Cartography M.Sc.

Beyond the Peel

Combining Art, Storytelling, and Visualization to Convey and Contextualize Projection Distortion

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Thesis Defense | September 28, 2022

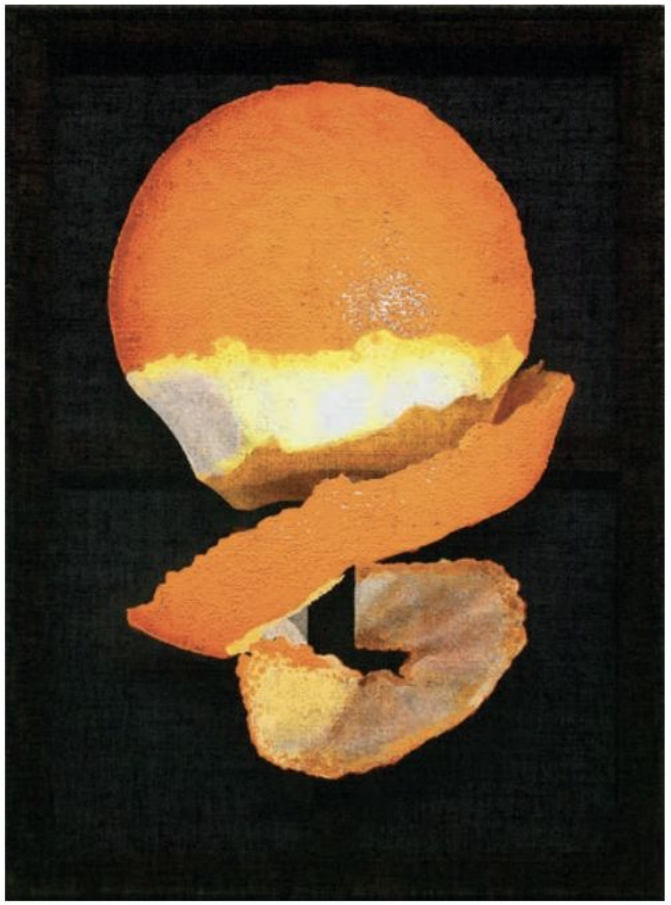
AGENDA

- Introduction and Motivation
- Research Identification
  - Objectives & Questions
- Part 1
  - Definitions, Current Research, Conceptualization of Approach
- Part 2
  - *The Projection Flipbook* Project: Process & Creation
  - Results, Discussion, Limitations
- Conclusion

INTRODUCTION & MOTIVATION

MOTIVATION

The public at large has “little to no interest in, or ability to, understand/compensate for map projection distortion.” (Battersby, 2021)



Maja Vukoje,
Orange, 2017
Acrylic on burlap, 100 x 70cm
Foto: Roland

RELEVANCE TODAY

Maps Have Been Lying To You Your Entire Life
—IFLifeScience

Maps have been lying to you all your life. Yes, even Google Maps
—AbcNews

The world map you know and love? It's been lying to you.—Vox

What are Map Projections? (And Why They Are Deceiving To Us) —GISGeography

Your Map Is Lying to You
—Outside

Why every world map you're looking at is WRONG —Daily Mail

RESEARCH IDENTIFICATION

OBJECTIVES

RO1 *To present the benefits and limitations of current distortion visualization offerings [and explore why alternatives may be needed].*

RO2 *To explore how distortion can be conveyed artistically and with storytelling methods.*

QUESTIONS

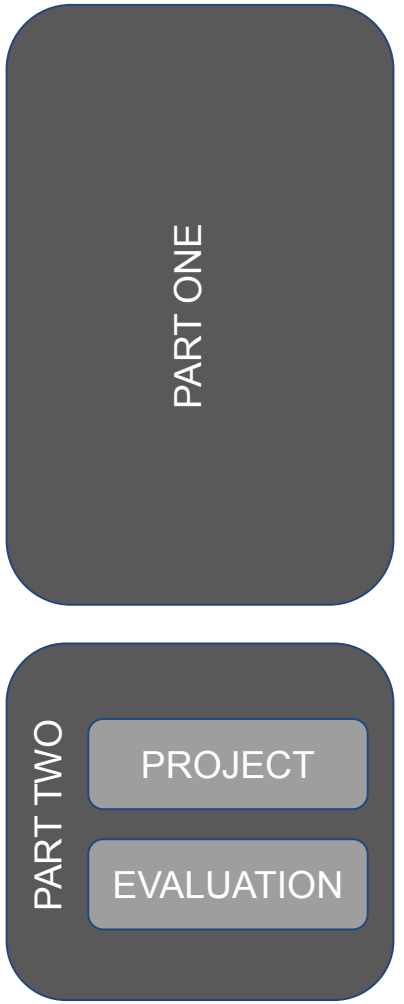
RQ1 *In which ways could the general public benefit from a better understanding of map projections and their distortions?*

