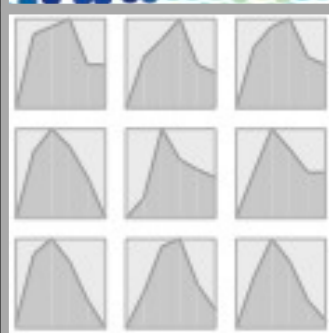
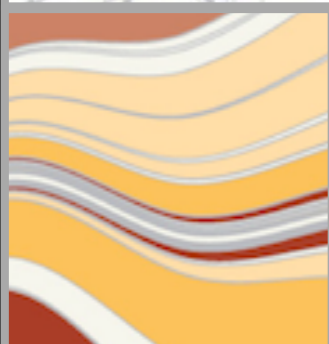
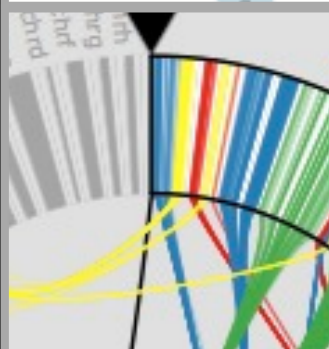
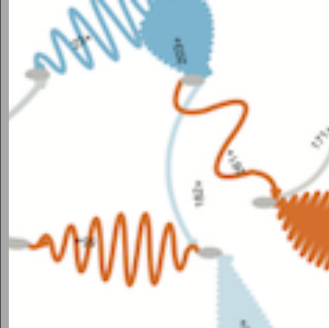


cs6964 | March 22 2012

DESIGN STUDIES

Miriah Meyer
University of Utah

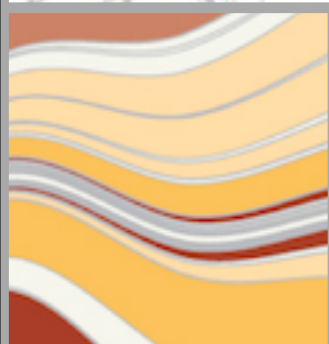
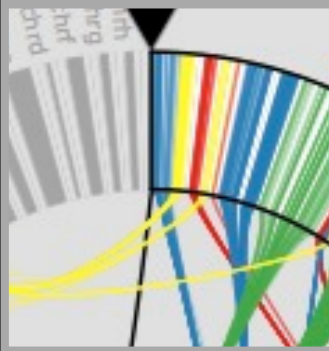
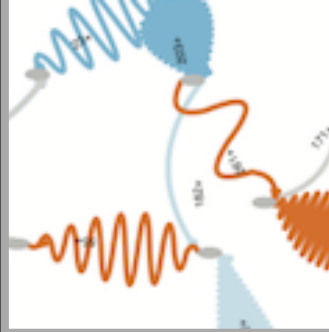


