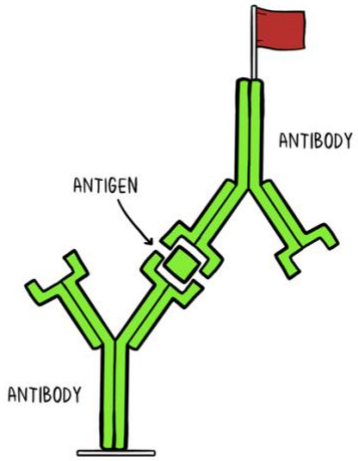


Figure 58. Antibodies grab an antigen in an immunoassay. Adapted from artwork by Toby Morris in WHO 2020 "How Do Vaccines Work?" https://www.who.int/news-room/feature-stories/detail/how-do-vaccines-work

[7] The test strip contains two sets of antibodies keyed to a particular antigen. The first set are free to move, and have been "flagged" with signal particles. The second set are fixed along a thin line on the test strip. When a specimen is added that contains the target antigens, both the flagged antibodies and the fixed antibodies will grab those antigens, and the "flags" will produce a visible coloured line.

Prior to the pandemic, lateral-flow assays were most commonly encountered in home pregnancy or HIV tests. In a Covid-19 rapid antigen test, antibodies with receptors for SARS-CoV-2 antigens grab hold of them, creating a coloured band in the test region. Other types of assay reverse the process and use fixed antigens to test for the presence of antibodies in a sample. A "multiplex assay" can test a sample for many different targets (Tighe et al.).

In the same way that an assay uses antibody receptors to flag the presence of literal antigens in a sample, a participatory scenario like *Shadowpox* can help us to grasp the anti-gens in a story, and to explore how they might also find receptors in the audience's imagination.

Ears for Fears

In this final chapter, I describe how my research into "what's generating the anti" shifted focus from storytelling to story-*listening*, imagining the Shadowpox storyworld as a multiplex assay with receptors for many anti-gens – with ears for many fears.

Heidi Larson is the Director of the Vaccine Confidence Project, which has built a global platform for "social listening," monitoring online and offline discourse for public opinion on vaccination (Karafillakis 2020). In her book *Stuck: How Vaccine Rumors Start – and Why They Don't Go Away,* Larson argues that when it comes to vaccine misinformation,

"The bigger issue is the underlying distrust, the feeling of being disenfranchised and not heard. Listening to rumors and the stories behind them can help us understand the reasons and in those lie the cues to building new and more trusting relationships" (Larson 2020, xxxiv).

Listening to people as they tell stories, whether live or mediated, can give insight into the "emotional determinants of health" – the calculus of "hopes or fears, anxieties and worries, and empathy and feelings" that is inextricable from the rational in health decision-making (Larson et al. 2020). And asking open-ended questions and listening with empathy are not only good information-gathering strategies for the listener. They can also provide an opportunity for the speaker to work through their own thoughts, and perhaps most importantly, a chance for both parties to build trust and respect ("How to Talk about Vaccines" 2020).

In the beginning, I saw the Shadowpox project as a way to explain concepts around vaccine science and vaccine hesitancy through science-fictional metaphor. The more I worked with it, however, the more I realized its value as a method for listening to participants' stories, and through them, hearing what they themselves have listened to online, in their communities, in their families and friend groups, and in their own hearts. In the same way the Vaccine Confidence Project built a platform for social listening, I began to see Shadowpox as a platform for story-*listening*.

It's important to remember that questions, concerns and fears voiced by characters in a fictional story do not necessarily reflect those of the story's creator. However, creators often draw on anti-gens they find particularly powerful, persuasive, dramatic, entertaining, or even ridiculous. In this way, the Shadowpox story framework can act as a multiplex assay indicating the participant's *awareness* of these anti-gens and of their emotion-generative power, even if it cannot assess *belief*. The metaphor-play of refraction can give participants the arm's-length space to explore these anti-gens safely and without embarrassment, while reflection during and after the story-telling process can give participants themselves the chance to story-listen, turning creation into research-creation for all involved, not just for the official "researcher".

The project evolved over a number of workshops with groups of young people in Canada, the UK, and South Africa, giving me the opportunity to experiment with different designs for the visual effects and the story framework, but also with ways to refract and assay three categories of vaccine-related concerns: mechanical, consequential and social fears.

Mechanical Fears

Perhaps the most straightforward example of refraction in the whole *Shadowpox* project was the challenge of how to represent the mechanism of inoculation. Trypanophobia (needle fear) is a significant factor in vaccine hesitancy, and the hypodermic needle is the classic icon for vaccination, but the whole mechanical process required a major rethink in this storyworld. It makes no sense to put a shadow-virus in a syringe.

Once upon a time, vaccination with cowpox and its predecessor, variolation with smallpox, was direct, arm-to-arm. A scene from the 2008 HBO miniseries *John Adams* has a queasily explicit dramatization of what variolation looked like in 1776 (youtu.be/4557X6VLVsI). Over the centuries, smallpox vaccination equipment and techniques evolved from a scratch from a knife-like lancet, to multiple punctures from a fork-like bifurcated needle, to a needle-free, high-pressure jet injector futuristic enough to inspire *Star Trek*'s "hypospray" in 1966. The oral polio vaccine is given in drops, sometimes on a sugar cube to sweeten the deal, and there's a velcro-like COVID-19 vaccine patch being tested, with hundreds of microneedles made of sugar that dissolve after painlessly pricking just into the surface of the skin.

Today, the universal icon for the concept of vaccination is the hypodermic syringe, as any Google image search will attest. If a stock photo doesn't show a child wincing or a baby crying as they are immunized, the overall sensation is usually literally clinical, and it's hard not to imagine the health worker holding the needle as cold and uncaring, performing an action so

fraught with power and pain. Even the terms we use are metaphorically violent: a “shot” in the US, a “jab” in the UK.

“Needle fear” is therefore a significant factor in vaccine hesitancy. The idea of a sharp point penetrating the skin, injecting a foreign substance into the body, is fundamentally disturbing. How should this viscerally unsettling concept be refracted in the *Shadowpox* storyworld? This central challenge was one I chewed on for years, and the conceptual design evolved through three phases.

RADA Workshop: Stepping into Shadow

The first Shadowpox workshop was held at the Royal Academy of Dramatic Art (RADA) in London, England, on 20-24 June 2016. As mentioned in chapter 4, at this stage the specific scenes of the story framework had not been designed, so the purpose of the workshop was to experiment with the motion-tracked, projection-mapped VFX in an “inoculation” scene, and to explore the general storyworld through in-character and out-of-character interviews.

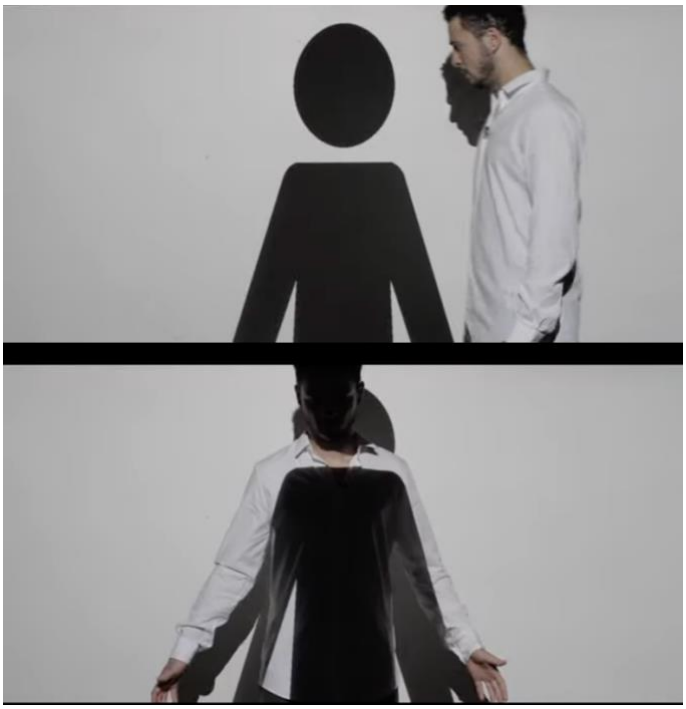


Figure 59. Inoculation v.1: Stepping into shadow. Jamael Westman, RADA, 24 June 2016.

For this first inoculation refraction, the vaccine trial volunteer had to step into a shadow in the shape of a human pictograph (Figure 59). I imagined a moment where the character stood at the

border of the lighted field, wrestling with their fear of entering the dark. In a world where shadow incubated a deadly virus, this could feel like voluntarily stepping down into one's own grave. The RADA actors instinctively played the drama of that moment of decision, "crossing the threshold" of the hero's journey while holding their breath and wondering if they would regret it.[8]

After the workshop, while deciding whether to refine this inoculation, I realized that the conceptual design raised more questions than it answered:

- *Who was the administering the vaccine in this scenario?* In real life, this scene would involve two people, but here there was no sign of a healthcare worker, only the vaccine trial volunteer.
- *How were we imagining the shadow-vaccine was contained and transported?* Real-life vaccines are usually liquids, contained in glass vials that need to be kept at optimal temperatures at every leg of the journey from factory to clinic. This "cold chain" becomes especially difficult in countries with high temperatures and low resources, as became a concern when it was announced that the first COVID-19 mRNA vaccine would require special freezers capable of reaching minus-70 degrees. But how can you hold a shadow in a vial?
- *Were we saying that the projector was the syringe?* Did the projector even exist as a projector "in-fiction"? If so, was it a regular projector or did its light or shadow have some special properties? If not, from what device was the light supposed to be coming?

All these questions led to the decision to drop the step-into-shadow gesture, and instead design a physical "inoculator" prop for the next phase of the development process.

York Workshop: The Inoculator as Prop

Over the next months, the story design continued to evolve. I read about the 1803 Balmis expedition, where King Charles IV of Spain, in response to a large smallpox outbreak in the Spanish colonies, funded physician Dr. Francisco Xavier de Balmis for a three-year mission to bring the new technology of vaccination to Central and South America, the Philippines, Macau and Canton. In an age before refrigeration, the cowpox-based vaccine was kept viable on the transatlantic journey by transmitting it at intervals from arm to arm of 22 orphaned children

[8] After this entering gesture, the visual effects were originally going to "drain" the shadow of the human-shaped pictograph into the shadow of the performer, by breaking it into pox-sized circles that shrank and migrated around to the dark side of the body – shadow injected into shadow. However, we didn't have enough time before the RADA workshop to build the full effect, so the pictograph shadow was absorbed into a flurry of light-circles.

between the ages of eight and ten. These boys were young enough not to have been infected with smallpox before, and were brought on the voyage under the care of the director of the orphanage, the only female member of the mission, who also brought her own son.

This “arm-to-arm” vaccination technique inspired the idea that the fictional toropox vaccine needed to be transmitted directly from one human carrier to the next. No putting shadows in a bottle, no refrigerated transport, no remote inoculation through fibre-optic cable, no middlemen. Donor and recipient would encounter one another face-to-face, and the inoculation would be passed from eye to eye.

Rhys Mendes worked from my inoculator concept art (Figure 60) to design and build a fully-functional electronic prop (Figure 61). The June 2018 design brief describes this as a “Sci-fi device that will be our equivalent of a vaccination syringe,” imagining that the toropox vaccine “is made of shadow like shadowpox, but is too weak to be contagious, and therefore needs to be transferred directly from donor to recipient via the most light-sensitive cells of the body, the rods and cones of the retina.”



Figure 60. Inoculator prop concept pictograph.

The design brief envisioned a telescope- or microscope-like prop where the “donor and recipient look into either end of a tube roughly 2ft long. A button is pressed, and a (non-blinding) light flashes from inside in both directions, bouncing light off donor’s retina onto recipient’s retina, ‘inoculating’ the latter with toropox.” Mendes suggested a strip of LEDs inside the tube, controlled by an Arduino, with one dark “spot” moving down the tube from donor to recipient (fig. Figure 62). It wasn’t light that was being transmitted, but shadow.

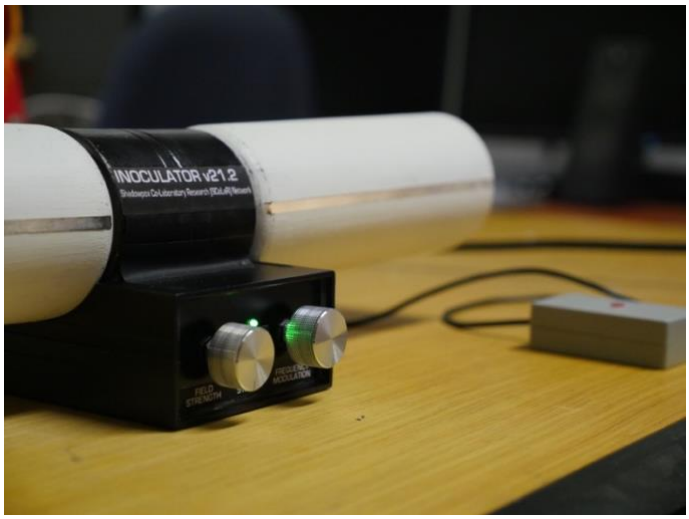


Figure 61. Inoculator prop by Rhys Mendes (exterior), 2018.

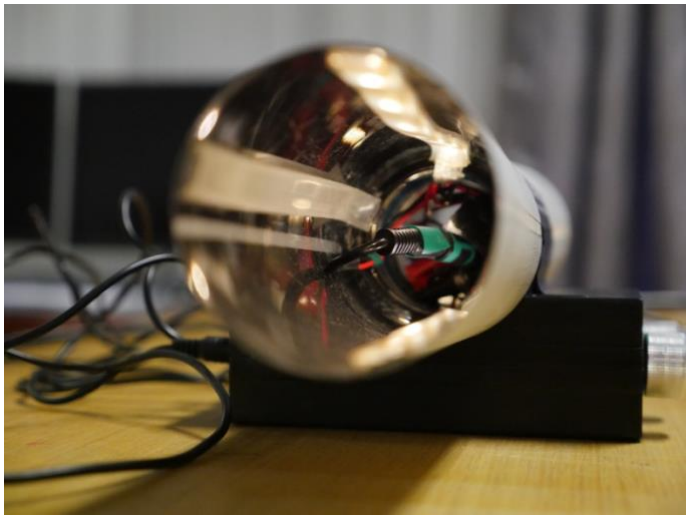


Figure 62. Inoculator prop by Rhys Mendes (interior), 2018.



Figure 63. Matt Sabidu and Aaron Kelly, “Shadowpox: The Glimpse” workshop, Devised Theatre Rodeo, Department of Theatre, York University, 15 Sept 2018.