RQ2 *What key methods are currently used to convey the effect of distortion?*

RQ3 *How might artistic and storytelling methods help to make distortion interesting, understandable, evocative, and relatable beyond the theoretical level?*

RQ4 *What could an artistic, thematic, storytelling approach to conveying distortion look like?*

RQ5 *What possible insights could be gleaned from the creation of such a project and how might one evaluate said project?*



PART ONE

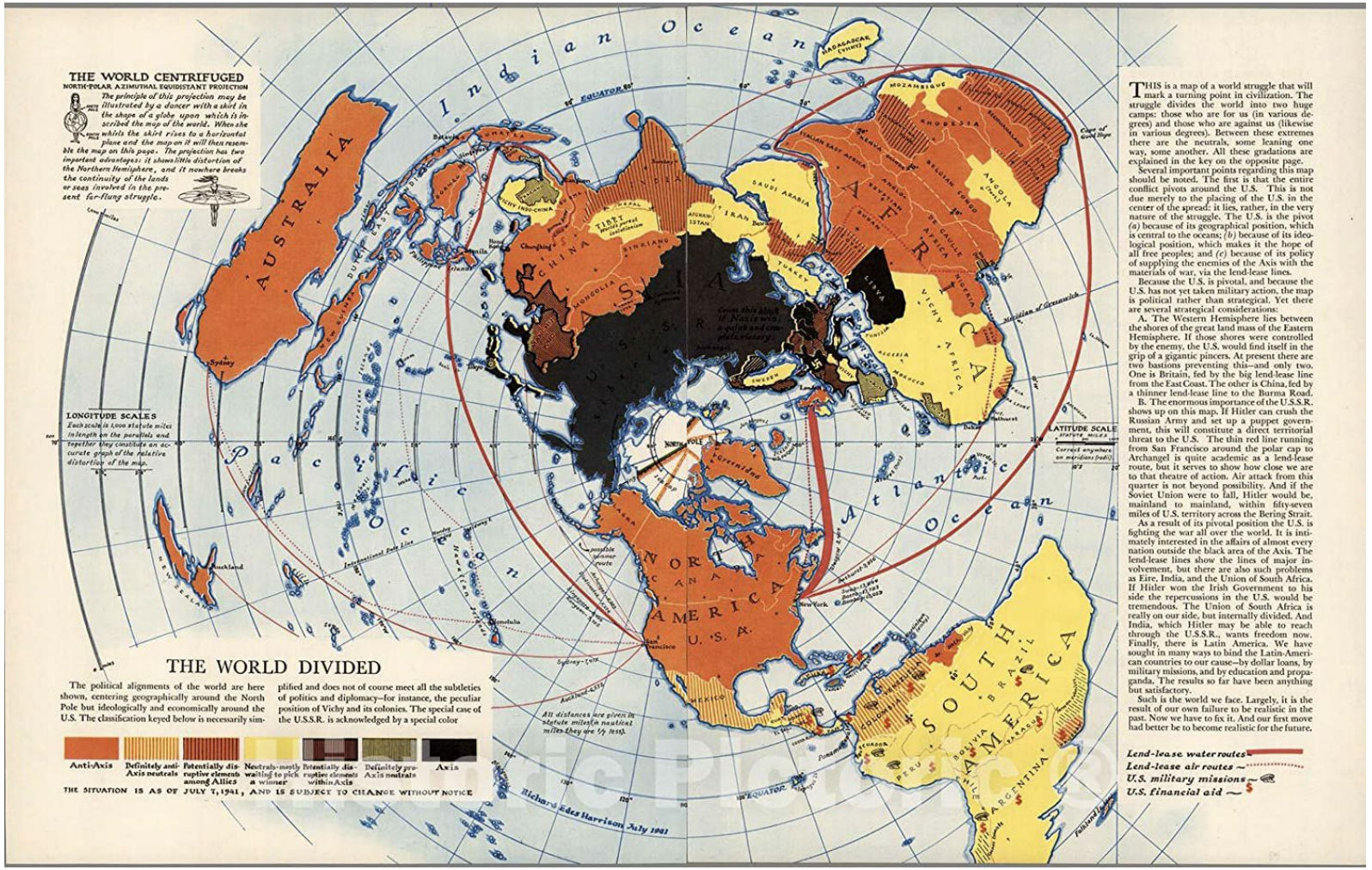
DEFINITIONS

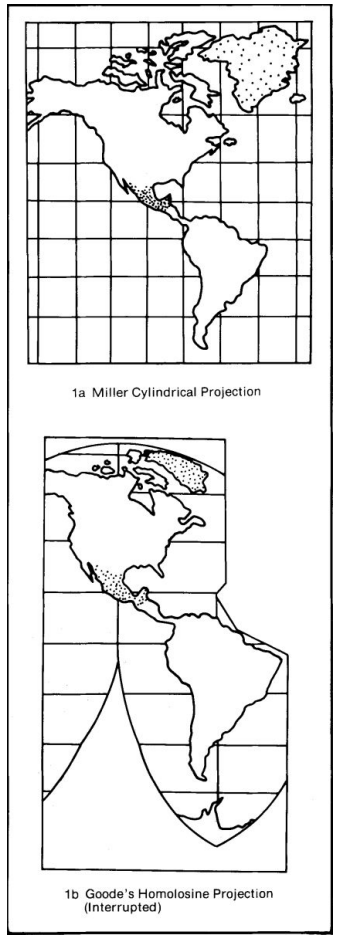
Functional map projection literacy (FMPL) includes “knowledge about types of map projections [...] and the ability to judge the accuracy and appropriateness of map projections for different purposes” (Hawkins et al., 1998). Additionally the knowledge:

- that all maps distort, and that they must (Monmonier, 2018; John Parr Snyder, 1987),
- that some projections are better suited than others, but all have their strengths and weaknesses (Burkalow, 1955), and
- that there can be no perfect projection (Battersby, 2021; Monmonier, 2018)
- and that a projection is not inherently good or bad, but that it depends on context and content.

PART ONE

HISTORICAL & CURRENT IMPORTANCE





Showing the misleading effects of projection distortion on dot density maps. Taken from Tyner (1982).

Richard Edes Harrison's 'The World Divided' first published in Fortune Magazine, 1941. Taken from Cornell University – PJ Mode Collection of Persuasive Cartography.