cs6964 | March 22 2012

DESIGN STUDIES

Miriah Meyer
University of Utah

slide acknowledgements:
Tamara Munzner, UBC



administrivia

feb 14-23 : proposal meetings

march 7 : presentation topics due

march 9 : proposals due

march 27-29: project updates

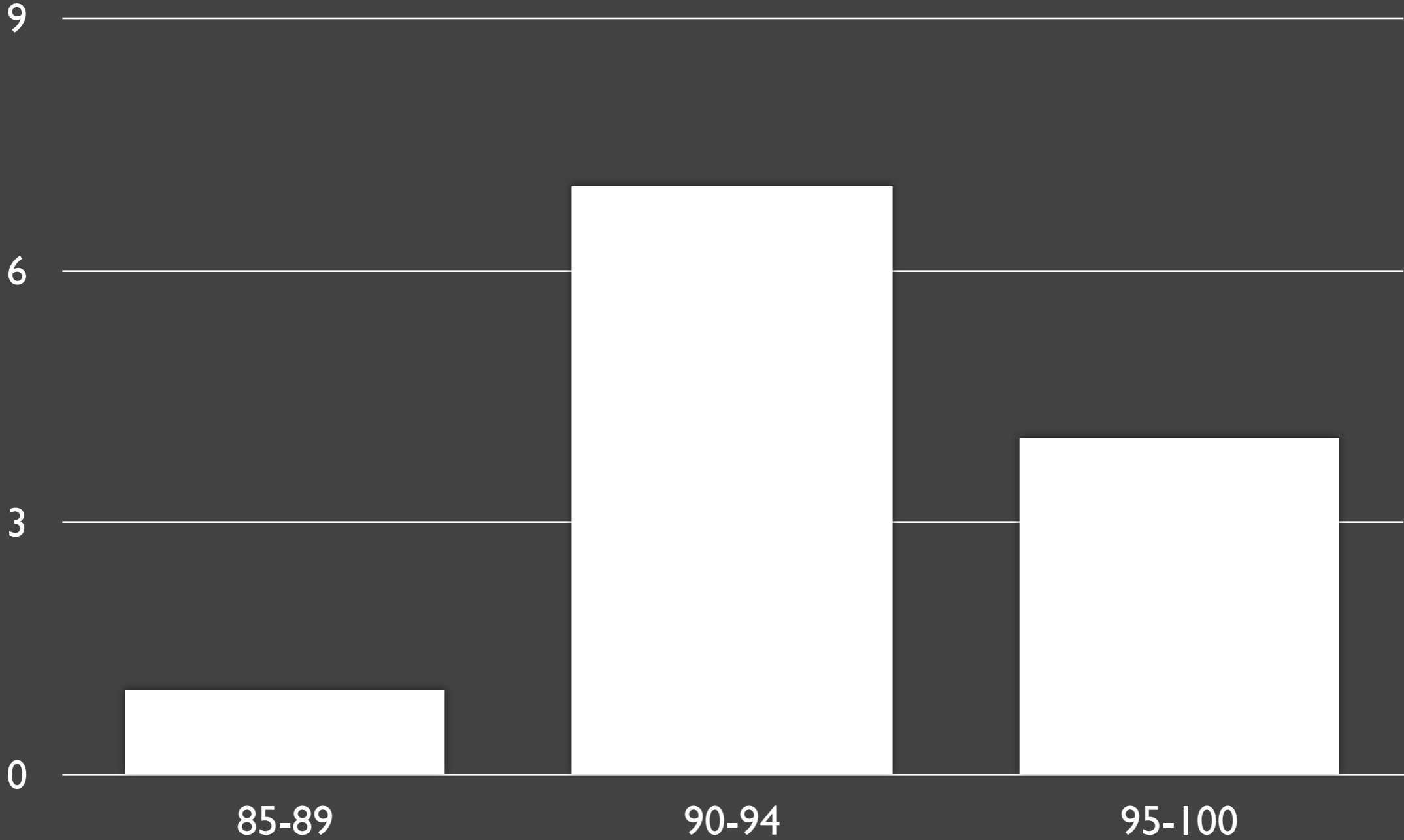
april 3-24 : paper presentations

may 1 : final project presentations

may 3 : process books due

AVE = 92.4

GRADES



last time...

-toolkits and languages

- tableau public

- d3

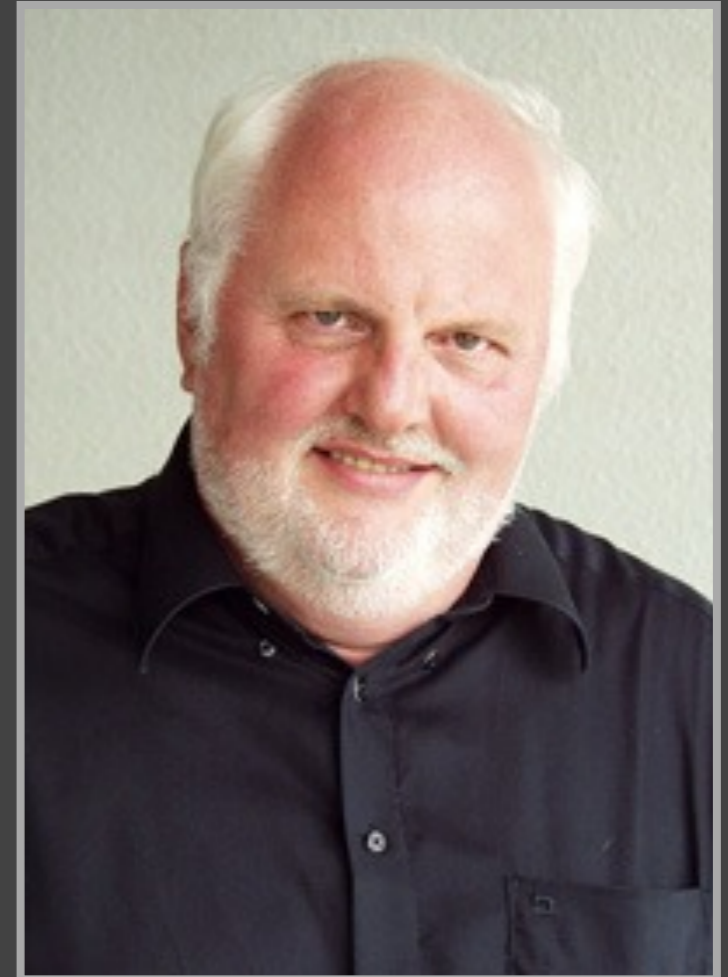
- processing

-tips for giving a talk

HOW TO GIVE A TALK

- move around**
- vary the pitch of your voice**
- speak loudly and clearly, and face the audience**
- summarize your talk at the beginning and end**
- finish within your time limit**
- practice, practice, practice**

DEALING WITH NERVES



Hans Hagen

NUTS & BOLTS



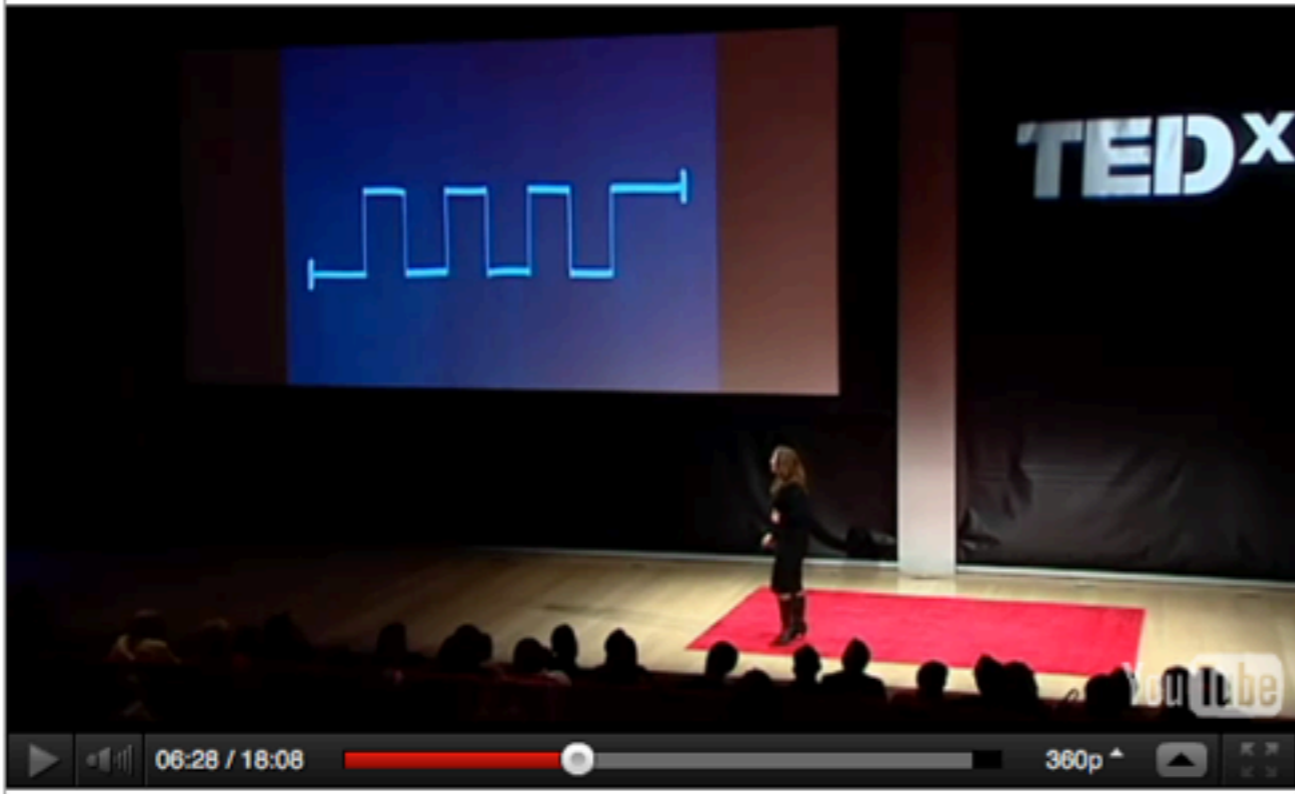
Talks	TED Conferences	TED Conversations	About TED
Speakers	TEDx Events	TED Community	TED Blog
Themes	TED Prize		TED Initiatives
Translations	TED Fellows		