The design was later changed to two buttons, so that both participants had to activate it together, like two keys being turned on a nuclear launch command. Vaccine recipients often feel vulnerable or fear loss of autonomy, so the device needed to give them a mechanism for consent and control. The inoculator also needed to be horizontal rather than angled like a telescope or microscope. This small design detail prevented the recipient from feeling subordinate to the donor. I was keen for all aspects of the "eye to eye" transfer to have the dynamic of a collaboration between equals.

We also had to make sure the inoculator was long enough that the two participants didn't feel uncomfortably close, and couldn't see each other's eye through the tube, to minimize awkward giggles in what was supposed to be a serious scientific procedure. Luckily, because it had to be able to be disassembled for transport, the design was based on two water bottles that screwed into a central hub, and the electronics obscured any view through the device.

We tested the finished prop in a workshop with Devised Theatre students at York University on 15 September 2018 (Figure 63). It was a valuable experiment, one that made me think hard about the technological aspect of the project, and how it affects the tone of the experience and the stories.

So much of the fear around vaccination has to do with its "unnaturalness", the industrial, chemical, capitalist Big Pharma aspects that make people uncomfortable with modern life in general. I started wondering whether the warm, human storytelling process was clashing with the image of a cold, clinical inoculating device. I also wondered whether the concept that the toropox had to be passed directly from carrier to carrier was being contradicted by a mechanical mediator.

As much fondness as I had for our high-concept needle-fear refraction, and as much as I admired Mendes's masterful realization of this sci-fi shadow syringe, the experiment left me feeling that it wasn't the inoculation design we needed.

Another problem emerged as Lalaine developed the VFX in Unity rather than the openFrameworks she had used for the game *The Antibody Politic*. For a while we couldn't get Unity to communicate with the Kinect, so we had to ask participants to hold very still, as if they were being photographed for a 19th-century daguerrotype. This enforced stillness tended to have an inhibiting effect on performances, but it was the only way to map the VFX manually to points on the body until we could get the motion-tracking/projection-mapping working again.

However, we did emerge with one successful refraction: the idea that the eye was the site of inoculation, and the toropox crescent around it could symbolize the bearer's immunized status, as the smallpox vaccine scar of yore once did. This crescent-shaped toropox eye glyph

became our focal visual effect (for video, see youtu.be/uUgKYyJv-L4), and for the next two workshops I led in late 2018, Lalaine expanded the singular toropox-eye effect into a full-body journey from infection to protection.

Debajehmujig Workshop: The Hand-to-Hand Arc

In the spring of 2018, I'd been musing on the storytelling categories of victim, villain, and the hero who protects one from the other. It struck me that with contagious disease, a person can be the victim at the moment they are infected, but as soon as they pass along the virus to one or more members of their family or community, they become the villain in that next person's story.

I had a vision of a single pox following an arc across the body: starting on the actor's right hand, the site of infection, and travelling up their arm, across their chest, and down their other arm to their left hand, where they would infect the next person in a long line of victims-turned-villains.

I sketched a visualization (Figure 64) where instead of crossing the actor's chest, the arcing pox continued up to their eye. If they were not inoculated, the pox would blind them, before making its way along to its next infectee.

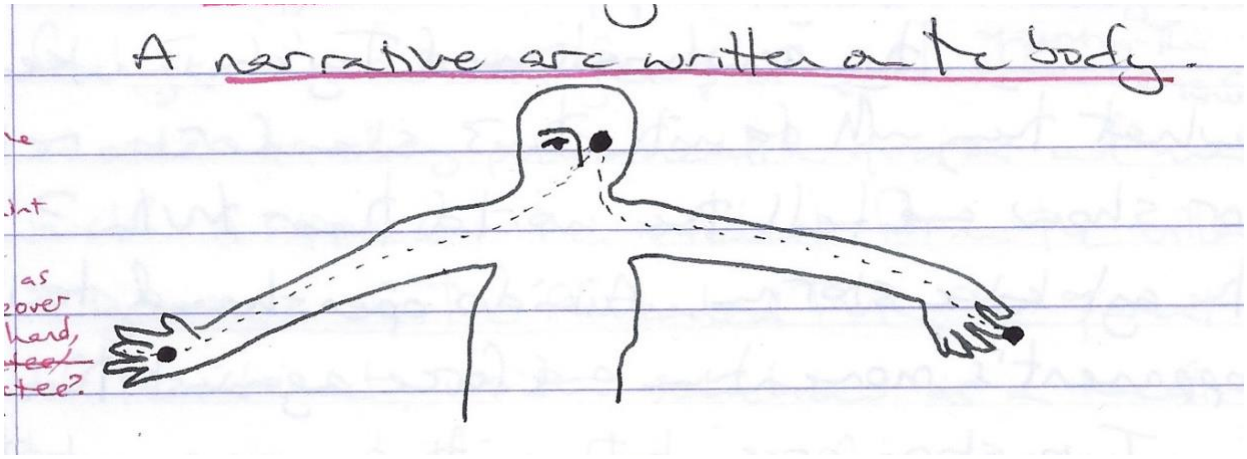


Figure 64. Sketch by author of hand-to-hand "narrative arc".

But if they had been vaccinated against the virus, it was there at their eye, at the site of their inoculation, that the circle began to morph into a crescent-shaped toropox (Figure 65).

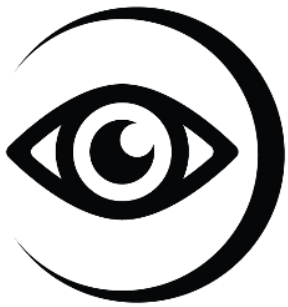


Figure 65. Torch eye glyph with toropox crescent.



Figure 66. "Infection" glyph: right hand with shadowpox circle.

The pox then continued its arc back down to their left arm, waning as it went. By the time it reached their left hand, it was so slender and weak that it couldn't infect anyone if it tried, and winked out of existence as it reached their fingertips. This new hand-to-hand arc visualized the heroism of refusing to pass along the harm one has received from another. A circular shadowpox on the right hand represented "Infection" (Figure 66). A crescent-shaped toropox on the left hand symbolized "Protection" (Figure 67).



Figure 67. "Protection" glyph: left hand with toropox crescent

Lalaine created visual effects for this arc that I tested with participants in a session at the Emergency and Emergence conference at the University of Southern California's School of Cinematic Arts in Los Angeles, 18 October 2018 (youtube.com/watch?v=kmxRmuCMOJ0), and a week-long workshop at Debajehmujig Storytellers in Wiikwemkoong Unceded Territory, Manitoulin Island, 12-18 December 2018. Again, we weren't able to get Unity to communicate with the motion sensor in time for these workshops, so I had to ask participants to stand very still so I could target specific points onto their body.

In real life, these moments of infection and protection are always invisible and frequently unknowable, despite the best efforts of contact tracers. But the story framework for the new workshops invited participants to bring them to light by telling the story of the person from whom their character received the virus, and the story of the person they would have infected in turn had they not been immunized, but protected instead.

Vaccination allows us to break the chain of infection (Figure 68), becoming the hero as we protect those we would otherwise inadvertently victimize. The hand-to-hand arc visualizes the site of this chain-breaking heroism – the specific moment a vaccinated person contributes to community immunity.

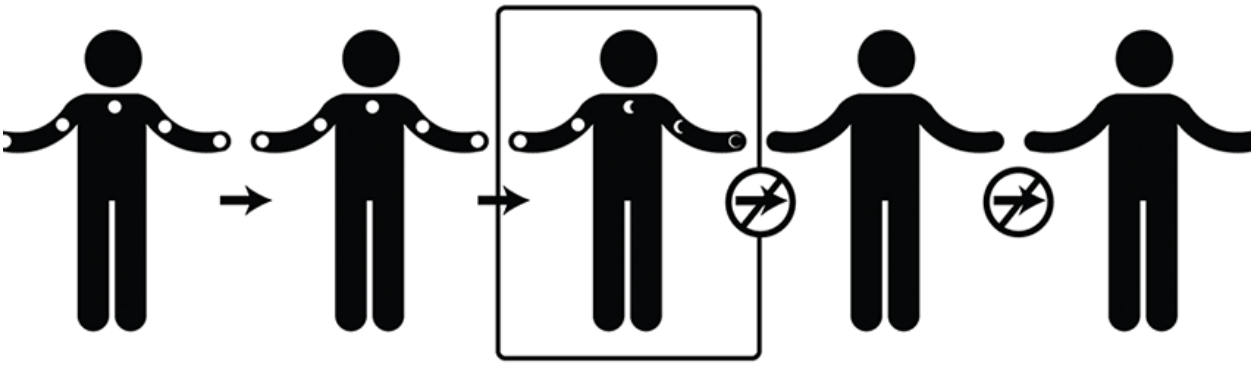


Figure 68. Breaking the chain of infection.

The final scene in *The Cytokine Storm* framework was designed to echo this idea in a more abstract way. In the climax of the story arc, the protagonist has a choice between retaliating against those who have attacked them on social media, or refusing to stoke the cycle of anger and revenge and instead defusing, de-escalating, and finding a way to create a more constructive response. "Generating the anti" is itself a viral phenomenon, and breaking that chain is every bit as important to our wellbeing.

DTHF Workshop: Passing the Torch

On 26 December 2018, after wrestling all fall with the inoculator prop and the visual effects technology in workshops at York, USC and Debajehmujig, I was reading *There Are No Secrets: Thoughts on Acting and Theatre* (1995). In this book, the renowned theatre and film director Peter Brook argues that the engagement of the spectator's imagination is

> the great difference between theatre in its essential form and cinema. Emptiness in the theatre allows the imagination to fill the gaps. Paradoxically, the less one gives the imagination, the happier it is, because it is a muscle that enjoys playing games. If we talk about 'audience participation,' what do we mean? It consists in becoming an accomplice to the action and accepting that a bottle becomes the tower of Pisa, or a rocket to the moon (27).

In an echo of his famous concept of the "empty space" as the ideal home for theatre, Brook says, "This alchemy is possible if the object is so neutral and ordinary that it can reflect the image that the actor gives to it. It could be called an 'empty object'" (46).

I wrote in my notebook:

"All this is awaking in me a question about Shadowpox. Is the visual effect simple enough to be an 'empty object'? Can we use light and shadow to represent disease and health and that in-between uncanny x-thing called a vaccine? How simple can the storytelling become?…

"We could let go of the complicated non-empty object of the inoculator prop and say that Torches can transmit their immunity without mediation (though I still feel like it needs not to be something that can happen accidentally, in contrast with infection; inoculation is deliberate and usually voluntary, yet some people doubtless fear it being weaponized, or made compulsory).

"Maybe it must be a gesture of hand over open eye? Maybe not covering the eyes, but shading them, as one does for oneself when standing in strong sunlight. Then the gesture reads as something less aggressive and more caring, like a benediction.…



Figure 69. Hand-eye inoculation experiments: The author and Abongile Maputuma, DTHF Youth Centre, 28 Feb 2019. Photo: Jenn Warren.

"This way we remove the curse of trying to make an electronic prop made from two water bottles and an LED strip look like what it's not. Don't keep trying to make the imaginary thing look more realistic. Turn around and start walking in the other direction. Let the audience participate – let the muscle of their imagination have room to flex.…



Figure 70. Hand-eye inoculation: The author and Bongo Ludidi, DTHF, 2019. Photo: Jenn Warren.

"Similarly, we may not need more and more realistic pox effects, with less lag in their motion-tracking, or more pixels in their high-definition projection. We may actually need less. Emptiness allows the imagination to fill the gaps….

"The three gestures of this empty-object VFX superhero movie, then, are 1) The Origin Story where you receive the inoculation, 2) Breaking the Chain to stop yourself from becoming the villain, and 3) Passing the Torch, overcoming being perceived as the villain so you can share the power with the next hero by inoculating them….



Figure 71. Hand-eye inoculation: Zanele Melapi and Lazola Nkelenjane, DTHF, 2019. Photo: Jenn Warren.

"The hand-to-hand arc and its infection and protection glyphs are theatrical. They're shadow-puppets to help tell the story of your superpower to the person you are trying to convince to receive the Torch power next….

"I'm realizing how little augmentation reality actually needs to stir the imagination. We started with a big HD projector and Kinect at RADA, slimming down to the USC/Debaj setup of a pico projector and no motion sensor (at the DT Rodeo we had the Kinect, but Rulr wasn't calibrating with Unity)…. Maybe the tech just needs to get out of the way of that imagination, not upstage it.



Figure 72. Hand-eye inoculation: Lazola Nkelenjane and Sibulele Bontshi, DTHF, 2019. Photo: Jenn Warren.

"The Torches are the vaccine personified – what do potential recipients say, do, fear? You start as the potential recipient in Gesture 1 – you explore your own fear and what you need to ask and learn before you are willing to become that hero. Then you experience the fear from the other side when you turn around to pass the spark to a new Torch….

"As Brook says, the emphasis is on 'human relationships… What holds our attention is the interplay between one person and another' (28). That's the core: the conflict over receiving a vaccine from another person. And you get to play both roles in one character: first the recipient and then the donor. The fearer and the feared."

The poetry of that simple gesture of a hand shadowing an eye finally landed the inoculation refraction. The recipient has to open their eyes to let in the shadow-vaccine, an act of extreme vulnerability and trust. (For an illustration of exactly how vulnerable an open eye can feel, see the notorious opening scene of Buñuel's 1929 film *Un Chien Andalou*.)

While the hand shadow could look like a gentle, caring gesture, a benediction, it could just as easily look ominous. The egalitarian staging of the horizontal inoculator prop is lost when the light is positioned above the recipient's face and they must look up into the shadow. And while the recipient can presumably see the hand casting the shadow, and the donor it belongs to, both are invisible to the viewer.



Figure 73. Hand-eye inoculation: Asiphe Ntshongontshi, DTHF Youth Centre, 3 March 2019. Photo: Jenn Warren.

My aim in refracting inoculation was to make space for the mechanical fears the vaccination needle stirs in us. After two failed VFX and prop experiments, the simplicity of the hand-eye shadow gesture was finally empty enough for the imaginative participation of the viewer. See youtu.be/SwK_D5xiBmo for the final inoculation sequence from the 2019 DTHF Youth Centre workshop.

This "empty object" exploration also led to one of the most enjoyable parts of that workshop. In order to see how simple we could make the VFX, I got some black circle stickers and used a large hole-punch to make crescents out of some of them, then stuck them on overhead transparency acetate sheets for "solar-powered pox" (Figure 74).



Figure 74. Zanele Melapi (right) and others cast toropox shadows on the hand of Lazola Nkelenjane, using crescent-shaped stickers on transparency sheets. DTHF Youth Centre, 19 February 2019.

The participants storyboarded then photographed *Shadowpox* stories using one another as actors, and finally turned these photos into comics in the *photo-roman* format using Comic Life software (Figure 75). At the end of the entire workshop, several participants identified this as their favourite part. I can see why – it was a group activity with lots of laughter, collaboration and physicality in the staging, in contrast to the solo, speech-heavy video scenes. But I think at least a part of the magic was that the "empty object" of the solar-powered pox invited leaps of imaginative participation in a way that neither realist acting nor motion-tracked, projection-mapped VFX made space for.