PART ONE

DISTORTION = DECEPTION?

"Changes in society (e.g., lower levels of trust in decision makers) and in mapmaking technologies and practices (e.g., anyone can now make their own maps) mean that we need to spend some time thinking about how, when, and why people trust maps and mapmaking processes. This is critically important if we want stakeholders to engage constructively with the information we present in maps, because they are unlikely to do so if they do not trust what they see." (Griffin, 2020)

Boston public schools map switch aims to amend 500 years of distortion

A district will drop the Mercator projection, which physically diminished Africa and South America, for the Peters, which cut the developed world down to size

The Gall-Peters projection, which shows land masses in their correct proportions by area, puts the relative sizes of Africa and North America in perspective. Photograph: Alamy Stock Photo

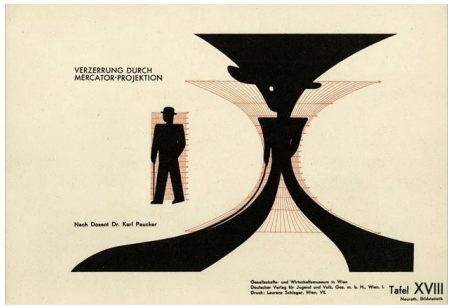
SUMMARY OF IMPORTANCE

Level of Understanding	None	Partial Literacy	Full FMPL
Ability to Make Decision about Individual Map	?	✓	✓
Trust in Map Making Process	✓	?	✓

PART ONE

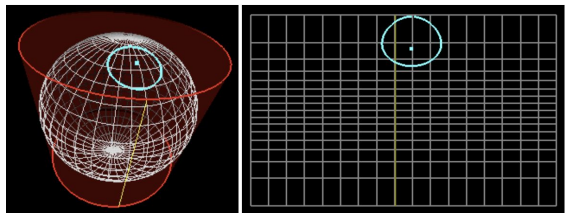
TRADITIONAL METHODS

Familiar Shapes



Otto Neurath's use of Familiar Shapes to show the impact of the Mercator Projection outside of map constraints. Taken from isotyperevisited.org.