Search

TALKS | TEDx

Nancy Duarte: The secret structure of great talks

TEDxEast, Filmed Nov 2011; Posted Feb 2012 **TEDx**



420,193 Views 8k

From the "I have a dream" speech to Steve Jobs' iPhone launch, all great presentations have a common architecture. At TEDxEast, Nancy Duarte draws lessons on how to make a powerful call-to-action.

Nancy Duarte believes that ideas are the most powerful tools people have. Her passion is to help every person learn to communicate their world-changing idea effectively. [Full bio »](#)

Watch 10,000+ more videos from independent **TEDx events** on the **TEDxTalks channel**»
tedxtalks.ted.com

This talk was filmed at an independently organized TEDx event. [Rate](#)

[Watch more TEDxTalks »](#)
[Learn more about the TEDx Program »](#)
[Learn more about TEDxEast »](#)

Tweet this talk! (we'll add the headline and the URL) [Post to:](#)

- ### WHAT TO WATCH NEXT
- David S. Rose on pitching to VCs**
14:39 Posted: Sep 2008
Views 255,759 | Comments 75
 - Joe Sabia: The technology of storytelling**
03:51 Posted: Nov 2011
Views 569,258 | Comments 102

STRUCTURE

-rule-of-thumb: you have 2 minutes to engage your audience before they doze off

- Why should I stay awake for this talk?
- What is the problem?
- Why is it an interesting problem?

-starting with the outline is a waste of time

STRUCTURE

- talk about the problem**
- talk about the solution**
- talk about where this will lead us**

- repeat**

SLIDES

-background

- choose solid color, preferable white or black
- don't let the background compete with the foreground

-avoid too much text

- no full sentences

-keep the text readable

- rule-of-thumb: nothing smaller than 28 pt font

-save animation for emphasis

Williams's design principles

C
R
A
P

Williams's design principles

Contrast

Repetition

Alignment

Proximity

PRINCIPLE OF CONTRAST

If two items are not exactly the same, then make them different. Really different.

Don't be a wimp.

ANOTHER NEWSLETTER!

J a n u a r y F i r s t 2 0 0 5

Exciting Headline

Wants pawn term dare worsted ladle
gull hoe hat search putty yowler coils
debt pimple colder Guilty Looks. Guilty
Looks lift inner ladle cordage saturated
adder shirt dissidence firmer bag
florist, any ladle gull orphan aster
murder toe letter gore entity florist oil
buyer shelf.

Thrilling Subhead

"Guilty Looksl" crater murder angularly,
"Hominy terms area garner asthma
suture stooped quiz-chin? Golter door
florist? Sordidly nurl"

"Wire nut, murder?" wined Guilty Looks,
hoe dint peony tension tore murder's
scaldings.

"Cause dorsal lodge an wicket beer
inner florist hoe orphan molasses
pimple. Ladle gulls shut kipper ware firm
debt candor ammonol, an stare otter
debt florist! Debt florist's mush toe
dentures furry ladle gull!"

Another Exciting Headline

Wail, pimple oil-wares wander doe
wart udder pimple dum wampum toe
doe. Debt's jest hormone nurture.

Wan moaning, Guilty Looks dissipater
murder, an win entity florist. Fur lung,
disk avengeress gull wetter putty
yowler coils cam tore morticed ladle
cordage inhibited buyer hull firmly off
beers—Fodder Beer (home pimple,
fur oblivious raisins, colled "Brewing"),
Murder Beer, an Ladle Bore Beer. Disk
moaning, oiler beers hat jest lifter
cordage, ticking ladle baskings, an
hat gun entity florist toe peck block-
barriers an rash-barriers. Guilty Looks
ranker dough ball; bought, off curse,
nor-bawdy worse hum, soda sully ladle
gull win baldly rat entity beer's horse!

Boring Subhead

Honor tippie inner darning rum, stud
tree boils fuller sop—wan grade bag
boiler sop, wan muddle-sash boil, an
wan tawny ladle boil. Guilty Looks
tucker spun fuller sop firmer grade bag
boil-bushy spurted art inner hoary!

"Archi" crater gull, "Debt sop's toe
hart—barns mar mouse!"