There's also a resonance here with the desire many people feel for more autonomy and participation in the healthcare experience, which is lampooned by *The Onion* (2014 – see criticalcommons.org/view?m=03hxwIbDL) in an article titled "Pharmaceutical Industry Reeling As More Moms Making Vaccines at Home," featuring a photo captioned "Many mothers say they 'just feel better' about giving their child a hepatitis A shot they made in the kitchen themselves."

The truth beneath the jibe is that a sense of agency, control and engagement makes most experiences – whether medical or creative – "just feel better".



Figure 75. Page from Lazola Nkelenjane's comic "Shadowpox Hero." DTHF Youth Centre, 20 February 2019.

Consequential Fears

"Can I know the side effects of the vaccine?"

The next player stepping up to *The Antibody Politic* chose his home, France, from the menu of countries to play for, so let's call him François. We were in a darkened room at the end of the gallery where <*ImmuneNations*> was celebrating its opening reception on 13 March 2017, packed with delegates from the Global Health and Vaccination Research (GLOBVAC) Conference in Trondheim, Norway.

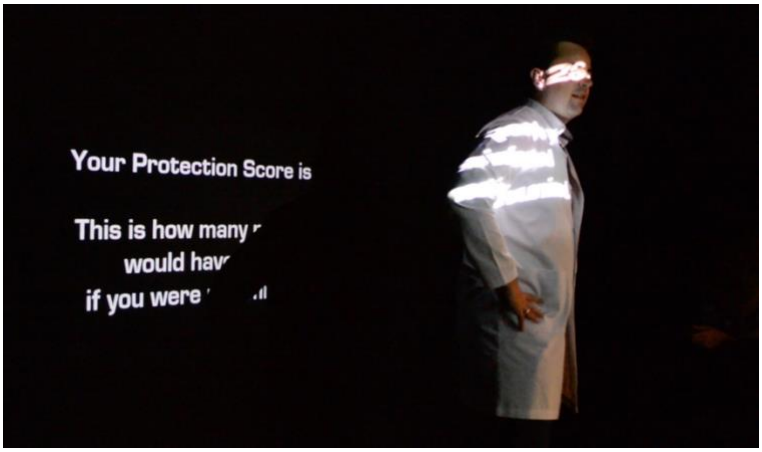


Figure 76. *Shadowpox: The Antibody Politic* player "" at <*ImmuneNations*> opening reception, Trondheim, 2017.

I was running the game on its buggy maiden voyage, as well as the camera recording players' reactions, so I may have been distracted when I mistook his cheerful question for one about the effects of the shadowpox virus. "Blindness and hypothermia," I replied, "and then 0.2 to 20% of people who are infected will die, depending on where they live and what kind of support they have."

"Yeah, but the vaccine," François politely insisted. "The side effects?"

"Oh, the vaccine. At the moment, we're not entirely sure because it's a very new vaccine. You're actually taking part in the first test cohort. But the risk of the disease is even greater. So you're having to make those decisions."

I might have quickly forgotten François's question after that, dismissing it as an example of his nation's unusually strong antipathy towards vaccination. France ranked last out of 67 countries in the Vaccine Confidence Project's 2016 survey: "41% of respondents in France disagreed with the assertion that vaccines are safe," compared to an average of just 12% in other nations (Cohen 2016). But this was the moment that was to stick most strongly in my memory from the Trondheim exhibition.

The fear of negative consequences – of side effects – is the most common reason Canadian parents give for hesitating to vaccinate their children (PHAC 2022), far outweighing the more immediate, mechanical fear of needles. Long before François voiced his concerns, I knew the Shadowpox storyworld would be incomplete without a refraction of the concept of "side effects" for the toropox vaccine.

Two months earlier, I had an early glimmer in a notebook entry from 17 January 2017:

> Thinking about arm-to-arm and the side effects of that early, primitive vaccination…. If the symptoms of shadowpox include nightmares in the waking dark of blindness – hallucinations that come from black holes over someone else's eyes… then maybe even the vaccine has that side effect, since it's a live-virus vaccine, attenuated, but… still viable, potentially. Not without risk….
>
> And so one of the things we discover is that everyone who receives the vaccine… still gets glimpses of the world through other people's eyes.

That seed of an idea grew into the concept of the Glimpse, the heart and arteries of our networked narrative, and the most media-meta aspect of the Shadowpox storyworld. While the hand-eye shadow inoculation has a kind of gestural poetry, the Glimpse is poetic in a conceptual sense, bringing participants into relationship with one another through a sort of story-contagion, whereby one character's momentary Glimpse becomes the germ from which another participant grows a whole scene for their character.

Given that the Shadowpox project was designed to span several continents, I was especially excited about the potential for young people halfway around the world to build on one another's work. A Glimpse from Samantha Brennan at Debajehmujig Storytellers in northern Ontario (youtu.be/m4nog94bbEY) was answered by a Blink by Asiphe Ntshongontshi at the DTHF Youth Centre in South Africa (youtu.be/YNfhYgjAtXA). Asiphe's own Glimpse (youtu.be/dd7L1xqi70E) was taken up in turn in a Blink by Darcy Smith at York University in Toronto (youtu.be/YvTK1U_qM9c).

Our fictional equivalent of the Vaccine Adverse Event Reporting System[9] (VAERS) is the Database of Visual Side Effects (D-ViSE), to which all trial-volunteer characters report their Glimpses and Blinks, and find out whose vision they've shared. Through these "visual side effects," a play on the filmmaking term "visual effects" or VFX, participants collaborate remotely

[9] VAERS is often cited by anti-vaccine activists as a source of evidence of all kinds of otherwise unsupported claims. However, as anesthesiologist and autism advocate James Laidler points out, "The chief problem with the VAERS data is that reports can be entered by anyone and are not routinely verified. To demonstrate this, a few years ago I entered a report that an influenza vaccine had turned me into The Hulk. The report was accepted and entered into the database. Because the reported adverse event was so… unusual, a representative of VAERS contacted me. After a discussion of the VAERS database and its limitations, they asked for my permission to delete the record, which I granted. If I had not agreed, the record would be there still, showing that any claim can become part of the database, no matter how outrageous or improbable" (Laidler 2005).

and asynchronously, building on the work of others in the "share alike" spirit of the project's Creative Commons BY-NC-SA 4.0 license, and engaging in the "improvisational network aesthetics" that Patrick Jagoda identifies in alternate reality games (2016, 187).

The fear of side effects is a common one, but for the majority it is overtaken by fear of the disease itself. Indeed, many vaccine side effects are shared with the diseases they prevent – for example, parents who feared reports of myocarditis in youth following Covid-19 vaccination did not always place these rare events against the much higher risk of myocarditis caused by Covid-19 infection itself (Voleti et al. 2022).

In the case of the shadowpox virus, an infected person might get a momentary Glimpse through someone else's eyes, but that would be the last thing they saw before the virus took their sight, and possibly their life. Toropox vaccination, by contrast, would prevent blindness or death, leaving the Glimpse as a momentary side effect – though the idea of someone else seeing through your eyes is still a disturbing one, echoing as it does the fear of surveillance through imaginary vaccine-embedded microchips (Heathers 2021).

The most recent refinement to the design of this side effect only came to me after the last workshop in May 2022. I decided that the prompt should be sharpened in order to highlight the Torch's power to break the chain of contagion. The Glimpse should be a vision of a specific person, someone within arm's reach, who would have been the next to be infected had the vaccinated Torch not broken the chain with the help of their fellow Torches' "light support".

Social Fears

The mechanical fear of needles and the consequential fear of side effects are relatively easy to grasp. By contrast, there is a miasma of social fears swirling around vaccination: Fear of being lied to about the need for, safety of, or efficacy of vaccines. Fear of being experimented on without informed consent. Fear of being told what to do, of loss of autonomy. Fear of cover-up or conspiracy by elites. Fear of being exploited for financial gain. Fear of being rendered infertile for purposes of population control or genocide. Fear of having one's fears disrespected and dismissed. Fear of being herded, not heard.

In January 2021, as the new vaccines against Covid-19 were just beginning to be rolled out, I embarked on the largest *Shadowpox* engagement to date, a new course I had designed to be taught to 25 upper-year undergraduates in Cinema and Media Arts and the new Global Health program at York University. I called it a *courseplay*[10], combining academic and role-

[10] A riff on "cosplay" – the costume play of animated or live-action characters most commonly practiced at fan conventions.

playing approaches to exploring the fears and social dynamics that undermine vaccine confidence.



Figure 77. Courseplay website for Digital Culture: Science & Fiction.

The course description read:

"What makes a story compelling? What makes science convincing? *Digital Culture: Science & Fiction* is a special edition of FILM 3841 for a moment in history when hundreds of millions of people around the world are making a potentially life-or-death decision: whether or not to get a new vaccine against Covid-19. If enough people choose to participate in this unprecedented global health effort, we can bring the pandemic to an early end.

"However, vaccination is unique among health decisions. We take a vaccine before we get sick, the life it saves might not be our own, and if it does prevent us from getting or passing along the disease, we might never know. The decision depends on trust. Trust depends on what we know, but also on how we feel. How do we know what we know? Why do we feel what we feel? In 2021, digital culture is at the core of both questions.

"Achieving vaccine-based herd immunity will take widespread public participation, but willingness to participate can be undermined by mis- and disinformation, and their spread on social media is part of participatory digital culture. The World Health Organization calls this phenomenon an 'infodemic', and WHO Health Emergencies Programme Executive Director Mike Ryan declared almost a year ago, 'We need a vaccine against misinformation.'

"This year's course format is as unusual as its context. In this hybrid 'courseplay', we will splice history and theory with the practice of dramatic composition, performance and digital production. Participants will create a six-part story arc in a shared science fiction universe, the *Shadowpox* storyworld, using the metaphor of immunity-as-superpower to reimagine historical and contemporary conflicts over immunization.

"Presenting persuasive accounts of cause and effect is a core concern of both the scientist and the storyteller. In this course, we will use science fiction to interrogate the concept of science fact – to compare and contrast how evidence is produced with how stories are designed. In addition to reading and writing, we will use metaphoric world-building and online role-play – 'citizen science fiction' – to deepen our understanding of civic engagement and resistance, deliberative rhetoric, evidence-based decision-making, and values-based narrative design."

Action Refraction

Interspersed with the production of the six scenes of Shadowpox: The Cytokine Storm were the weekly themes for the course (for more detail, see the syllabus in Appendix B):

- Science/Story
- (Mis)information/(Mis)trust
- Evidence/Plausibility
- Ethics/Power
- Cooperation/Conspiracy
- Denial/Outrage
- Hero/Villain
- Rhetoric/Dialogue
- Risk/Benefit

The readings, videos and discussions around each week's theme formed the first step in a three-part research-creation pedagogy I called *action refraction*. The fruits of that first step, Research, are brought into the second step, Refraction, where students decide how to translate what they've learned from the real world into the science-fiction storyworld, then record themselves in character to experience the facts and feelings of the issue from the inside. In the third step, Reflection, the student and two peers respond to the video, make new connections to the research, and consider how they might use these insights back in real life.

For example, after three weeks with the themes of Cooperation/Conspiracy, Denial/Outrage and Hero/Villain, students' videos for Scene 5: The Cytokine Storm refracted that research to create "an anti-Torch post/meme/video in which you have become the new poster child for Project Cytokine's conspiracy theory." Admittedly, the richness of their creations might not have owed anything to the course's required readings, given how thoughtfully many mobilized their own familiarity with social media forms and tropes (Figure 78Figure 82).

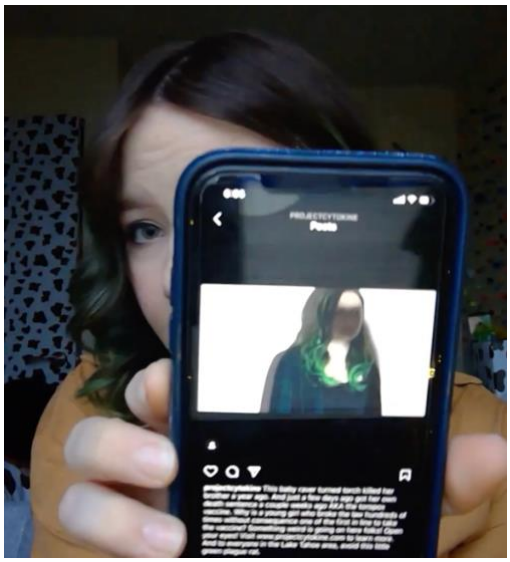


Figure 78. Still from video by Laur Doud for Scene 5, Shadowpox courseplay, York University, 2021.



Figure 79. Meme by Darcie Supsup for Scene 5, Shadowpox courseplay, York University, 2021.



Figure 80. Meme by Darcy Smith for Scene 5, Shadowpox courseplay, York University, 2021.

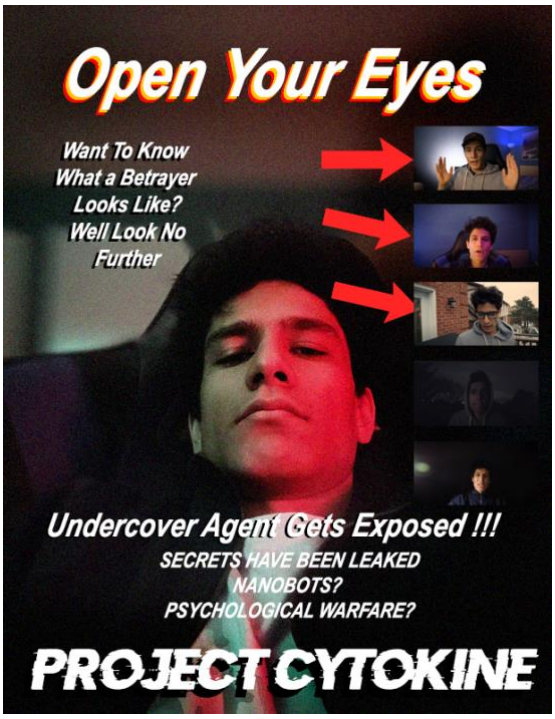


Figure 81. Poster by Kurosh Maghsoudi for Scene 5, Shadowpox courseplay, York University, 2021.