Interactive Displays



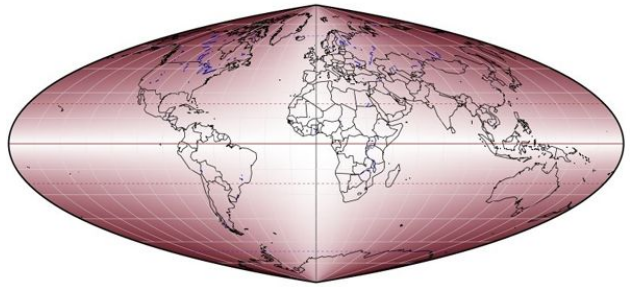
Floating Ring tool showing the Mercator Projection. Taken from Brainerd and Pang (1998).

Comparison

Tissot's Indicatrices

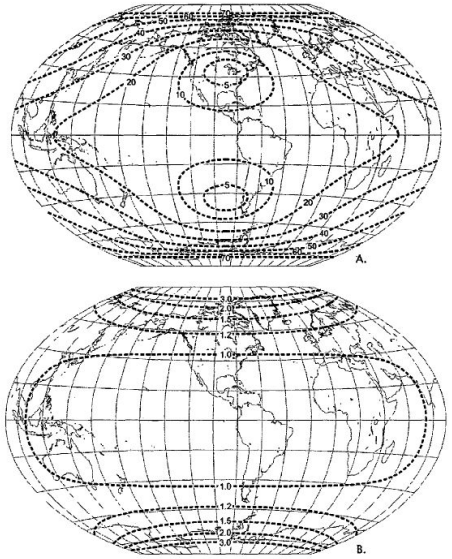
Visual Analysis of Map Graticule

Color



Color Method where darker colors represent angular distortion. Taken from Cartographic Perspectives.

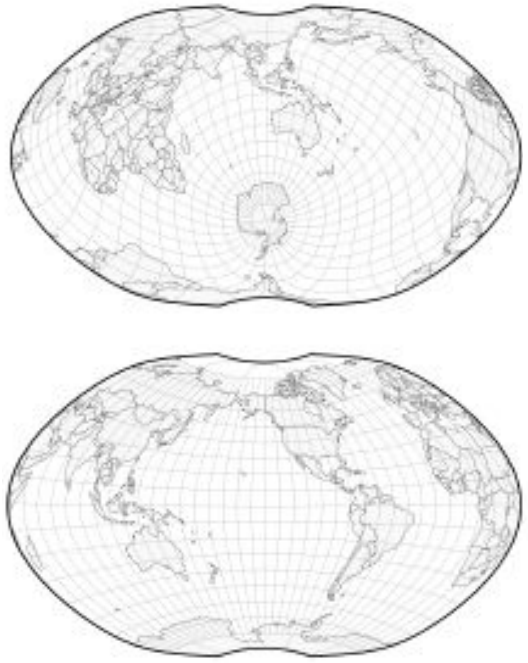
Isolines



Isolines showing distortion of the Winkel Tripel projection. Taken from Mulcahy and K. C. Clarke (2001).

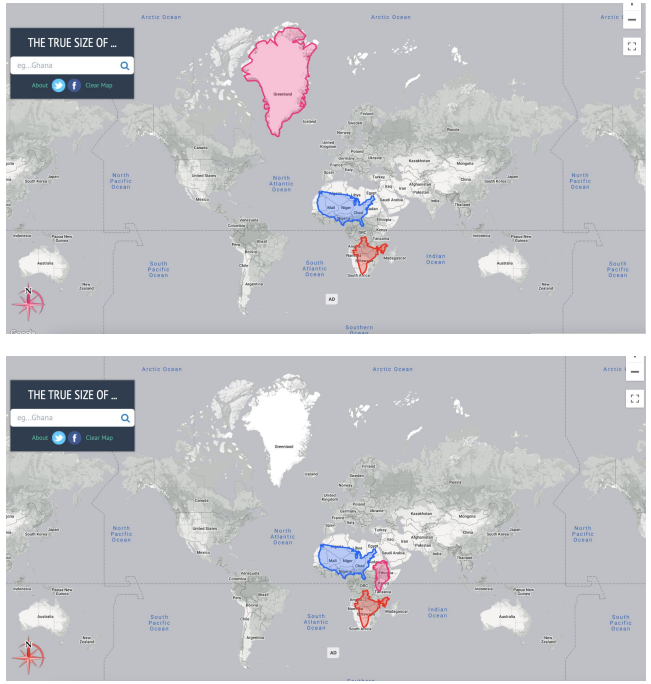
NOVEL / INTERACTIVE METHODS

Consistent Transitions



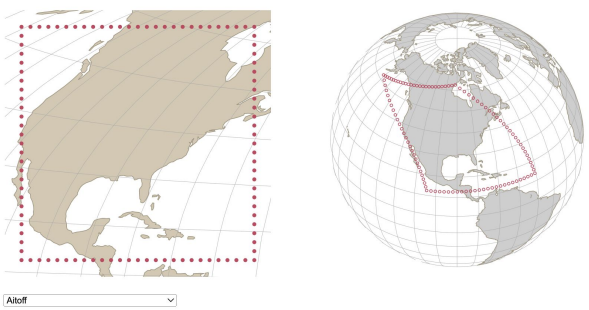
Jason Davies' Map Projection Transitions: Ginzburg IV Centered on Antarctica and Atlantic.