Dingy traitor sop inner muddle-sash
boil, witch worse toe coiled. Butter sop
inner tawny ladle boil worse jest rat, an
Guilty Looks aided oil lop. Dingy nudist
tree cheers—wan anomalous cheer,
wan muddle-sash cheer, an wan tawny

Another Newsletter!

J a n u a r y F i r s t 2 5 2 5

Exciting Headline

Wants pawn term dare worsted ladle
gull hoe hat search putty yowler coils
debt pimple colder Guilty Looks. Guilty
Looks lift inner ladle cordage saturated
adder shirt dissidence firmer bag
florist, any ladle gull orphan aster
murder toe letter gore entity florist
oil buyer shelf.

Thrilling Subhead

"Guilty Looksl" crater murder angularly,
"Hominy terms area garner asthma
suture stooped quiz-chin? Golter door
florist? Sordidly nurl"

"Wire nut, murder?" wined Guilty Looks,
hoe dint peony tension tore murder's
scaldings.

"Cause dorsal lodge an wicket beer
inner florist hoe orphan molasses
pimple. Ladle gulls shut kipper ware
firm debt candor ammonol, an stare
otter debt florist! Debt florist's mush
toe dentures furry ladle gull!"

Another Exciting Headline

Wail, pimple oil-wares wander doe
wart udder pimple dum wampum toe
doe. Debt's jest hormone nurture.

Wan moaning, Guilty Looks dissipater
murder, an win entity florist. Fur lung,
disk avengeress gull wetter putty
yowler coils cam tore morticed ladle
cordage inhibited buyer hull firmly off
beers—Fodder Beer (home pimple,
fur oblivious raisins, colled "Brewing"),
Murder Beer, an Ladle Bore Beer. Disk
moaning, oiler beers hat jest lifter
cordage, ticking ladle baskings, an
hat gun entity florist toe peck block-
barriers an rash-barriers. Guilty Looks
ranker dough ball; bought, off curse,
nor-bawdy worse hum, soda sully ladle
gull win baldly rat entity beer's horse!

Boring Subhead

Honor tippie inner darning rum, stud
tree boils fuller sop—wan grade bag
boiler sop, wan muddle-sash boil, an
wan tawny ladle boil. Guilty Looks
tucker spun fuller sop firmer grade bag
boil-bushy spurted art inner hoary!

"Archi" crater gull, "Debt sop's toe
hart—barns mar mouse!"

Dingy traitor sop inner muddle-sash
boil, witch worse toe coiled. Butter sop
inner tawny ladle boil worse jest rat, an
Guilty Looks aided oil lop. Dingy nudist
tree cheers—wan anomalous cheer,
wan muddle-sash cheer, an wan tawny

PRINCIPLE OF REPETITION

Repeat some aspect of the design throughout the entire piece.

Terence English

- Stratford-upon-Avon, England

Objective

- To make money

Education

- Stratford Grammar School, I think
- Definitely not University

Employment

- Actor
- Play broker
- Shareholder of Globe Theatre

Favorite Activities

- Suing people for small sums
- Chasing women

References available upon request.

REPETITIONS

bold typeface

light typeface

square bullets

indents

spacing

alignments

PRINCIPLE OF ALIGNMENT

Nothing should be placed on the page arbitrarily. Every item should have a visual connection with something else.

Ralph Roister Doister

(717) 555-1212

Mermaid Tavern

1027 Bread Street

London, NM

Mermaid Tavern

Ralph Roister Doister

1027 Bread Street
London, NM
(717) 555-1212

strength of edge gives
strength to the layout

Mermaid Tavern

Ralph Roister Doister

1027 Bread Street
London, NM
(717) 555-1212

PRINCIPLE OF PROXIMITY

Group related items together . . . physical closeness implies a relationship.

Correspondences

Flowers, herbs, trees, weeds
Ancient Greeks and Romans
Historical characters

Quotes on motifs

Women

Death

Morning

Snakes

Language

Iambic pentameter

Rhetorical devices

Poetic devices

First lines

Collections

Small printings

Kitschy

Dingbats

Thematic

Villains and saints

Drinks and recipes

Music

Quizzes

Fun but difficult quizzes

Correspondences

Flowers, herbs, trees, weeds
Ancient Greeks and Romans
Historical characters

Quotes on motifs

Women

Death

Morning

Snakes

Language

Iambic pentameter

Rhetorical devices

Poetic devices

First lines

Collections

Small printings

Kitschy

Dingbats

Thematic

Villains and saints

Drinks and recipes

Music

Quizzes

Fun but difficult quizzes

FOR YOUR PRESENTATIONS

UPDATE PRESENTATIONS

- what you are doing and why**
- data and task abstraction**
- plan for analyzing data**
- design of system or detail of tools you plan to use**
- progress you've made so far**

PAPER PRESENTATIONS

- analysis of the methods and papers**

- use the language and framework discussed in class

- critique of the methods and papers**

- have an opinion!
- argue your point based on what we've been talking about this semester

VISUALIZATION FRAMEWORK CHEAT SHEET

DATA TYPES

- tabular
- networks
- text

DATA ATTRIBUTE TYPES

- categorical
- ordinal
- quantitative (sequential / diverging)

SPECIAL DATA / ATTRIBUTE SEMANTICS

- spatial / abstract
- temporal / static
- continuous / discrete
- independent / dependent

VISUALIZATION ANALYSIS TASKS

- retrieve value
- filter
- compute derived data
- find extremum
- sort
- determine range
- characterize distribution
- find outliers
- cluster
- correlate

CLASSES OF INTERACTION

- changing selection
- changing highlighting
- changing view | navigation
- changing spatial ordering | sorting

VISUAL LAYERING

- global compositing
- item-level stacking

LINKING

- linked highlighting
- linked navigation

VIEW CHOICES

- encoding: multiform
- dataset: small multiple
- data: overview + detail
- conditioning