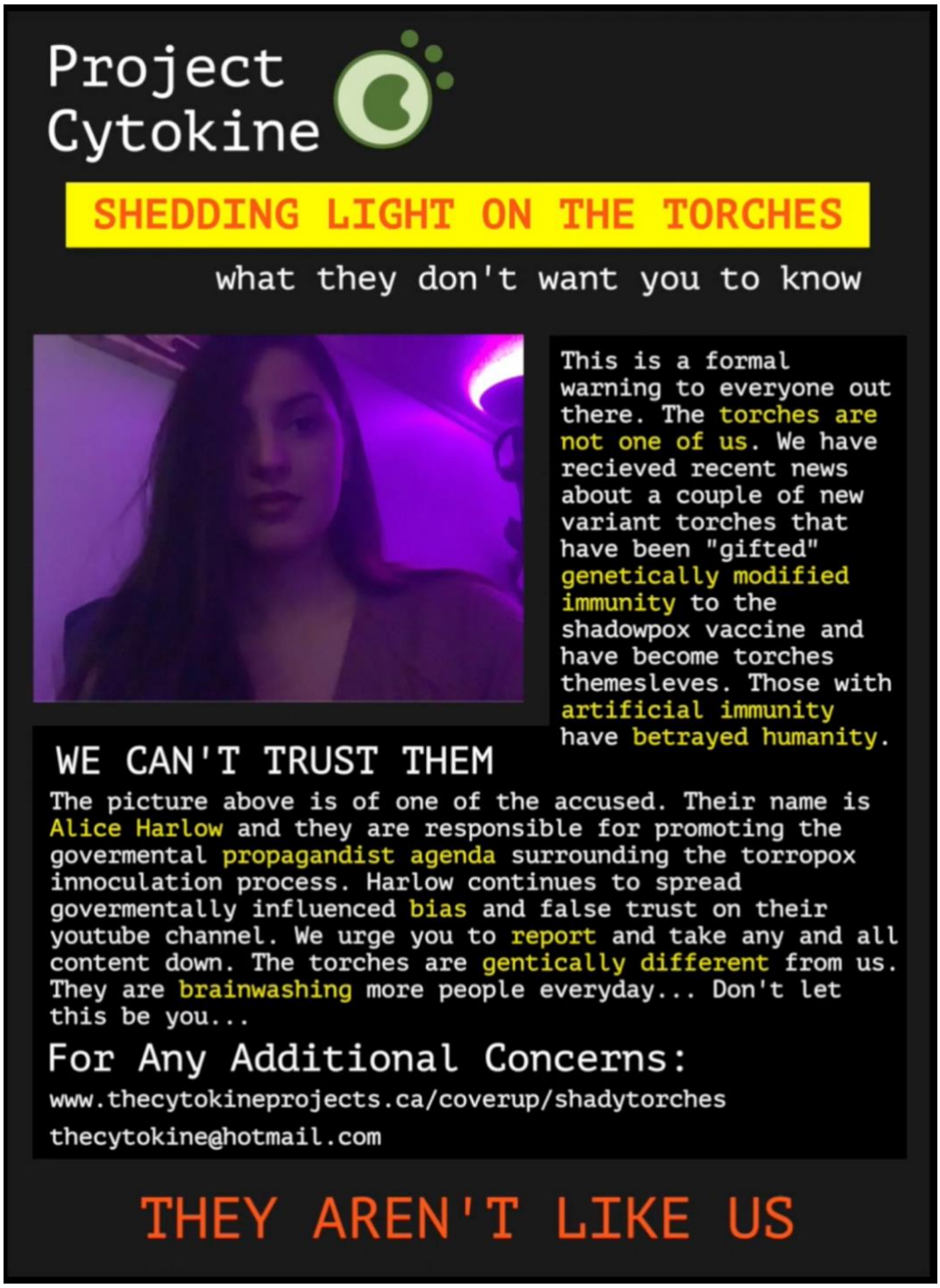


Figure 82. Poster by Alia Marlow for Scene 5, Shadowpox courseplay, York University, 2021.

In the following week, “Rhetoric/Dialogue,” the prompt for Scene 6: A Torch in the Firewall asked how their character would “stop the spread of the outrage and disinformation that Project Cytokine stoked in scene 5. A cytokine storm is a spiral of harmful inflammation. You have the choice to be a pro-inflammatory or an anti-inflammatory force in this storm.” Students were asked to watch the John Cook video *How to Debunk Misinformation* and read the World Health Organization report *How to Respond to Vocal Vaccine Deniers in Public*, “then choose one of these three-step procedures [Fact, Myth, Fallacy; or Technique, Topic, Response] to structure your response around.” They rehearsed valuable skills by writing and performing their character’s rebuttal to the meme attack – skills several said they could imagine using in real life one day.

The fears refracted here – for example, that a vaccine supporter is a “corporate shill” for a “corrupt industry,” that vaccines confer an inferior form of “artificial immunity” or a “death sentence” – were deliberately chosen by the students to act as powerful anti-gens in their stories. Whether the storytellers actually subscribe to these fears themselves, or are merely aware of how potent they can be for others, the *Shadowpox* framework acts as an immunoassay to surface the presence of these anti-gens in the collective imagination, even before its constituent stories do any work to inoculate their audience against them.

Chapter Six: Conclusion

Days of Future Past

Some doctoral students live in fear that another researcher will scoop their idea before they can get to the end of their dissertation. I used to think my quirky research-creation project with its unique science-fictional pandemic storyworld immunized me from that concern. Then came COVID-19.

Suddenly what had been personal was global. I watched as graphic designers from dozens of news outlets mobilized digital visual effects to help audiences understand the dynamics of contagion. Politicians bastardized the concept of herd immunity to justify letting the virus rip. TV anchors interviewed vaccine trial volunteers while the world held its breath. And vaccine denialists began denouncing those trials long before the results came out.

I was as frightened as anyone else by the SARS-CoV-2 virus that swept into our lives like a plague of old. But what also scared me was the possibility that my work was not – as many people remarked to me – suddenly terrifyingly topical, but that its time had suddenly passed.

A defining feature about vaccines is that they are a prevention, not a cure. A vaccine must be given beforehand, while the recipient is still healthy, so they will have time to learn how to deal with the real threat when they finally meet it. (Rabies is a rare exception, as the infection moves slowly enough that a shot can counteract it after the fact.) In late 2021, after COVID-19 vaccines had become widely available, nurses reported tragic deathbed conversions of the vaccine-hesitant, where the patient was finally ready to ask for an intervention at a stage where it would no longer do them any good (Kale 2021).

Years into a federally-funded research project mashing up inoculation theory with the superhero genre, I figured it was now my duty to help save the world. But with the pandemic turbocharging the anti-vaccine movement (Lerman 2020, Scott 2022) and turning vaccination from a niche concern into a politicized cause that would bring Canada's capital to a blockaded standstill (Colaresi et al. 2022), I sometimes wondered whether one tiny sci-fi scenario was too little, too late to attenuate the misinformation-fuelled narratives of "fear and hate."

The Magic Bullet

Our *Antibody Politic* team did reassemble in March 2020 for an emergency repurposing of the interactive gallery installation into an online game. But soon after we finished, it began to feel like a damp squib next to the pandemic response I imagined it was my responsibility to produce.

In 1907, Nobel Prize-winning immunologist Paul Ehrlich coined the term *Zauberkugel* (German for "magic bullet") for his theory of an agent that can kill a pathogen without harming its host. Erlich applied this theory in foundational research on antibodies and chemotherapy (two other terms he coined), including an antiserum against diphtheria and the first cure for syphilis (Schwartz 2004, Blair 2017).

Even today, as I attempt to sum up the contributions and limitations of my doctoral research, there is a part of me that believes I have failed, because the outcome should have been the creation of a magic bullet against vaccine hesitancy arising from mis- and disinformation.

One of my goals was to see if citizen science fiction could help young people "build emotional and intellectual antibodies against diseases of the body politic," and I cannot be sure how much I have succeeded. Unlike other research on inoculation theory as a way to promote public resistance against misinformation (for example, the online games developed by psychologists Roozenbeek and van der Linden), the *Shadowpox* project to date has not included either wide-scale rollout or quantitative or qualitative evaluation of its efficacy.

Even if it were to be proven effective, there is also a chance that these interventions are merely inventive distractions from more serious work that needs to be done in this area. Another Nobel Prize-winner, the playwright and reformer George Bernard Shaw, once referred to vaccination itself as "a cheap prophylactic… employed as an alternative to a civilized housing programme" (Carpenter 2007). I am open to the possibility that a project like *Shadowpox* is not only lightweight but a potential diversion from better approaches to the problems I have been studying. It is worth being extra skeptical about the shortcuts we long for.

Minds, Hearts and Other Body Parts

Artificial intelligence is democratizing disinformation to such an extent that the problem will likely metastasize in the near future. Critics of large language models like ChatGPT point to their ability to create micro-targeted misinfo at a scale previously out of reach of even the most well-funded bad actors. Generative AI puts the powers that would-be on an even persuasive playing field with the powers that be.

Meanwhile, media literacy and the ability to perceive when we were being manipulated are hard skills to build, not just for students but for the citizenry at large. It's an arms race to keep up with a highly-motivated opponent. As Shaw explains in a different context,

> If I have ulterior designs, if in occupying the playgoer's mind agreeably I take advantage of his pre-occupation to extirpate his worn-out convictions and substitute fresh ones: in short, if I not only occupy his mind but change it, then the last thing I desire is that he should be conscious of the operation.... I like my patients to leave the hospital without a suspicion that they have been operated on and are leaving it with a new set of glands. (Carpenter 2007)

For my own part, as my research progressed, I shifted from a focus on changing minds through new ways to teach media and scientific literacy, to noticing what I and other would-be teachers might learn through listening. Kitta and Goldberg (2016) note that an "information deficit" framing of vaccine refusal misses essential root causes including "belief formation, risk and risk communication, fear, and legend," leading to "interventions and policy responses... likely to be poorly formed from the outset." Even though *Shadowpox* has never been didactically fact-forward, it did start with a goal to win the hearts and minds of my participants, rather than to open my own ears to what they were feeling and thinking. I offer the concept of the "straw ear" – a portmanteau of "straw man" and "tin ear" – for our difficulty hearing what others are actually saying, as opposed to what we'd like to believe they're saying.

As I described in chapter 2, misinformational con-fects, crafted around factual ev-facts and af-facts, are designed to feed emotional inflammation and political polarization. My initial hope was that the science-fictional re-fract might serve as an inoculation. But maybe refraction does something else as well.

In physics, refraction splays simple white light into many colours, enabling observation of a rainbow of constituent parts. Echoing *X-Men* writer Jonathan Hickman's urging to move beyond one-point perspective, Amanda Ripley (2018) offers advice for "journalists (or anyone) working amidst intractable conflict: complicate the narrative." This is not just for the sake of creating a richer story, she argues, but for improving the social climate in which it is received. "When people encounter complexity, they become more curious and less closed off to new information. They listen, in other words."

Throughout my work on the *Shadowpox* project, my understanding of its civic literacy aspect – the "citizen" part of citizen science fiction – has changed the most, precisely because of this growing awareness of the power of listening for complexity.

Trust: The Force

I used to visualize the "citizen science" part of citizen science fiction as something like Fold.it, a participatory protein-folding puzzle game through which the public can help drive real cutting-edge biological discoveries. For the idea of a "fiction citizen" – akin to Schneidmueller's (2016) "story citizen" – I drew on participatory culture and interactive narratives that draw their audience into the action in some way.



Figure 83. The author (as an X-wing starfighter) and her brother (as a Jawa) engage in participatory culture in 1977, the year of the first *Star Wars* movie's release. On the right is the neighbour who got them both into superhero comics, and therefore has no business pretending he's not as big a nerd as they are.

However, my deepest insights into what "citizen" now means in citizen science fiction come from Danielle Allen's *Talking to Strangers: Anxieties of Citizenship since Brown v. Board of Education* (2004). A true scientist of citizenship, Allen anatomizes the "diseases of the body politic" I merely quipped about. Her focus in this book is the problem of distrust, especially racial distrust.

Vaccine hesitancy and political polarization have in common a root in distrust, which Allen notes is often a product as much of history as of present-day personal experience: "It takes time to build up a record of experiences and narrative to justify distrust.... Within democracies, such congealed distrust indicates political failure.... When citizenly relations are shot through with distrust, efforts to solve collective problems inevitably founder" (xiii). The present pandemic has been one of the largest collective problems in a century, and we have seen

efforts to save lives succeed or fail based (among other factors) on levels of trust citizens have for their institutions and one another.

The decision to let someone you've just met put a needle into your arm, much less inject you with a substance designed and manufactured by people neither of you know, is an extremely vulnerable one. As Allen defines it,

> Trust in one's fellow citizens consists in the belief, simply, that one is safe with them. This trust can be registered cognitively, as when one believes that a particular fellow citizen is unlikely to take advantage of one's vulnerability… or it can be registered emotionally, as when one feels confidence, or a lack of fear, during a moment of vulnerability before other citizens. (82)

Once it became clear that this coronavirus was airborne, not just in large droplets but aerosols that could float farther than the magic two metres of social distancing, reasons to fear went through the roof. The simple act of inhaling near another person could make one vulnerable to infection, disease, and possible death. Exhaling could make those around us equally vulnerable. What Allen uses as a metaphor, the pandemic made literal:

> a core citizenly responsibility is to prove oneself trustworthy to fellow citizens so that we are better able to ensure that we all breathe healthy air. But in order to prove oneself trustworthy, one has to know why one is distrusted. The politics of friendship requires of citizens a capacity to attend to the dark side of the democratic soul. (xxii)

How does one attend to the dark side – or to any side one is not already aware of, for that matter? The climactic moments of both *Star Wars* and its sequel hinge on Luke Skywalker's decision to *listen*.

Af-facts in Action

Why listen? What exactly are we listening for?

Allen argues cogently for a citizenship of political friendship, a practice that can be cultivated through "the imperfect ideals for trust production crafted in the rhetorical tradition" (Allen 2004, 140). Drawing on Aristotle's *Art of Rhetoric,* she explains that this practice invites us to "separate the people from the problem" by… engaging with specific features of [a person's] subjective situation," and to "be precise about which emotions are at stake in a particular conversation" (157). We might call these their ev-facts and af-facts.

You could learn about these specifics through a conversation, interview or questionnaire. You could harvest psychometric data from millions of Facebook users like Cambridge Analytica (Cadwalladr and Graham-Harrison 2018). Or you could devise a science-fictional role-playing scenario. Take your pick.

The suspension of distrust and the suspension of disbelief intertwined in a salutary way during the South African *Shadowpox* workshop, though at the time I had no idea. It took me four years after the workshop in South Africa to learn the reason a good number of the participants drifted away.