The True Size Of



Screenshots of The True Size of showing Web Mercator's size distortion. Taken from The True Size Of.

Bounding Box

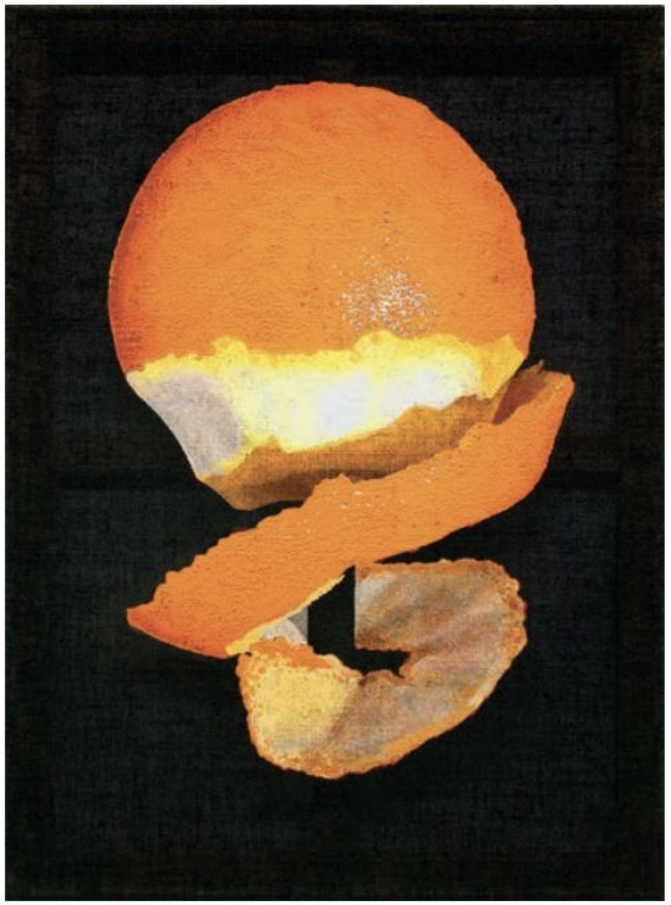


Screenshot of Aitoff Bounding Box Comparison. Taken from Johnson (2021).

PART ONE

CURRENT STATE

The public at large has “little to no interest in, or ability to, understand/compensate for map projection distortion.” (Battersby, 2021)



Maja Vukoje,
Orange, 2017
Acrylic on burlap, 100 x 70cm
Foto: Roland

PART ONE

CURRENT LEVELS

EFFECTIVE TECHNIQUES, BUT LOW LEVELS OF UNDERSTANDING AND INTEREST…

?

ALTERNATIVE APPROACHES

Storytelling has the ability to "make students experience curiosity, mystery and even wonder."
(Kokkotas, Rizaki, and Malamitsa, 2010)

ALTERNATIVE APPROACHES

Art can "address significant concepts and prompt viewers to think about them, perhaps for the first time or more deeply than they have before."
(Marshall and Donahue, 2014)

ART?

Now what I have been saying may sound like saying, “a work of art is an object of which someone has said, ‘I christen this object a work of art’.” And I think it is rather like that.
—George Dickie

PART TWO

PROCESS


Mercator
Plate Carée
Best so far:
- personalities / horses / playing cards / prisoners
- inverse
- colors.
- monoline
"One line Projection based on Winkel Tripel"
If it is about understanding how much do I need to teach
OR JUST INTERESTING
TO REVERSE BACK AND SEE any image
BEYOND THE PEEL
FALSE DICHOTOMY
Timeline
Behind Prison Bars
WANTED SIGNS
NUANCE
Projection, Projection, SLIDES
-drawing on the slides
-PLASTIC SURGERY FOR PROJECTION
-drag to realign
show how impossible it is to make it accurate in all directions
-shift between as you pull from one to the next.
-RANK on each scale w/ distortion measure.
angle
distance