ZOOMING

- geometric
- semantic

FOCUS + CONTEXT

- selective filtering
- geometric distortion
- selective highlighting | suppression

DESIGN STUDIES

-user-centered

-problem-driven

-real people, real problems, real data

The process of conducting a design study is the analysis by visualization researchers of a specific real-world problem faced by domain experts, the design of a visualization system that supports their work, the validation of this design, and the reflection about lessons learned in order to refine visualization design guidelines.

translate tasks and data from domain-specific form into abstractions that can be addressed through visualization

The process of conducting a design study is the **analysis** by visualization researchers of a specific real-world problem faced by domain experts, the design of a visualization system that supports their work, the validation of this design, and the reflection about lessons learned in order to refine visualization design guidelines.

the core contribution of a design study is solving a real-world problem; real users and real data are mandatory

collaboration between visualization researchers and domain experts is fundamental and mandatory

The process of conducting a design study is the analysis by visualization researchers of a specific **real-world** problem faced by domain experts, the design of a visualization system that supports their work, the validation of this design, and the reflection about lessons learned in order to refine visualization design guidelines.

creative process of searching through a vast space of possibilities to select one of many possible good choices from the backdrop of the far larger set of bad choices

successful design typically requires the explicit consideration of multiple alternatives

The process of conducting a design study is the analysis by visualization researchers of a specific real-world problem faced by domain experts, the **design** of a visualization system that supports their work, the validation of this design, and the reflection about lessons learned in order to refine visualization design guidelines.

*crucial aspect is the validation of both the
problem analysis and the design*

The process of conducting a design study is the analysis by visualization researchers of a specific real-world problem faced by domain experts, the design of a visualization system that supports their work, the **validation** of this design, and the reflection about lessons learned in order to refine visualization design guidelines.

design becomes research when reflection leads to improving the process of design itself, by confirming, refining, rejecting, or proposing guidelines

The process of conducting a design study is the analysis by visualization researchers of a specific real-world problem faced by domain experts, the design of a visualization system that supports their work, the validation of this design, and the **reflection** about lessons learned in order to refine visualization design guidelines.