Asiphe Ntshongontshi was one of the peer health educator interns at the Desmond Tutu HIV Foundation Youth Centre in 2019, and in May 2023 she joined me and two members of the Debajehmujig workshop by Zoom for a roundtable at the Film and Media Studies Association of Canada conference. In a Zoom interview we pre-recorded for the event, she explained,

> Do you think at the beginning of the project, did we believe you? Because there was a time whereby we were like, 'Just nod for the sake of nodding.'... We started as a huge group. We were all interested in this because it was new. But then when we got to the real deal, why you were there at the first point, we were like, 'There's no such thing as this.' And then people would quit....
>
> So as Shadowpox was encouraging the importance of getting vaccinated, alerting us that you can get this [disease] without you knowing, me, I wouldn't have believed any of what you said if it wasn't for the training that we got at the beginning of our internship. I would have said, 'I was raised this way. I believe in this. There is no way that you can get a disease without you knowing that you will get one. Your body will tell you.' But the thing is about the body, when you get the disease, in that minute, it won't raise an alarm and be like, 'Asiphe, you've got this.' It's going to wait.... And then when I find out, I already have fever....
>
> So when COVID-19 hit, it was the same thing. Because if you remember that scene [in her Shadowpox comic], you were coming from the Youth Centre, and then you get to see me and Lazola... when you pass, you know, without you even knowing, you infect us. But [fortunately], we were vaccinated... so we got to be protected....
>
> So COVID-19 kind of opened our eyes. So when COVID-19 was here and then everyone was talking about it, we were like, 'Okay, we had a project that was talking about this. The importance of getting vaccinated.'...
>
> At that time, I was working for the research site [on vaccine trials at DTHF]. So when I went to the research site, I knew exactly what you were talking about. I didn't know that the information I was learning on Shadowpox, I was going to have to implement it at work. So we had to talk to people and be like, 'This is why this is being done. This is why there's a study called Johnson & Johnson. This is why we have Pfizer. This is why we have Moderna. This is why you have to get the vaccine....'
>
> Shadowpox is similar to COVID. Shadowpox you couldn't see a virus with the naked eye, but you get it. And then there were times whereby people would get COVID, and then they wouldn't get the side effects. They won't cough. They won't have fever. But then they will spread it to other people. Which is what Shadowpox was teaching us. That you can – Alison is coming from Canada. She's carrying it. You are all healthy and well. She doesn't even know she's giving it to you. But then because you are protected, you survive. So yeah, COVID-19 told us that it's real. It can come into life without you knowing.

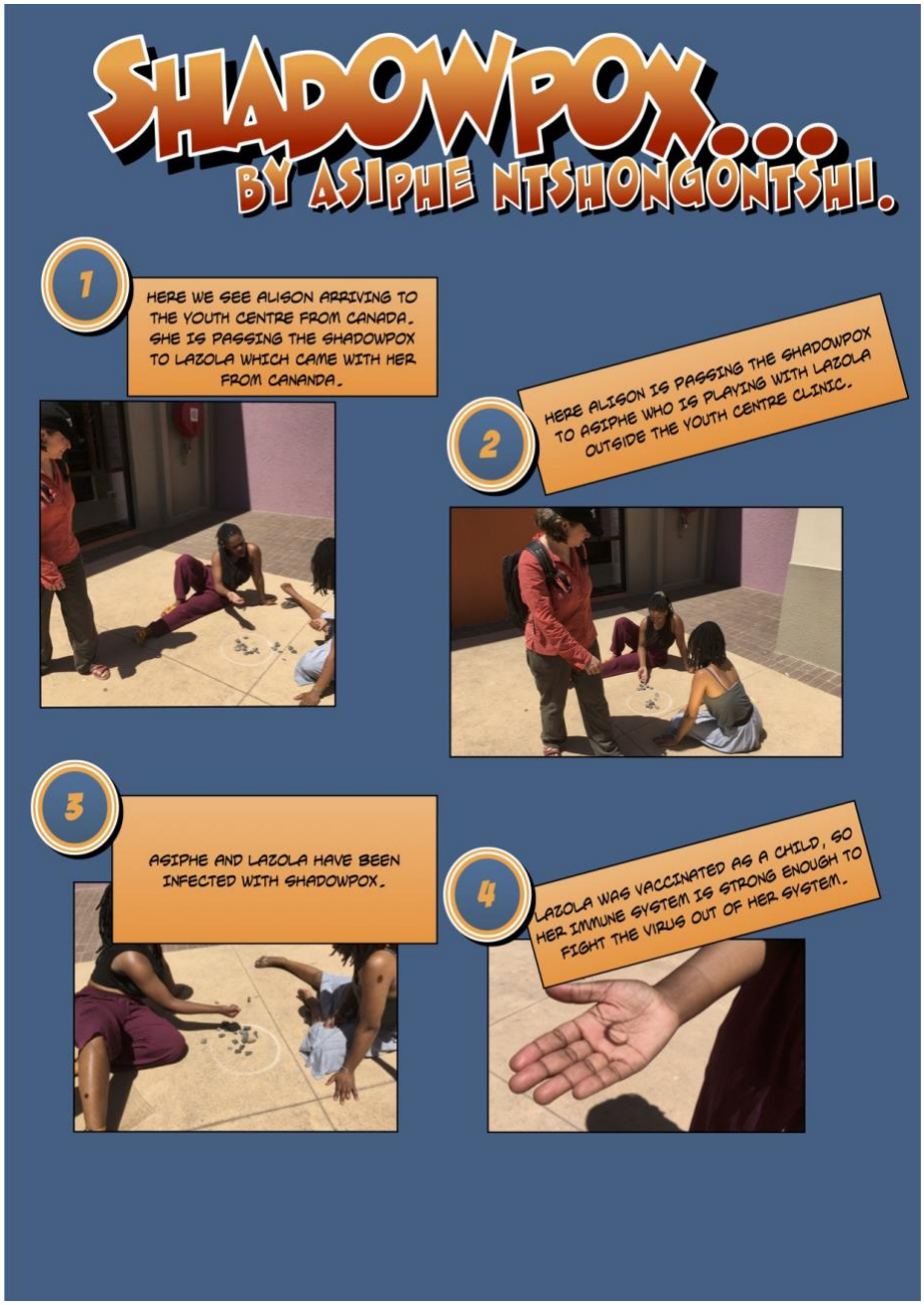


Figure 84. Page from Asiphe Ntshongontshi's comic "Shadowpox...." DTHF Youth Centre, 20 February 2019.

In 2019, Ntshongontshi had declined to do the optional interviews at the end of the workshop, and even if she hadn't, she might not have told me that this disbelief of asymptomatic spread was a sticking point. Her colleague Sibulele Bontshi did choose to do a post-workshop interview (youtu.be/RIDoyogklh4), and in it, he hinted at his own difficulty with the concept:

> I think the Shadowpox vaccine was just too creative. Because even the shadow thing, I've never heard of a disease that you spread just by catching someone's shadow. That's so– I don't know if I'd say it's freaky or like so unusual, it was just something

> different for me, like, "What? Catch a disease where you–" Because now I'm imagining if I see maybe you're infected, then I'll have to give you so much space just not to catch your shadow. And that would be so awkward in the road, because there's a lot of people now, and you don't even know who's infected or not. Ah! That would be so hectic.

In all my research on vaccine hesitancy, this objection to the very possibility of asymptomatic spread had never really occurred to me. During the creative process, Bontshi and Ntshongontshi were willing to suspend their disbelief in the re-fract of a virus that hides in shadows. But their interview comments resonate with the early 2020 conspiracy theorists who urged fellow activists to #FilmYourHospital to prove that the "invisible" COVID-19 pandemic was in fact a fiction (Ahmed et al. 2020). The af-fact in play in both cases is amusement, suspicion or indignation at being asked to believe what one cannot see. How ironic that it took me so long to hear it.

What's Generating the Pathos?

The *Shadowpox* project has evolved from a participatory storyworld that *explains* how immunization works through a superhero metaphor, to one that *explores* how storytelling generates pathos – and particularly antipathy – in vaccine hesitancy and vaccine denialism.

This is not to say that explanation doesn't have a role to play. In chapter 3, I described my early experiments in using mixed reality as an "inoculation" that grafts glyphs onto the body as the rootstock for new ways of seeing. From the simple, circular shadowpox virus and crescent-shaped vaccine glyphs to the complex visualization of herd immunity in the game *Shadowpox: The Antibody Politic,* these experiments created visual metaphors that were powerful in themselves.

The Lancet reviewed the <*ImmuneNations*> exhibition, citing *The Antibody Politic* as "undoubtedly one of the most powerful and playful ways to illustrate both the individual and population-level implications of community immunity" (Smith 2017).

An equally powerful review came from a docent at the 2018 Robert McLaughlin Gallery exhibition, who recounted seeing two thirteen-year-old girls who played the game and read through the stories in their infection collection. They then sat in a corner for 20 minutes talking solemnly. The docent finally went over to ask how they were doing, and one of them said, "I killed an eleven-year-old girl who's never been kissed." She felt the implications at the most individual level possible.

Zandile Mentjies, an applied theatre student at the University of Cape Town, told me after the *Shadowpox* workshop there (21 February 2019) that she had previously worked for two

years as a Community Engagement Group member for an HIV vaccine trial in her township, Khayelitsha. Speaking of the circle and crescent glyphs and the hand-to-hand arc, she said,

> Where I come from, we do not know about such information [about vaccines and medical trials]…. But this [Shadowpox] now is coming forward: something they can see, it's something they can understand more clearly than words and the terminology. It's hard for us to understand the medical terms. When someone is standing there speaking the terms, then you get lost in the presentation. But if it's there in an image, and it is there in a language that you understand, then it becomes clear, and you understand it fully.

Similarly, Debajehmujig artistic director Bruce Naokwegijig described the *Shadowpox* project as a set of "tools for seeing" things that don't appear to our senses, not unlike "the tools that we use for spirituality," including the eagle feather or sage smudging, "tools to honour a higher being, and tools to honour each other" (Zoom interview, 26 October 2020).

However, as the project progressed into the full participatory storyworld phase, I began to understand more deeply Jacques Rancière's insistence that "The very act of storytelling, an act that presumes in its interlocutor an equality of intelligence rather than an inequality of knowledge, posits equality, just as the act of explication posits inequality" (1991, xxii).

From Explanation to Empathy

In chapter 4, I proposed an expansion of inoculation theory with the concept of *action refraction*, "attenuating" vaccine-denialist narratives by resituating them within a wider science-fictional story framework. In one sense, the *Shadowpox* storyworld design was more subtle form of explanation, employing a mutant metaphor to personify the vaccine and generate empathy for its representatives as the subjects of antipathy-generating misinformation that frames their heroic risk-taking as a threat to the very community they are making this sacrifice to protect.

As Allen says, "The hard truth of democracy is that some citizens are always giving things up for others. Only vigorous forms of citizenship can give a polity the resources to deal with the inevitable problem of sacrifice" (29). Her focus is on the sacrifice of the democratic minority in acquiescing to majority rule, while mine is on the vaccine-trial volunteer who takes the risk of stepping to the front of the community-immunity line. But in both cases, "a hero chooses her sacrifice and thereby gains honor from other citizens… democratic responsibility consists of an agreement to honor the voluntary sacrifice" (109-110). Or so the story should go. The denialist narrative in which *philoi* are not only not respected for their heroism but are recast as villains becomes, in the *Shadowpox* story framework, the Aristotelian tragic *pathos* of an action bringing pain or destruction within a relationship between friends.

And yet, as I wrote in chapter 5, the most valuable discovery for me in this whole research-creation project has been the power of story-*listening*. As I explored how citizen science fiction innovations like the *Shadowpox* scenario can serve as "immunoassays" to promote reflection on our receptors for misleading and harmful narratives, I began to see that this reflection should not just be an assignment for students in a courseplay.

An Ethics of Story-Listening

In the dramatic arts, audiences listen by definition. Many of them will also, hopefully, reflect, and the best theatre and film critics turn this audiencing into an artform in itself. But in the earliest *Shadowpox* workshop at RADA, the graduating dramatic artists mentioned again and again the importance of actors *listening to one another* within the story they are telling together.

Jamael Westman explained that it is "very difficult to find yourself in the present moment really listening to someone.... When you go, 'I know what is going to happen,' you're denying the randomness of life.... Let's put that to the side and play with what's right in front of me. Not easy. *So* not easy."

Discussing Greek-chorus work, Natasha Cowley said, "you have to just be turned on and listening all the time, otherwise you're letting everyone else down.... It's a completely different thing actually listening to somebody and looking like you're listening but just waiting for your line.... You can't do anything without other people."

Abraham Popoola summed up these insights with the observation that,

> As an actor, fear is the biggest enemy. Not listening to your acting colleagues in a play, scene partners – that's down to fear. Not allowing yourself to be in the moment, fear of not having control, fear of not being good enough... What you achieve when you overcome that fear is something quite beautiful.... Be bold, bring in stuff that's huge and messy and scary.... You're yourself, times however many other people in the ensemble with you, which makes you really powerful.... The fear you feel is the cost... compared to the scale of the good you can do if you overcome it.

It is our responsibility and our privilege as actors in the network of citizenship to listen to the stories our fellow actors are telling. It is only by really listening that we can hope to understand not just what pathos a storyteller is generating, but how it was originally generated for them as an af-fact powerful enough to drive them creatively. Allen says, "Citizens must, then, cultivate their capacities to identify the particular emotions at play... as well as refining their understanding of how particular emotions can be dealt with" (151). This is the civic literacy I did not know I was hoping to engender at the start of the *Shadowpox* project.

Loveless (2019) concludes that “Research-creation, at its best, has the capacity to impact our social and material conditions, not by offering more facts, differently figured, but by finding ways, through aesthetic encounters and events, to persuade us to care and to care differently” (107). This project has certainly persuaded me to care differently, and I look forward to continuing to develop citizen science fiction as a research-creation practice that invites participants into a story ethic of care-full listening, and colourful refraction of emotion-as-fact.

One opportunity for further research in the immediate future is *Shadowcasting • Mazinaateshin*,[11] a multi-year project based at the Northern Ontario School of Medicine University, and funded by the Canadian Institutes for Health Research. For this project, I am working with a team of researchers led by principal investigators Marion Maar and Maurianne Reade, to invite Indigenous youth in northern Ontario into the *Shadowpox* storyworld. I look forward to the chance to continue my collaboration with Debajehmujig Storytellers, and to engage in story-listening of a more formal, qualitative-analysis kind for the first time.

A second prospect is an idea I have circled but avoided throughout the current project. Taking *Shadowpox* back to its origins in the myth of the Minotaur and his mother Pasiphae, *Dark Mater* is a story I have wanted to write about the scientist who invented the toropox vaccine, and confected rumours connecting her to the origins of the virus itself. Although the extensive worldbuilding and framework design described in this dissertation have certainly been one form of storytelling, this will be my first chance to follow in the steps of my participants and set foot into the scenario space myself. For that reason and many others, *Dark Mater* promises a whole new chapter of challenge.

Beyond *Shadowpox*, broadening from vaccination to other urgent and contentious issues – including and especially the climate crisis – my ongoing aspiration as a creator and a researcher is to continue to build cross-fertilizations of participatory media, education and entertainment. This project is hopefully only the first in a series of exciting, collaborative engagements reinvigorating the kind of thoughtful and empathetic citizenship that the arts at their best have always inspired.