PART TWO

CRITERIA

1. Whether the idea presented enough artistic and creative opportunities for experimentation.

2. Whether the idea would be feasible given the limited time frame and my programming capabilities.

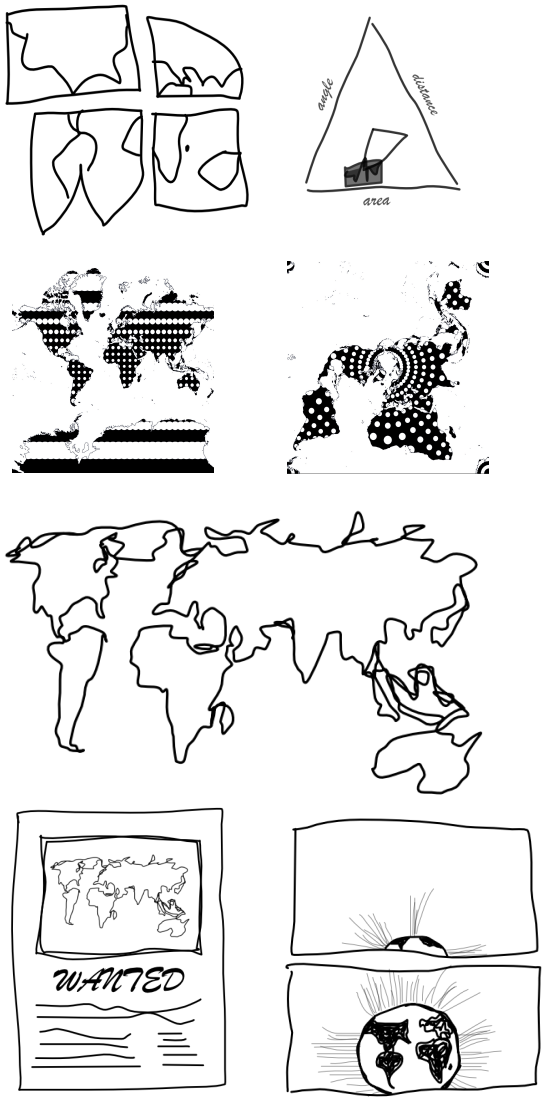
3. Whether the idea could incorporate the key takeaways from the literature review, namely to allow for exploration of nuance through the incorporation of thematic data and usage of existing distortion visualization techniques.

Inspiration in many forms. The Pinakothek der Moderne where an artwork using the Mercator projection stands next to a piece from Joseph Beuys.

PART TWO

ELIMINATION

	AESTHETICS	FEASIBILITY	LIT. REVIEW
Transitional Developable Surface	✓	-	-
One Liners	✓	-	-
Puzzle Projections	✓	-	-
Triangle Selector	✓	-	-
Wanted Ads: Anthropomorphism	✓	✓	-
Subtractive TI	-	✓	✓



PART TWO

SELECTION OF THE PROJECTION FLIPBOOK

Attribute	Benefits
Stacked	Stacking the pieces of the maps allows for more than two distortions to be compared at once and helps show the idea that every projection is but one of many possibles.
Controversial Titles	Prompts the reader to question and breakdown the dichotomous good / bad, true/false view .
Integration of Thematic Data	Show the interaction of projection distortion and thematic data symbolization techniques, making projections more relatable and important.

PART TWO

THE PROJECTION FLIPBOOK: DATA

Predetermined data?

- Controversial
- Widely interesting
- Global
- Country Level
- Different visualization techniques*