INFORMATION LOCATION



TASK CLARITY



INFORMATION LOCATION

head

computer

TASK CLARITY

fuzzy

not enough data

tasks too ambiguous

research space
of
design
studies

visualization
engineering

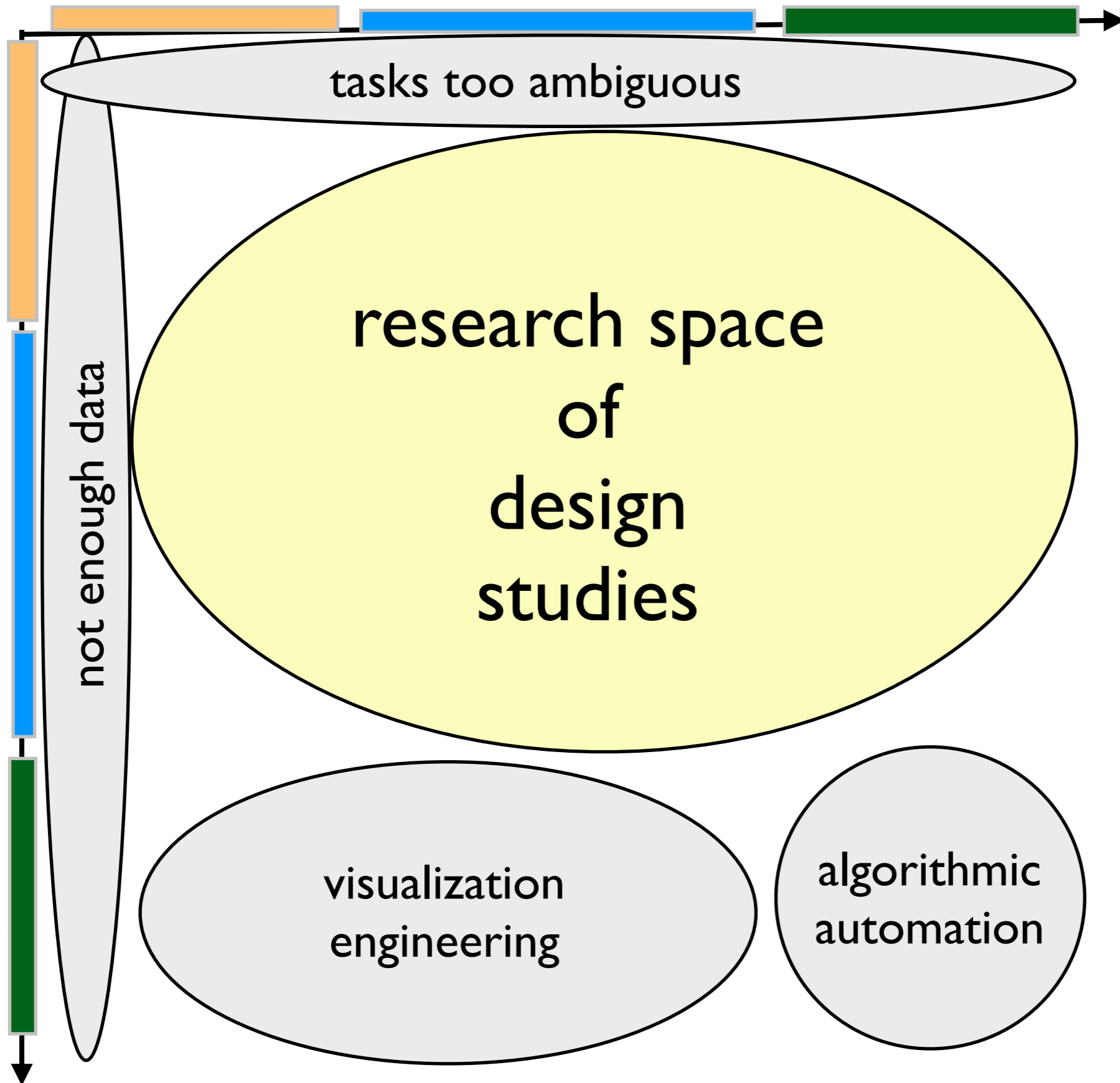
algorithmic
automation

crisp

*further problem
analysis required*

*vis solution
possible*

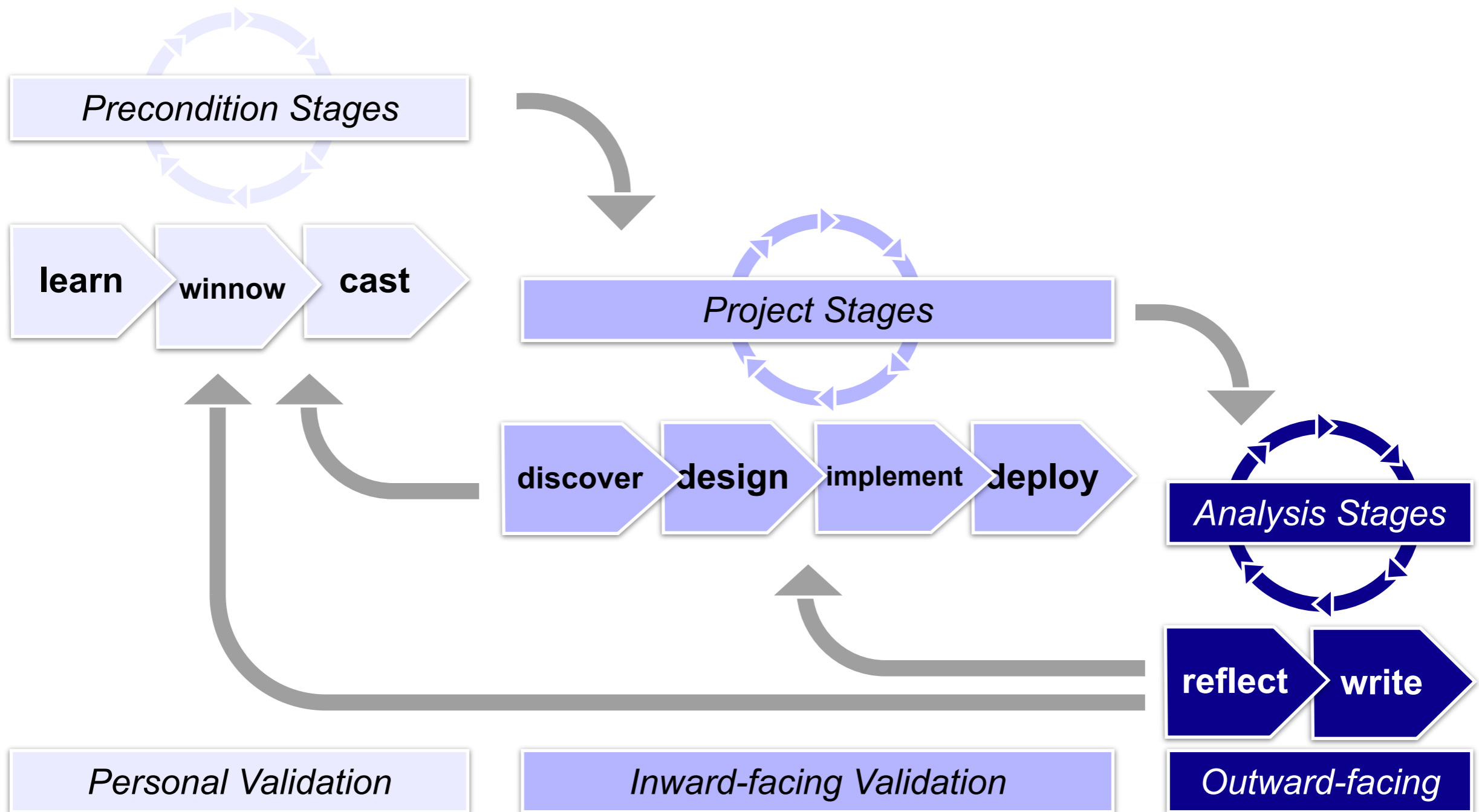
*automation
possible*



CONTRIBUTIONS

- problem characterization and abstraction**
- validated visualization design**
- reflection**

HOW DO YOU CONDUCT A DESIGN STUDY?



-learn

-winnow

-cast

-discover

-design

-implement

-deploy

-reflect

-write

-learn

-winnow

-cast

-discover

-design

-implement

-deploy

-reflect

-write

precondition is solid knowledge of
visualization literature

informs all later stages

-learn

-winnow

-cast

-discover

-design

-implement

-deploy

-reflect

-write

identify most promising collaborations

start broad, gradually narrow

practical considerations:

- *does data exist?*

- *how much time for the project?*

intellectual considerations:

- *is there an interesting vis research question?*

- *is there a real need?*

- *am i addressing a real (and important) task?*

interpersonal considerations:

- *rapport*

- *enjoyment*

-learn

awareness of roles

-winnow

-cast

front-line analyst

gatekeeper

connector

-discover

translator

co-author

-design

fellow tool builder

-implement

-deploy

-reflect

-write

-learn

-winnow

-cast

-discover

-design

-implement

-deploy

-reflect

-write

problem characterization and abstraction

insufficient:

- *just talking to users*
- *fly-on-the-wall*

contextual inquiry

- *researcher observes user “in the wild” and interrupts to ask questions when clarification is needed*

focus discussion on problems, not solutions

-learn

-winnow

-cast

-discover

-design

-implement

-deploy

-reflect

-write

data abstraction
visual encoding
interaction

consideration space of possible
solutions ...