[11] While "Shadowcasting" plays on broadcasting/podcasting, "Mazinaateshin" is an Anishinaabemowin word that means both “s/he casts a shadow” and “s/he is on television or in a movie,” and plays on the poetic resonance between casting a shadow and appearing on-screen.

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Appendix A: Chronology of Development, Workshops and Exhibitions

Aug 2015 (Ottawa): First <*Immune Nations*> workshop held at the University of Ottawa, 18-21 August 2015.

Apr-Jun 2016: First-round development of *Shadowpox* visual effects (VFX) with technical director LaLaine Ulit-Destajo in the Alice Lab for Computational Worldmaking and Augmented Reality Lab, York University, Toronto.

Apr 2016 (Montreal): Panel "Perils and Promises: Arts, Health, and Public Participation" at the Canadian Conference on Medical Education's Creating Space VI, Health Humanities: Social Accountability in Action, Montreal, 15-16 April 2016.

Jun 2016 (London): Week-long *Shadowpox* performance/production workshop with graduating 3rd-year actors at the Royal Academy of Dramatic Art, London, England, 20-24 June 2016.

Aug 2016 (Geneva): Second <*Immune Nations*> workshop held at UNAIDS, Geneva, Switzerland, 5-7 August 2016.

Oct 2016 (Wiikwemkoong): Week-long relationship-building visit with Debajehmujig Storytellers on Wiikwemkoong Unceded Territory, Manitoulin Island, 16-21 October 2016.

Jan-Apr 2017: Second-round development of *Shadowpox* VFX for game *Shadowpox: The Antibody Politic* with technical director LaLaine Ulit-Destajo, Alice Lab for Computational Worldmaking / Augmented Reality Lab, York University.

Feb 2017 (Cape Town): Two-week relationship-building visit to South Africa, including Desmond Tutu HIV Foundation and the Centre for Theatre, Dance & Performance Studies at the University of Cape Town. 18 February to 6 March 2017.

Mar 2017 (Trondheim): Game installation *Shadowpox: The Antibody Politic* in exhibition <Immune Nations> at Galleri KiT, Trondheim Academy of Fine Arts, Trondheim, Norway. Opening event of the 2017 Global Health and Vaccination Research Conference. 13 to 24 March 2017.

Mar 2017 (Trondheim): Third <*Immune Nations*> workshop held at Trondheim Academy of Fine Art, Trondheim, Norway, March 13–15, 2017.

Apr 2017 (Toronto): Symposium presentation "Shadowpox: Sci-Fi Insights on Co-Immunity," and installation *Shadowpox: The Antibody Politic* shown at *The Art and*

Science of Immunization, part of a two-year working group (September 2016 to April 2018) at the Jackman Humanities Institute of the University of Toronto. 13 April 2017.

May-Jun 2017 (Geneva): Game installation *Shadowpox: The Antibody Politic* in exhibition <*Immune Nations*> at UNAIDS in Geneva, Switzerland, coinciding with 2017 World Health Assembly. Presentations given to First Ladies of Namibia and Panama. 23 May to 30 June 2017.

May 2017 (Geneva): Fourth <*Immune Nations*> workshop held at UNAIDS, Geneva, May 22–23, 2017.

Jun 2017: *The Lancet* reviews <*Immune Nations*> exhibition, calling *Shadowpox: The Antibody Politic* "undoubtedly one of the most powerful and playful ways to illustrate both the individual and population-level implications of community immunity." 17 June 2017.

Sept 2017 (Toronto): One-day *Shadowpox* performance/production workshop, part of Devised Theatre Rodeo, Department of Theatre, York University, 16 September 2017.

Feb 2018 to Mar 2019: Story framework development for *Shadowpox: The Cytokine Storm*. Third-round VFX development with technical director LaLaine Ulit-Destajo, Alice Lab for Computational Worldmaking / Augmented Reality Lab, York University.

Apr 2018 (Aarhus): Conference presentation "Imagination, Inoculation and the Cosmopolitics of Co-immunity," at Cultures of Participation: Arts, Digital Media and Politics, Aarhus University, Aarhus, Denmark, 18-20 April 2018.

Aug 2018 (Wiikwemkoong): Planning visit for *Shadowpox: The Cytokine Storm* workshop with Debajehmujig Storytellers, Wiikwemkoong Unceded Territory, Manitoulin Island, 8-11 August 2018.

Sept 2018 (Toronto): One-day *Shadowpox* performance/production workshop as part of Devised Theatre Rodeo, Department of Theatre, York University, 15 September 2018.

Sept 2018 (Toronto): Conference presentation "Shadowpox: Visual FX in the Eye of the Storm," Digitally Engaged Learning conference, York University, Toronto, 22 September 2018.

Sept 2018 – Jan 2019 (Oshawa): Game installation *Shadowpox: The Antibody Politic* in exhibition *Public Notice* at the Robert McLaughlin Gallery, Oshawa, Ontario, 15 September 2018 to 19 January 2019.

Oct 2018 (Oshawa): Conference presentation "Imagination as In-Oculation – *Shadowpox: The Antibody Politic*" at Ideas Digital Forum, Robert McLaughlin Gallery, Oshawa, 12-13 October 2018.

Oct 2018 (Los Angeles): Conference workshop "VFX, Infection, and Affect in a Co-Created Superhero Storyworld," and talk, "Imagination as In-Oculation," at Emergency & Emergence USC Cinema & Media Studies Graduate Conference, University of Southern California, Los Angeles. 18-20 October 2018.

Dec 2018 (Wiikwemkoong): Week-long performance/production workshop *Shadowpox: The Cytokine Storm* with arts animator interns at Debajehmujig Storytellers, three teachers from Wikwemikong High School, and Northern Ontario School of Medicine Associate Professor Maurianne Reade. Wiikwemkoong Unceded Territory, Manitoulin Island, 12-18 December 2018.

Feb 2019: Feature article and video by Research & Innovation at York: "Interactive video game highlights the impact of vaccine decision-making," YFile, York University, February 7, 2019.

Feb-Mar 2019 (Masiphumelele): Workshops on filmmaking, storyboarding and photo-comics, and week-long performance/production workshop *Shadowpox: The Cytokine Storm,* with peer health interns at the Desmond Tutu HIV Foundation Youth Centre, Masiphumelele, South Africa, 4 February to 20 March 2019.

Feb 2019 (Cape Town): One-day performance/production workshop "Hand to Hand, Eye to Eye" with students at the Centre for Theatre, Dance & Performance Studies, University of Cape Town, South Africa, 21 Feb 2019.

Mar 2019 (Cape Town): Conference presentation "Shadowpox: Participatory Science Fiction Storytelling to Boost Community Immunity" at the Desmond Tutu HIV Foundation Research Meeting, Institute of Infectious Disease & Molecular Medicine, University of Cape Town, South Africa, 15 March 2019.

Apr 2019 (Toronto): Game installation *Shadowpox: The Antibody Politic* at CRAM Festival of Learning and Discovery, York University, April 5, 2019.

May 2019 (Vancouver): Conference presentation "Building Co-Immunity in Wiikwemkoong and Masiphumelele: Participatory Science Fiction to Inoculate the Civic Imagination" at the Humanities, Arts, Science, and Technology Alliance and Collaboratory (HASTAC) conference, University of British Columbia, Vancouver, 17 May 2019.

Feb 2020 (Toronto): Seminar presentation at Sensorium Lunchtime Seminar, York University, February 26, 2020.

Apr 2020 (online): Reinvented game *Shadowpox: #StayHome Edition* (shadowpox.org/game) launches with a York media release, "Online video game brings to life the impact of staying home during COVID-19 pandemic," 8 April 2020.

Apr 2020: A CTV News feature on *Shadowpox: #StayHome Edition* airs on 16 April 2020. Radio-Canada mentions the game on 25 April 2020.

Aug 2020: Two journal articles in *Imaginations: Journal of Cross-Cultural Image Studies* as part of special issue *Immune Nations: Research-Creation at the Intersection of Vaccine Science and Global Health Policy*, 31 August 2020: "Shadowpox: The Antibody Politic - Thoughts and Reflections" with Caitlin Fisher and Steven Hoffman, and "Imagining Co-Immunity in Shadowpox: The Antibody Politic"

Nov 2020 (online): Conference presentation "Citizen Science Fiction: Imagining Immunity in the Shadowpox Storyworld," BC Nurses' Union's Human Rights and Equity Conference, 26 November 2020.

Oct 2020 (online): Artist capsule "Shadowpox: Citizen Science Fiction," part of exhibition *Life, A Sensorium*, presented by York's Sensorium: Centre for Digital Art and Technology at the International Symposium of Electronic Art (ISEA), Montreal, Quebec, 13-18 October 2020.

Jan-Apr 2021 (online): Design and teach new *Shadowpox*-based "courseplay" Digital Culture: Science & Fiction (FILM/CMA 3841), Department of Cinema and Media Arts (cross-listed with the School of Global Health), York University, Toronto, January-April 2021.

Sept-Dec 2021 (Hamilton): Game installation *Shadowpox: The Antibody Politic* in exhibition <*Immune Nations*> at the McMaster Museum of Art, Hamilton, Ontario, 2 September to 10 December 2021.

Oct 2021 (online): Panel "Ensuring Equitable Access: Life-Saving Vaccines during COVID-19 and Beyond", McMaster Museum of Art, Hamilton, Ontario, 14 October 2021.

Jan 2022: Announcement of two-year CIHR-funded project "Co-Creating Vaccine Confidence: An Anishinabe Theatre-Based Approach to Strengthen Indigenous Youth and Young Adult Vaccination Support," a collaboration between the Northern Ontario School of Medicine, Debajehmujig Storytellers, and Indigenous organizations and communities. 2022-2024.

Jan-Apr 2022 (online): Design and teach new course *Writing for Games and Interactive Media* (FILM 1123), Department of Cinema and Media Arts, York University, Toronto, January-April 2022.

Feb 2022 (online): Presentation on "Co-Creating Vaccine Confidence" project to Chiefs of Ontario Health Forum, 23 February 2022.

May 2022 (Wiikwemkoong): Week-long *Shadowpox: The Cytokine Storm* workshop with new cohort of arts animator interns at Debajehmujig Storytellers, Wiikwemkoong Unceded Territory, Manitoulin Island, 9-13 May 2022.

Sept-Dec 2022 (online): Revise and teach new course *Writing for Games and Interactive Media* (CMA 1123), Department of Cinema and Media Arts, York University, Toronto, September-December 2022.

May 2023 (Toronto): Panel "Shadowcasting from Manitoulin to Masiphumelele: 'Citizen Science Fiction' as Mixed-Reality Role-Play for Civic, Scientific and Media Literacy," in the Film and Media Studies Association of Canada conference, York University, Toronto, 28 May 2023.

Jun 2023 (Oxford): Panel "AI and Theatre," part of the Artful Intelligence Season hosted by The Oxford Research Centre in the Humanities (TORCH) and The Institute for Ethics in AI, Oxford University, England, 26 June 2023.

Appendix B: Courseplay Syllabus

Digital Culture: Science & Fiction – FA/FILM 3841 3.00 Winter 2021

Department of Cinema and Media Arts
School of the Arts, Media, Performance and Design, York University

FILM 3841 Course Calendar Description

Explores the history, theory, and practice of digital media through an examination of contemporary practice and theories of digital art, social media, gaming culture, film, new media, animation, and software studies. Prerequisites: FA/FILM 1400 6.00, FA/FILM 1401 6.00, or permission of the Instructor. Open to non-majors. Course Instructor: Alison Humphrey.

Expanded Course Description

What makes a story compelling? What makes science convincing? DIGITAL CULTURE: SCIENCE & FICTION is a special edition of FILM 3841 for a moment in history when hundreds of millions of people around the world are making a potentially life-or-death decision: whether or not to get a new vaccine against COVID-19. If enough people choose to participate in this unprecedented global health effort, we can bring the pandemic to an early end.

However, vaccination is unique among health decisions. We take a vaccine before we get sick, the life it saves might not be our own, and if it does prevent us from getting or passing along the disease, we might never know. The decision depends on trust. Trust depends on what we know, but also on how we feel. How do we know what we know? Why do we feel what we feel? In 2021, digital culture is at the core of both questions.

Achieving vaccine-based herd immunity will take widespread public participation, but willingness to participate can be undermined by mis- and disinformation, and their spread on social media is part of participatory digital culture. The World Health Organization calls this phenomenon an "infodemic", and WHO Health Emergencies Programme Executive Director Mike Ryan declared almost a year ago, "We need a vaccine against misinformation."

This year's course format is as unusual as its context. In this hybrid "courseplay", we will splice history and theory with the practice of dramatic composition, performance and digital production. Participants will create a six-part story arc in a shared science fiction universe, the SHADOWPOX storyworld, using the metaphor of immunity-as-superpower to reimagine historical and contemporary conflicts over immunization.

Presenting persuasive accounts of cause and effect is a core concern of both the scientist and the storyteller. In this course, we will use science fiction to interrogate the concept of science fact, to compare and contrast how evidence is produced with how stories are designed. In addition to reading and writing, we will use metaphoric world-building and online role-play – "citizen science fiction" – to deepen our understanding of civic engagement and resistance, deliberative rhetoric, evidence-based decision-making, and values-based narrative design.

TECHNICAL REQUIREMENTS FOR TAKING THE COURSE
Please note that this is a course that depends on remote teaching and learning. There will be no in-class interactions or activities on campus.

The course will be taught in a combination of synchronous Zoom seminar discussion at the scheduled class time of 7:00pm-10:00pm Wednesdays, and asynchronous elements including video and written assignments, eClass forum discussion and peer feedback. Video journal assignments and reflective blog posts, will be shared on a private "co-laboratory" on the Scalar scholarly media publishing platform (https://scalar.me/anvc/scalar/).

In order to fully participate in this course, students will be required to take part in video conferencing and will also appear on video (e.g., for seminar discussion, in-character video assignments, etc.). In addition to stable, higher-speed Internet connection, students will need access to a computer with webcam and microphone. Please run an online test such as Speedtest (https://www.speedtest.net/) to determine Internet connection and speed.

TOPICS AND CONCEPTS
Note: All readings for this course will be provided online via eClass. Due to the topical and unfolding nature of the subject matter, we may make changes to the reading list to take advantage of unforeseen learning opportunities. Students are also encouraged to bring current news and other relevant research into the discussion forum – particularly compelling materials may be added to the secondary recommended readings. Please consult the eClass site regularly, as the most up-to-date information about due dates, course readings, and assignments (including explanations for how to successfully complete these tasks) can be found there.