- Abortion & COVID-19 Data

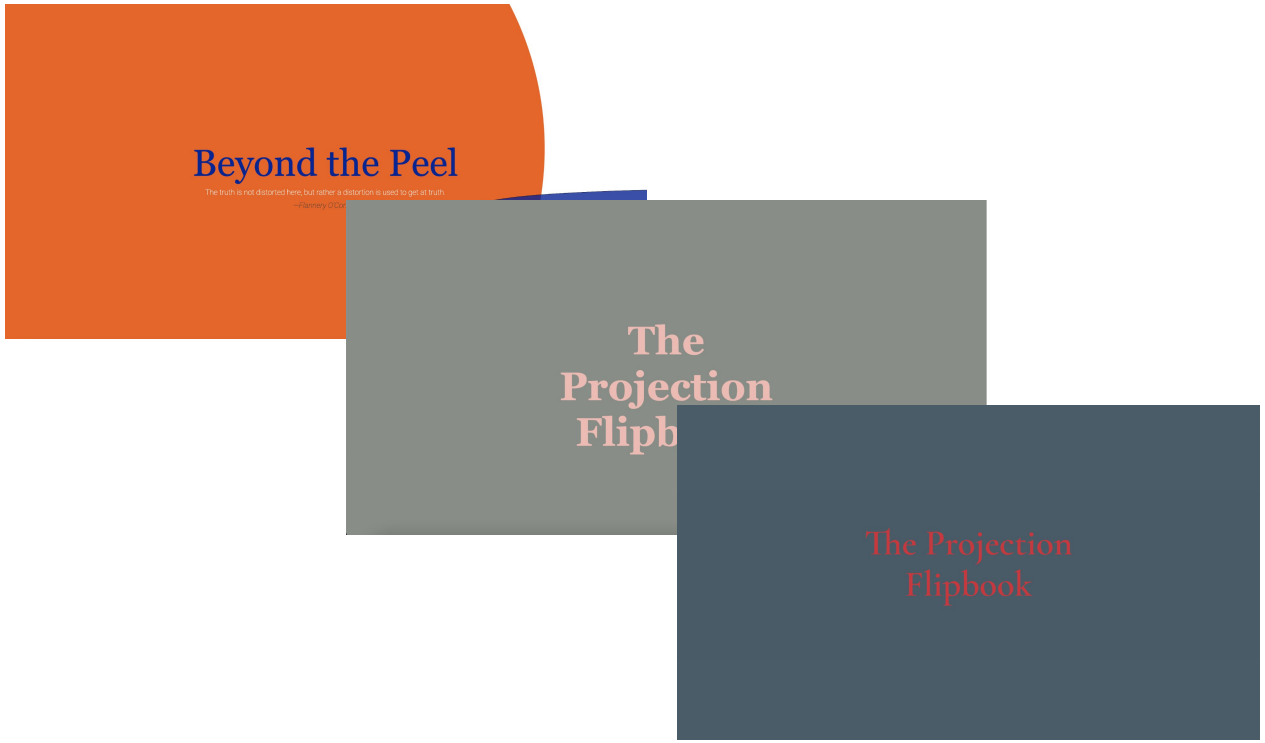
DATASET	SOURCE	DESCRIPTION
Thematic Data		
Reproductive [Abortion] Rights	Center for Reproductive Rights	This dataset contains information on access to abortion. Data is nominative, with rankings from I to V (V being the most comprehensive access). This dataset is used for *choropleth* mapping. Note that since this data was initially collected (February 23, 2021) many countries have changed their reproductive rights policies.
COVID-19 Case and Deaths Data	World Health Organization	This dataset contained both raw and per 100,000 figures for COVID-19 cases and deaths. This dataset is used for *choropleth* and *dot density* mapping. Data last updated August 1, 2022.
Additional		
Country Outlines	Natural Earth, processed by D3	TopoJSON versions of Natural Earth country outlines at 110m, TopoJSONified by D3.
ISO Codes	ISO 3166	The ISO three-digit numeric code (numeric-3) was used to join the natural earth data to the thematic data within the project