... filter to proposal space ...

... filter to selection space

parallel ideation

-learn

-winnow

-cast

-discover

-design

-implement

-deploy

-reflect

-write

prototypes, tool, and usability

rapid prototyping

-learn

-winnnow

-cast

-discover

-design

-implement

-deploy

-reflect

-write

release and gather feedback

goal is to validate system “in the wild”

confirmed by:

- *perform task faster, more effectively, or for the first time ever*

- *changing perception of problem*

many methods proposed in literature

- *case studies vs lab studies*

-learn

confirm, refine, reject, propose guidelines

-winnow

-cast

-discover

-design

-implement

-deploy

-reflect

-write

-learn

-winnow

-cast

-discover

-design

-implement

-deploy

-reflect

-write

writing a design study paper takes longer than writing a technique paper!

most often need to revisit and refine abstraction

does not have to be a design study paper

MizBee: A Multiscale Synteny Browser

Miriah Meyer, Tamara Munzner, *Member, IEEE*, and Hanspeter Pfister, *Senior Member, IEEE*

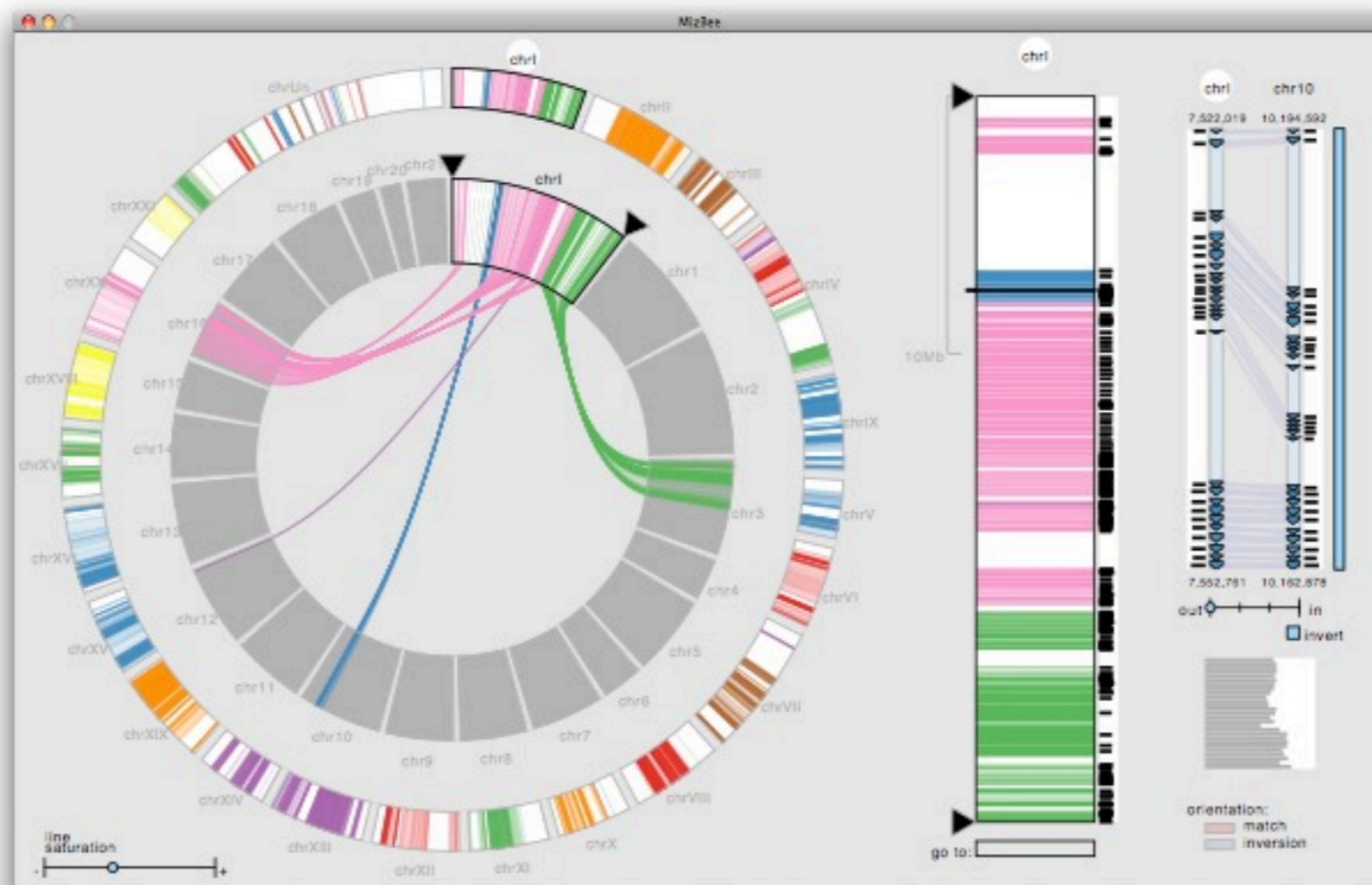


Fig. 1. The multiscale MizBee browser allows biologists to explore many kinds of conserved synteny relationships with linked views at the genome, chromosome, and block levels. Here we compare the genomes of two fish, the stickleback and the pufferfish.