Week 1 – Introduction to the "Courseplay" – January 13
Week 2 – Science/Story – January 20
Due: Scene 1 Video "A Memory and a Motive"
Week 3 – (Mis)information/(Mis)trust – January 27
Due: Scene 2 Video "Anonymous Warning"
Week 4 – Evidence/Plausibility – February 3
Due: Reflections on Scene 1
Week 5 – Ethics/Power – February 10
Due: Scene 3 Video "Informed Consent"; Reflections on Scene 2
Reading Week
Week 6 – Cooperation/Conspiracy – February 24
Due: Scene 4 Video "Visual Side Effects"
Week 7 – Denial/Outrage – March 3
Due: Reflections on Scene 3
Week 8 – Hero/Villain – March 10
Due: Scene 5 Video "The Cytokine Storm"; Reflections on Scene 4
Week 9 – Rhetoric/Dialogue – March 17
Due: Scene 6 Video "A Torch in the Firewall"; Reflections on Scene 5
Week 10 – Risk/Benefit – March 24
Due: Reflections on Scene 6
Week 11 – Review – March 31
Week 12 – Final Reflections and 'Pox Party – April 7
Due: Final Reflection Essay

LEARNING OUTCOMES WITH EXAMPLES

Upon completing this course, students will be able to:

- Analyze and critique the rhetorical uses of drama, especially speculative fiction.
- Make persuasive and compelling arguments through the written word and dramatic video.
- Understand the concepts, strengths, vulnerabilities and stakes of vaccination in public health.
- Participate more responsibly and persuasively in evidence-based democratic decision-making.

Learning Activities

This course uses a new experiential learning methodology called *action refraction*, in which participants explore a contentious issue through participatory science fiction, using four steps: Research, Refraction, Action, and Reflection. The first step, ***Research***, involves the required and recommended readings and viewings, as well as any materials you bring into the conversation from outside. The second step, ***Refraction***, is conceptual and compositional, as you decide how to translate this real-world research into the science fiction of the storyworld. The third step, ***Action***, takes your refraction into production and performance, as you record video of yourself in character to experience the facts and feelings of the issue from the inside. In the fourth step, ***Reflection***, you and two "outside eye" peers respond to and analyze to the video, make new connections to the research, and consider how you might use these insights in future work and in life. Please see eClass for full learning activity instructions.

Refraction Videos (6 videos x 2-3 minutes each)

In the refraction videos, you will create and role-play a character who is a volunteer in a Phase I vaccine trial for the fictional virus shadowpox. *Shadowpox: The Cytokine Storm* is a story framework with creative prompts for six video journal entries. These six scenes add up to a complete character arc by the end of the course. Note that these scenes are research-creation to investigate fact and feeling, cognition and affect through drama, so high production values are not the primary goal here. Your character is supposedly using their own computer or smart-phone to record themselves, so you can use the same tools. If you prefer not to appear on camera, please see the instructor to discuss alternative ways to present your character.

Reflection Posts (6 weeks x 1 self reflection and 2 peer reflections)

Reflection posts on the Scalar site are your opportunity to reflect in writing on three refraction videos submitted for the same scene: your own work, and the videos of two peers. Think of the self reflection as a "behind-the-scenes" in which you explore your creative choices and relate your work to the course readings and research. Think of the peer reflections as an exercise in articulating your responses as an audience member and as a fellow creator, acting as a supportive, candid "outside eye" for your colleagues' work – an essential skill in any career. Scalar allows you to annotate, tag and comment on video and written text, making links between the videos' refractions and the research that might have inspired them. These posts may also provide you with preliminary material for your final reflection essay.

Participation

Participation includes attendance and active participation in weekly Zoom seminar discussions, in conversations on the eClass forum, and in sharing research materials on Scalar. We will treat these synchronous and asynchronous activities as a "writers' room" or "braintrust" of creators working on individual projects in a shared fictional universe. Honing the skills to support and respectfully challenge one another's explorations, in a spirit of positive candor and collegiality, may be some of the most valuable learning we do in this course.

Final Reflection Essay

In your final reflection essay on Scalar, you will draw on any of your previous refraction videos and reflection posts, along with a minimum of four course readings, to analyze your research-creation in the *Shadowpox* storyworld as if it were a scientific experiment.

Course Expectations

Students are required and expected to check in regularly with the course via eClass. In addition to undertaking the learning activities above, students are expected to pay particular attention to the following:

- Reviewing guidance and instructions and referring to them when necessary.
- Making sure Course Announcements are being received by email, and reading all announcements promptly upon receipt.
- Seeking clarifications when required about course operations, learning activities, and expectations by posting in the Administrative Forum.

Graded Assessment

The final grade for the course will be based on the following items weighted as indicated:

- Refraction Videos (6 videos x 5% each = 30%)
- Reflection Posts – Self and Peer (6 sets x 5% each = 30%)
- Participation (20%)
- Final Reflection Essay (20%)

Additional Information

The *Shadowpox* storyworld material is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International license (CC BY-NC-SA 4.0), which states, in part, "If you remix, transform, or build upon the material, you must distribute your contributions under the same license as the original." Course assignments that build on the *Shadowpox* materials will therefore be subject to this Creative Commons license, and students will be asked to agree to its terms: https://www.creativecommons.org/licenses/by-nc-sa/4.0/

The Scalar site will be private for the duration of the term, available only to participants in the course and any York faculty or staff added to the site, such as Digital Scholarship Librarian Kris Joseph, who will be our Scalar advisor. After the end of the course, students may optionally choose to make some of their materials public, working with the instructor to ensure that what they publish respects the privacy of fellow students, copyright and Creative Commons, and York's research ethics guidelines.

COURSE SCHEDULE

WEEK 1

Introduction to the "Courseplay"

Shadowpox – Intro to the Storyworld

- Theoretical context: "citizen science fiction"
- Backstory
- Story framework
- Creating your character

Learning the Course Website – Intro to Scalar

- Set up your profile
- Make a comment on a post
- Make an annotation on a video

WEEK 2

Science/Story

VIDEO ASSIGNMENTS:

Intro video – Say hello to your colleagues in the course!

Scene 1 – "A Memory and a Motive" (see *Shadowpox* story framework)

Required Readings

Biss, Eula. "Sentimental Medicine: Why we still fear vaccines." *Harper's Magazine,* January 2013. https://harpers.org/archive/2013/01/sentimental-medicine/?single=1

Jenkins, Henry. "'What Else Can You Do with Them?': Superheroes and the Civic Imagination." *The Superhero Symbol: Media, Culture, and Politics*. Rutgers University Press, 2019. https://drive.google.com/file/d/16JTCazvm047D-_1hFUOEWky5xucFBW1K/view?usp=sharing

Team Halo. "'It came in a locked box': UK Covid vaccine volunteers – in pictures." *The Guardian,* 13 November 2020. https://www.theguardian.com/society/gallery/2020/nov/13/it-came-in-a-locked-box-uk-covid-vaccine-volunteers-in-pictures

"Philosophy - Aristotle." *YouTube*, uploaded by The School of Life, 29 October 2014, https://youtube.com/watch?v=csIW4W_DYX4.
(Sections #2 on tragedy and #4 on rhetoric are a good introduction to the next reading.)

Aristotle's sciences, rhetoric and drama – PDF of excerpts from:
Shields, Christopher. "Aristotle," *The Stanford Encyclopedia of Philosophy* (Fall 2020 Edition).
https://plato.stanford.edu/entries/aristotle/#AriCorChaPriDiv
https://plato.stanford.edu/entries/aristotle/#RheArt

Recommended Readings

Le Guin, Ursula. "On Fiction vs. 'Alternative Facts': Letter to the Editor." *The Oregonian*, February 1, 2017. https://www.oregonlive.com/opinion/2017/02/ursula_leguin_on_fiction_vs_al.html

Rosenberg, Brian. "Higher Education in a Time of Insurrection." *Chronicle of Higher Education*, January 7, 2021. https://www.chronicle.com/article/higher-education-in-a-time-of-insurrection

WEEK 3

(Mis)information/(Mis)trust

VIDEO ASSIGNMENT: Scene 2 – "Anonymous Warning"

Required Readings

Larson, Heidi. "Why Rumors about Vaccines Spread — and How to Rebuild Trust." *TEDMED 2020*, March 2020. https://www.ted.com/talks/heidi_larson_why_rumors_about_vaccines_spread_and_how_to_rebuild_trust

"The Anti-Vaxx Playbook." Center for Countering Digital Hate, 2020. pp. 4-23. https://www.counterhate.com/playbook

"Plandemic and the Seven Traits of Conspiratorial Thinking." *YouTube*, uploaded by John Cook, 12 May 2020. https://www.youtube.com/watch?v=Rban0JGEimE.

Kata, Anna. "A Postmodern Pandora's Box: Anti-Vaccination Misinformation on the Internet." *Vaccine*, vol. 28, no. 7, 30 Dec. 2009, pp. 1709–16. https://immunize.ca/sites/default/files/resources/1700e.pdf

Ellick, Adam B. and Adam Westbrook. "Operation InfeKtion: How Russia Perfected the Art of War." *New York Times*, 12 November 2018. https://www.nytimes.com/2018/11/12/opinion/russia-meddling-disinformation-fake-news-elections.html

Recommended Readings

Martine, Arkady. "The Mysterious Discipline of Narratologists: Why We Need Stories to Make Sense." *Tor.com*, 29 January 2019. https://www.tor.com/2019/01/29/the-mysterious-discipline-of-narratologists/

Sobo et al. "Information Curation among Vaccine Cautious Parents: Web 2.0, Pinterest Thinking, and Pediatric Vaccination Choice." *Medical Anthropology*, 35:6. 2016. pp529-546. https://doi.org/10.1080/01459740.2016.1145219

WEEK 4

Evidence/Plausibility

WRITTEN ASSIGNMENT: Scene 1 Self & Peer Reflection Posts

Required Readings

Coleridge, Samuel Taylor. "Willing suspension of disbelief" *Biographia Literaria*, Chapter XIV (paragraphs 1-2). 1817. http://www.english.upenn.edu/~mgamer/Etexts/biographia.html

Tangherlini, Timothy. "An AI tool can distinguish between a conspiracy theory and a true conspiracy." *Nieman Journalism Lab,* 16 Nov. 2020. https://www.niemanlab.org/2020/11/an-ai-tool-can-distinguish-between-a-conspiracy-theory-and-a-true-conspiracy/

Yeh, Robert W., et al. "Parachute Use to Prevent Death and Major Trauma When Jumping from Aircraft: Randomized Controlled Trial." *BMJ* 2018; 363. https://www.bmj.com/content/363/bmj.k5094

Green, John. "Evaluating Evidence: Crash Course Navigating Digital Information #6." *YouTube*, uploaded by CrashCourse, 12 February 2019. https://www.youtube.com/watch?v=hxhbOvR2TGk

Recommended Readings

Tangherlini, Timothy. "Toward A Generative Model of Legend: Pizzas, Bridges, Vaccines, and Witches". *Humanities*, vol 7, no. 1, 2017. https://www.mdpi.com/2076-0787/7/1/1/htm

Schulz, Kathryn. "Fantastic Beasts and How to Rank Them." *The New Yorker*, November 6, 2017. https://www.newyorker.com/magazine/2017/11/06/is-bigfoot-likelier-than-the-loch-ness-monster

WEEK 5

Ethics/Power

VIDEO ASSIGNMENT: Scene 3 – "Informed Consent"
WRITTEN ASSIGNMENT: Scene 2 Self & Peer Reflection Posts

Required Readings

Gyasi, Yaa. "Bad Blood." *The 1619 Project – New York Times Magazine*, 18 August 2019. https://www.nytimes.com/interactive/2019/08/14/magazine/african-american-poets.html

"Scientific Lessons from the History of Infectious Diseases." *Infection and Immunity.* The Open University, 2015. (Read sections 2.0, 2.1, 2.6, 2.7, 2.8 and 2.9 on Edward Jenner, smallpox vaccination and the scientific method.) https://www.open.edu/openlearn/ocw/mod/oucontent/view.php?id=28151

Shermer, Michael. "'The Doctor Who Fooled the World' Review: Vax Populi," *Wall Street Journal,* 27 September 2020. https://www.wsj.com/articles/the-doctor-who-fooled-the-world-review-vax-populi-11601238052

Szeto, Eric, et al., "Hidden Cameras Capture Misinformation, Fundraising Tactics Used by Anti-Vaxx Movement." *CBC Marketplace*, 17 January 2020. https://www.cbc.ca/news/health/marketplace-anti-vaccination-hidden-camera-washington-1.5429805

Recommended Readings

Kean, Sam. "22 Orphans Gave Up Everything to Distribute the World's First Vaccine," *The Atlantic*, 12 January 2021. https://www.theatlantic.com/science/archive/2021/01/orphans-smallpox-vaccine-distribution/617646/

Morales, Robert and Kyle Baker. *Truth – Red, White & Black.* New York: Marvel Comics. 2003. https://www.amazon.ca/Truth-Red-White-Black-3-ebook/dp/B078X2C85H/

York University's ethics review process for research involving human participants http://research.info.yorku.ca/ore/human-participants/

WEEK 6

Cooperation/Conspiracy

VIDEO ASSIGNMENT: Scene 4 – "Visual Side Effects"

Lecture Videos

Lewis, Justin Jaron. "Rigid Stories and Stories That Dance: Part 1." *Biology of Story*, 25 November 2016. https://biologyofstory.com/#/main?media=rigid-stories-and-stories-that-dance-pt-1

Hanson, Joe. "Visualizing Herd Immunity (with 500 Mousetraps!) (feat. @The Slow Mo Guys)." *YouTube,* uploaded by It's Okay to Be Smart, 4 February 2021. https://www.youtube.com/watch?v=Et_J8_x4qBs

Required Readings

David Gorski, "The Confluence of Antivaccine Beliefs and Conspiracy Theories in COVID-19 Denial." *Science-Based Medicine*, September 28, 2020. https://sciencebasedmedicine.org/the-confluence-of-antivaccine-beliefs-and-conspiracy-theories-in-covid-19-denial/

Warzel, Charlie. "Is QAnon the Most Dangerous Conspiracy Theory of the 21st Century?" *New York Times*, 4 August 2020. https://www.nytimes.com/2020/08/04/opinion/qanon-conspiracy-theory-arg.html

Teer, Kaitlyn. "Reading 'On Immunity' During a Measles Outbreak." *Electric Literature*, 7 May 2019. https://electricliterature.com/eula-biss-on-immunity-vaccination-antivax-measles-outbreak/

O'Grady, Cathleen. "For Vaccinations, Will People Follow the Herd or Free-Ride off It?" *Ars Technica*, 10 March 2017. https://arstechnica.com/science/2017/03/for-vaccinations-will-people-follow-the-herd-or-free-ride-off-it/

Recommended Readings

Blauw, Sanne. "How long does it take for a conspiracy to come out?" *The Correspondent*, 20 August 2020. https://thecorrespondent.com/653/how-long-does-it-take-for-a-conspiracy-to-come-out/86366466956-1e5f6eab