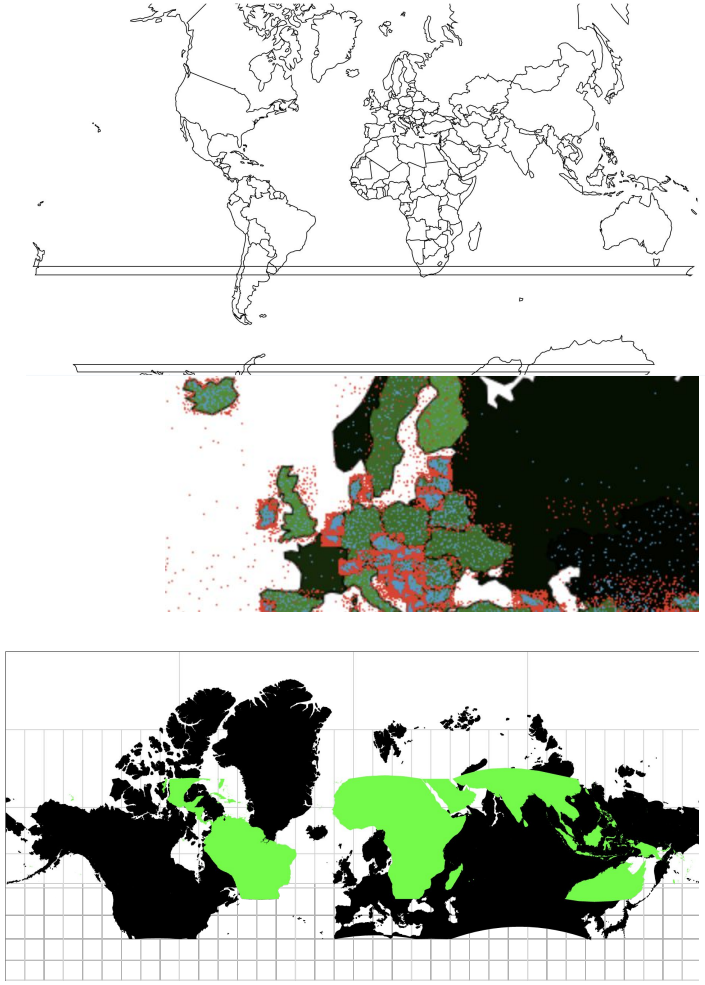
Table 6: *Data Sources*

Nothing and I mean nothing, is interesting unless it is PERSONAL.
—Billy Baldwin

PART TWO

THE PROJECTION FLIPBOOK: CHALLENGES





PART TWO

TECHNICAL IMPLEMENTATION

THE PROJECTION FLIPBOOK

THE PROJECTION FLIPBOOK: VIDEO

RESULTS & DISCUSSION

PART TWO

EVALUATION: BEFORE

PRIOR KNOWLEDGE OF MAP PROJECTIONS

"Um, almost zero. Like I know what a map is I'm not sure if I know what a map projection is."

"Better than average. And only because of that one episode on the West Wing."

"I guess to be honest I never really thought about it that much. Obviously the experience I have is probably limited to google maps."

PART TWO

EVALUATION: AFTER

PROJECTION KNOWLEDGE

Just as “you can kind of wield statistics like a weapon where you can kind of choose what key facts you want and that might not tell the whole story. And it’s interesting to think about maps in the same way.”

“A lot better. Oddly enough I found the COVID one very interesting because I’ve been looking at COVID maps a lot and the fact that depending on how big the country is displayed on the map changes the density of the dots is very apropos because it totally changes the information that you’re getting from the map and I hadn’t realized that.”

“Every maps lies. Or not lies, but has to use some form of distortion because there is no perfect form of map projection.”

It shows how the map “maybe wasn’t a great picture. Or could have been. Or could not have been.”

EVALUATION: AFTER

"...just because it isn't 100 percent the mirror image copy of something doesn't make it inherently a bad representation of it. I think it's asking viewers to reexamine the current claims of 'we're presenting something in this way but it doesn't actually mean it's an accurate presentation.' I think it makes people recognize there isn't ... just because we're reexamining things doesn't mean the old one is inherently attempting to present things in a disingenuous manner."

PART TWO

DISCUSSION

TAKEAWAYS

- Better knowledge
- Enjoyed the animation aspect
- Liked the quotes / unveiling of information:

"It's a story where you don't really get what's going on until the very end."

CRITIQUES

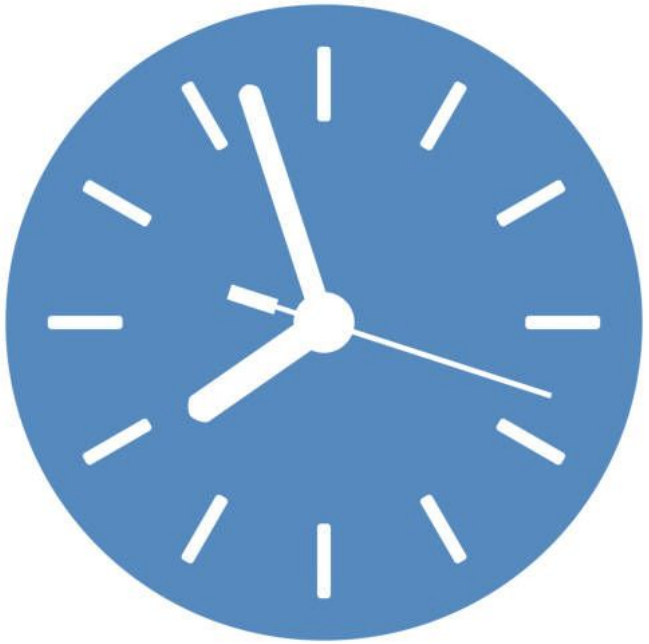
- Colors
- Integration of explanation
- Simpler / lower baseline
- Scrollytelling implementation
- More clues–scale, legend, etc.

PART TWO

LIMITATIONS

- Time & Technical Inexperience with D3
- Combinations of Projections / Projection Types
- Visibility of Thematic Data vs Computing Requirements
- Limited Evaluation

… more work to be done!



CONCLUSION

QUESTIONS?

Thank you!

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