Atlani-Duault, Laëtitia et al. "Blood Libel Rebooted: Traditional Scapegoats, Online Media, and the H1N1 Epidemic." *Culture, Medicine, and Psychiatry*. Volume 39, Number 1. 2015. pp43-61. https://www.researchgate.net/publication/273670961_Blood_Libel_Rebooted_Traditional_Scapegoats_Online_Media_and_the_H1N1_Epidemic

Biss, Eula. "On Vampire Capitalism and the Fear of Inoculation." *Harper's Magazine*, Dec. 27, 2012. https://harpers.org/blog/2012/12/on-vampire-capitalism-and-the-fear-of-inoculation/

WEEK 7

Denial/Outrage

WRITTEN ASSIGNMENT: Scene 3 Self & Peer Reflection Posts

Lecture Videos

Crockett, Molly. "Moral Outrage in the Digital Age." The Leakey Foundation. 4 March 2020. https://www.youtube.com/watch?v=b2AYlD8ReeA

Cook, John. "FLICC: The Techniques of Science Denial, Part 1."
UQx Denial101x Making Sense of Climate Science Denial, 9 March 2020.
https://www.youtube.com/watch?v=gjtMDtA0N7Y
See also: https://crankyuncle.com/a-history-of-flicc-the-5-techniques-of-science-denial/

"FLICC: The Most Common Disinformation Tricks of Science Deniers." Klimafakten, n.d.
https://www.klimafakten.de/meldung/f-l-i-c-c-most-common-disinformation-tricks-science-deniers

Required Readings

Rose-Stockwell, Tobias. "This Is How Your Fear and Outrage Are Being Sold for Profit." *Medium.com*, 14 July 2017. https://tobiasrose.medium.com/the-enemy-in-our-feeds-e86511488de

McNeil Jr., Donald G. "Russian Trolls Used Vaccine Debate to Sow Discord, Study Finds." *NYT*, 23 August 2018. https://www.nytimes.com/2018/08/23/health/russian-trolls-vaccines.html

Cohen, Elizabeth, and John Bonifield. "Her Son Died. And Then Anti-Vaxers Attacked Her." *CNN.* 21 March 2019.
https://www.cnn.com/2019/03/19/health/anti-vax-harassment-eprise/index.html

Ireland, Nicole. "Doctors Worry as Anti-Vaccination Messages Escalate from Social Media Misinformation to Personal Threats." *CBC News.* 1 May 2019. https://www.cbc.ca/news/health/anti-vaccination-threats-against-canadian-doctors-1.5115955

Grimes et al. "Establishing a Taxonomy of Potential Hazards Associated with Communicating Medical Science in the Age of Disinformation." *BMJ Open*, 15 May 2020.
https://bmjopen.bmj.com/content/10/7/e035626

Kahn-Harris, Keith. "Denialism: what drives people to reject the truth?" *The Guardian*, 3 August 2018.
https://www.theguardian.com/news/2018/aug/03/denialism-what-drives-people-to-reject-the-truth

WEEK 8

Hero/Villain

VIDEO ASSIGNMENT: Scene 5 – "The Cytokine Storm"
WRITTEN ASSIGNMENT: Scene 4 Self & Peer Reflection Posts

Lecture Videos

Rubin, Peter and Chris Robichaud. "A Harvard Professor Explains What the Avengers Can Teach Us About Philosophy." *Wired*, 27 April 2019. https://www.wired.com/video/watch/a-harvard-professor-explains-what-the-avengers-can-teach-us-about-leadership-morality

"Cytokine Storm: Unchecked Inflammation." *Beckman Coulter Dx.* 1 October 2020. https://youtu.be/b9J3NjvDIQA

Iwasaki, Akiko. "How COVID-19 Turns Your Immune System Against You." Yale School of Medicine, 9 April 2020. https://youtu.be/vvKhT9tAhig

Required Readings

"Behind A Twitter Campaign, A Multitude of Stories." *NPR*, August 16, 2014. https://www.npr.org/sections/codeswitch/2014/08/16/340669034/behind-a-twitter-campaign-a-multitude-of-stories

Bainbridge, Jason. "'This Land is Mine!' Understanding the Function of Supervillains." *The Superhero Symbol: Culture, History, Politics*. Rutgers University Press, 2019. https://bit.ly/Bainbridge_Supervillains

Wagner-Egger et al., "Lay Perceptions of Collectives at the Outbreak of the H1N1 Epidemic: Heroes, Villains and Victims." *Public Understanding of Science*, July 2011, pp461-76. https://bit.ly/Wagner-Egger_Heroes_Villains_Victims

Benassi, Matthew. "A Conspiracy Theory Almost Ruined My Family's Life. This Could Prevent It from Happening to You." *CNN Business Perspectives*, 23 October 2020. https://www.cnn.com/2020/10/23/perspectives/section-230-disinformation-hate-speech-social-media/index.html

Aaronovitch, David. "A Travesty of Truth." *The Guardian*, 14 December 2003. https://www.theguardian.com/society/2003/dec/14/broadcasting.science

Recommended Readings

Nattrass, Nicoli. "The Social and Symbolic Power of AIDS Denialism." *Skeptical Inquirer,* Volume 36.4, July/August 2012. https://skepticalinquirer.org/2012/07/the-social-and-symbolic-power-of-aids-denialism/

Wall, Thomas Carl. "The Biology of Literary Affect: A Review Essay on *Comeuppance: Costly Signaling, Altruistic Punishment, and Other Biological Components of Fiction* by William Flesch." *Ecozon@*, Vol. 1, no. 1, 23 April 2010. https://ecozona.eu/article/view/354/334

WEEK 9

Rhetoric/Dialogue

VIDEO ASSIGNMENT: Scene 6 – "A Torch in the Firewall"
WRITTEN ASSIGNMENT: Scene 5 Self & Peer Reflection Posts

Required Readings

World Health Organization. "How to Respond to Vocal Vaccine Deniers in Public." Chapter 4, "The Argument" (pp 27-31). https://bit.ly/WHO_How_to_Respond

Cook, John. "How to Debunk Misinformation" (Fact, Myth, Fallacy). https://youtu.be/6I37HD444aI

Rose-Stockwell, Tobias. "How to Design Better Social Media." https://medium.com/s/story/how-to-fix-what-social-media-has-broken-cb0b2737128

Voices for Vaccines, "Don't Hesitate: Talking to Your Vaccine-Hesitant Loved Ones with Compassion and Confidence." https://www.voicesforvaccines.org/content/uploads/2016/02/Vax-Hesitant-Loved-Ones-Toolkit.pdf

Wiles, Siouxsie, and Toby Morris. "Bridging the Gap with Someone Who's Been Pulled in by Disinformation." https://thespinoff.co.nz/society/15-09-2020/siouxsie-wiles-toby-morris-bridging-the-gap-with-someone-whos-been-pulled-in-by-disinformation/

Recommended Readings

Thompson, Derek. "The Surprising Key to Combatting Vaccine Refusal: It's Not Just One Problem." https://www.theatlantic.com/ideas/archive/2021/02/vaccine-hesitancy-isnt-just-one-thing/618164/

Jankowicz, Nina. "The Disinformation Vaccination." *Wilson Quarterly,* Winter 2018. https://wilsonquarterly.com/quarterly/the-disinformation-age/the-disinformation-vaccination/

WEEK 10

Rhetoric/Dialogue

WRITTEN ASSIGNMENT: Scene 6 Self & Peer Reflection Posts

Lecture Videos

CrashCourse: "Karl Popper, Science, & Pseudoscience: Crash Course Philosophy #8."
https://youtu.be/-X8Xfl0JdTQ

Haven, Kendall. "Your Brain on Story." *The Biology of Story.*
https://biologyofstory.com/#/main?media=your-brain-on-story

Required Readings

Loveless, Natalie. *How to Make Art at the End of the World: A Manifesto for Research-Creation.* Chapter 1, pp. 19-25. https://bit.ly/Loveless_How_to_Make_Art_ch1

Recommended Readings

Haven, Kendall. "How Stories Attract Attention, Part 1." *The Biology of Story.*
https://biologyofstory.com/#/main?id=not-all-narratives-are-stories&media=how-stories-attract-attention-part-1-kendall-haven

Jenson et al., "Deep Assessment: An Exploratory Study of Game-Based, Multimodal Learning in 'Epidemic'" (skim for IMRaD structure and highlights). https://bit.ly/Jenson_Deep_Assessment

Nature, "Scientific Papers" (good overview of the IMRaD structure)
https://www.nature.com/scitable/topicpage/scientific-papers-13815490/

James Somers, "The Scientific Paper Is Obsolete." *The Atlantic*, April 2018.
https://www.theatlantic.com/science/archive/2018/04/the-scientific-paper-is-obsolete/556676/

Victor, Bret. "Scientific Communication as Sequential Art."
http://worrydream.com/ScientificCommunicationAsSequentialArt/

WEEK 11

Review

ASSIGNMENT: Continue work on final reflection essays for next week.

Lecture Games

Lewsey, Fred. "Go Viral! Cambridge Game 'Pre-Bunks Coronavirus Conspiracies." https://www.cam.ac.uk/stories/goviral

Roozenbeek and van der Linden, "Breaking Harmony Square: A Game that 'Inoculates' against Political Misinformation." https://misinforeview.hks.harvard.edu/article/breaking-harmony-square-a-game-that-inoculates-against-political-misinformation/

Cook, John. The "Cranky Uncle" Game. https://crankyuncle.com/game/

Recommended Readings

Fawaz, Ramzi. "'Where No X-Man Has Gone Before!' Mutant Superheroes and the Cultural Politics of Popular Fantasy in Postwar America." *American Literature,* volume 83, issue 2*,* 1 June 2011, pp 355–388. https://doi.org/10.1215/00029831-1266090

The Technology and Social Change Project, "The Media Manipulation Casebook." https://mediamanipulation.org/

Kulwin, Noah. "An Apology for the Internet — From the Architects Who Built It." *New Yorker Magazine*, April 2018. http://nymag.com/intelligencer/2018/04/an-apology-for-the-internet-from-the-people-who-built-it.html

WEEK 12

"Pox Party"

ASSIGNMENT: Final Reflection Essay due.

In your final reflection essay on Scalar, you will draw on any of your previous refraction videos and reflection posts, along with a minimum of four course readings, to analyze your research-creation in the *Shadowpox* storyworld as if it were a scientific experiment. Use the IMRaD structure of a scientific journal article (Introduction, Methods, Results, and Discussion).

Lecture Videos

Caulfield, Mike. "Investigate the Source: Evaluate Expertise." *CTRL-F.* https://ctrl-f.ca/source/

Oreskes, Naomi. "Why We Should Trust Scientists." *TED Talk*, Jun 25, 2014. https://youtu.be/RxyQNEVOElU

Recommended Reading

Jorrin, Michael. "Why We Take the Bait: What's the 'Universal Vaccine'?" https://www.stockgumshoe.com/reviews/nutrition-healing/why-we-take-the-bait/

Goldacre, Ben. "The Doctor Will Sue You Now." https://badscience.net/files/The-Doctor-Will-Sue-You-Now.pdf

"Pox Party" Film Festival

In-class screenings of the best excerpts from everyone's videos all term.

Discussion Questions

Week 2

- How are cause and effect made persuasive in storytelling? In the scientific method?
- How does research inform public health policy and vaccine hesitancy?
- How does research inform the creation of drama (e.g. screenwriting, film production)?
- What is rhetoric, and why should it be considered a "productive science"?

Week 3

- What kinds of specific details must a writer provide to make a scientific finding, or a pseudoscientific assertion, or a fantastical invention, plausible?
- Ideas of research, evidence and expertise have shifted since the advent of Web 2.0 – what are the benefits and dangers?
- How can motivated reasoning and other cognitive biases affect both the production of scientific evidence and the public's reception of it?

Week 4

- Terms like "legend" and "folklore" can be used pejoratively, or to refer to narratives of a bygone age, but how are these narrative forms alive and productive in our lives today?
- What does the randomized controlled trial reported by Yeh et al. illustrate about this particular genre of scientific narrative?
- How do groups negotiate what is accepted as "believable" in their sphere?

Week 5

- Research involving human participants is subject to strict ethical guidelines, even for undergraduates at York. What are the short- and long-term dangers of researchers abusing the imbalance of power between themselves and their study participants?
- How does Gyasi use the metaphor of "bad blood" to explain mistrust of scientists?
- How does the concept of informed consent address the ethical risks of an imbalance of knowledge?
- What benefits and harms can come from cultivating a narrative – such as when a researcher presents him- or herself as the underdog against government or Big Pharma?

Week 6

- What specific qualities make conspiracy theories such compelling narratives?
- How does our present form of capitalism affect collective endeavours like herd/community immunity?
- What features does social media have that make it more vulnerable than traditional media to the spread of misinformation and disinformation?
- In what ways do conspiracy theories operate like alternate reality games?

Week 7

- How do emotions drive engagement on social media, and what are the dangers of algorithms built to profit from this dynamic?
- Why do certain parties have an interest in stoking outrage online, and what storytelling techniques do they use to stir it up?
- What distinguishes critical thinking and reasonable doubt from "denialism"?

Week 8

- What rights and responsibilities do filmmakers have when crafting a story "based on real events"?
- Nattrass identifies "four groups of characters in the AIDS denialist community." How does she use storytelling techniques in her article?
- How did the social media campaign #IfTheyGunnedMeDown seek to educate the traditional media on the power of visual rhetoric?

Week 9

- After 9/11, fears of biological weapons led to high-level debate about reviving smallpox vaccination in the United States. In what ways was that risk/benefit analysis similar to everyday vaccination decisions made by individuals? In what ways was it different?
- We each draw on many sources to build a mental model of risk. What is the subtext of dismissing public concerns as "science fiction fears"? What alternative approaches might produce more productive public debate on science-related policy?
- Esposito notes that the words *immunity* and *community* have opposite meanings based on the same Latin root. In what sense does refusing vaccination make a person "immune"?

Week 10

- Why does Arendt see "fact" as essential to political debate, but "rational truth" as antagonistic to it?
- How does the language of "scientism" and "irrationalism" create and militarize a split between "fact" and "value"? What are the pleasures of such dramatic conflict? What are the perils, given Booth's definition of rhetoric as "the art of discovering warrantable beliefs and improving those beliefs in shared discourse?"
- In what ways might "complicating the narratives" help health practitioners and vaccine-hesitant patients to shift stereotypes and build mutual trust?

Week 11

- Dramatists often do extensive research to build a "heat map" of a subject or issue. Go back over all the readings from the previous weeks and choose one or two around which you can imagine building a feature film.
  What elements in those readings spiked your interest, and why?
- How might you craft those elements into a one-sentence logline?

For additional material including design briefs, videos and images,
please see the online version of the dissertation at:
https://scalar.usc.edu/works/shadowpox-citizen-science-fiction/
or
https://www.alisonhumphrey.com/p/dissertation.html