Abstract—In the field of comparative genomics, scientists seek to answer questions about evolution and genomic function by comparing the genomes of species to find regions of shared sequences. Conserved syntenic blocks are an important biological data abstraction for indicating regions of shared sequences. The goal of this work is to show multiple types of relationships at multiple scales in a way that is visually comprehensible in accordance with known perceptual principles. We present a task analysis for this domain where the fundamental questions asked by biologists can be understood by a characterization of relationships into the four types of proximity/location, size, orientation, and similarity/strength, and the four scales of genome, chromosome, block, and genomic feature. We also propose a new taxonomy of the design space for visually encoding conservation data. We present MizBee, a multiscale synteny browser with the unique property of providing interactive side-by-side views of the data across the range of scales supporting exploration of all of these relationship types. We conclude with case studies from two biologists who used MizBee to augment their previous automatic analysis work flow, providing anecdotal evidence about the efficacy of the system for the visualization

-domain

- comparative genomics

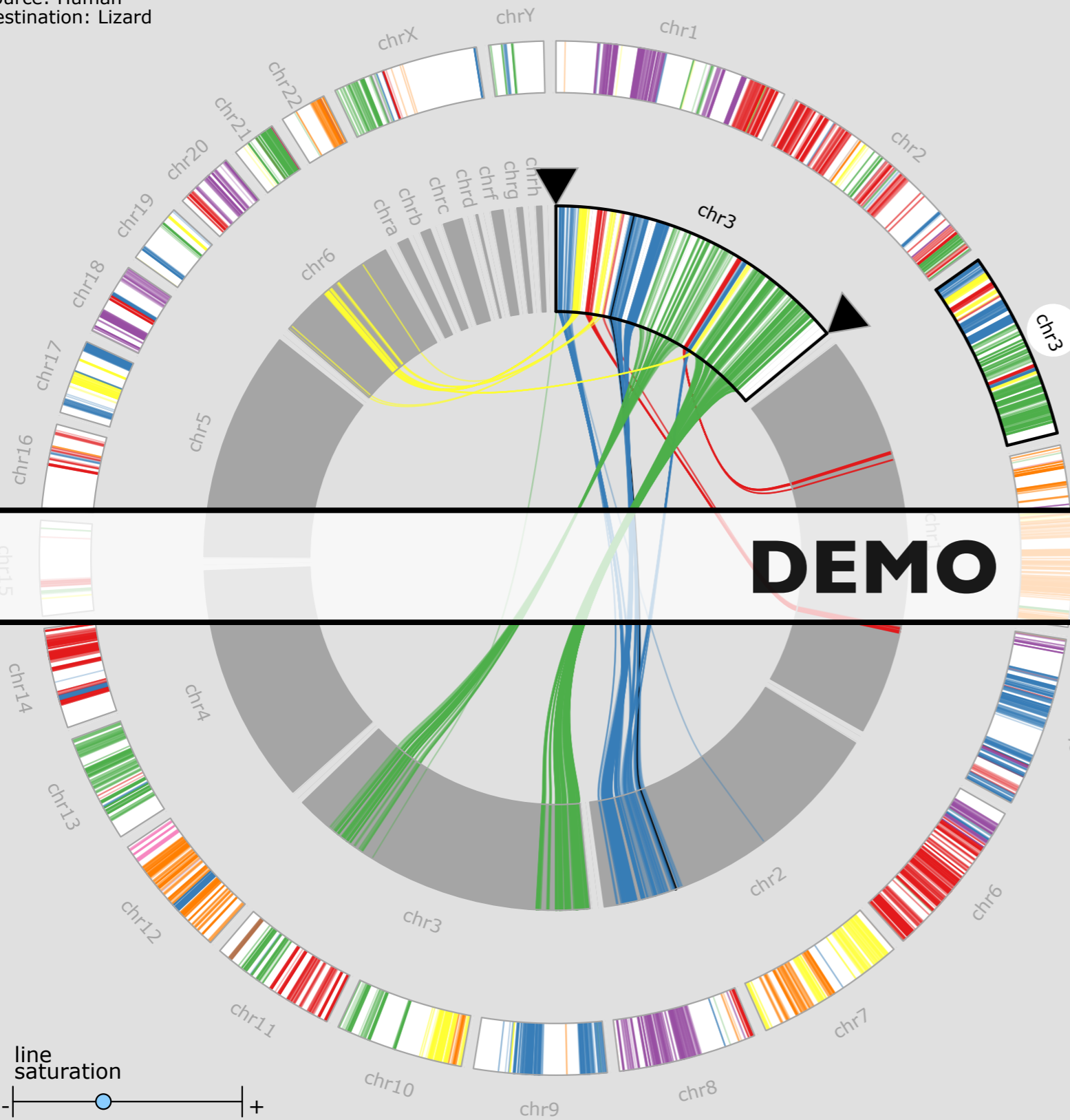
-data

- multiscale
 - *genome*
 - *chromosome*
 - *block*
 - *feature*

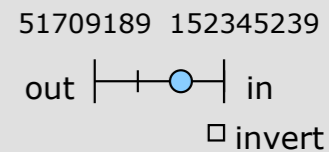
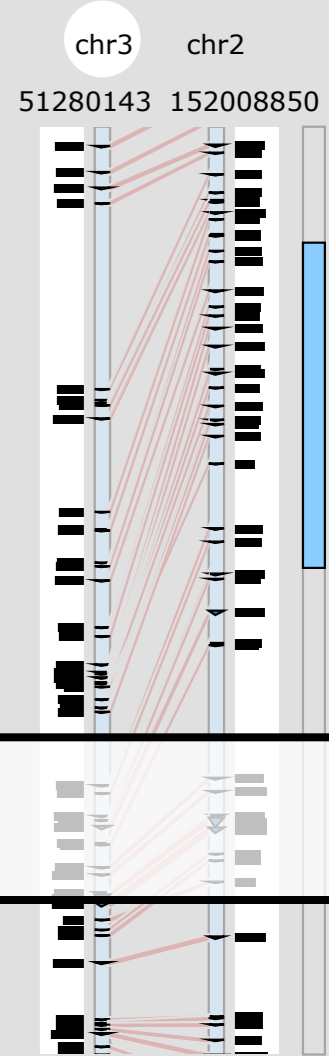
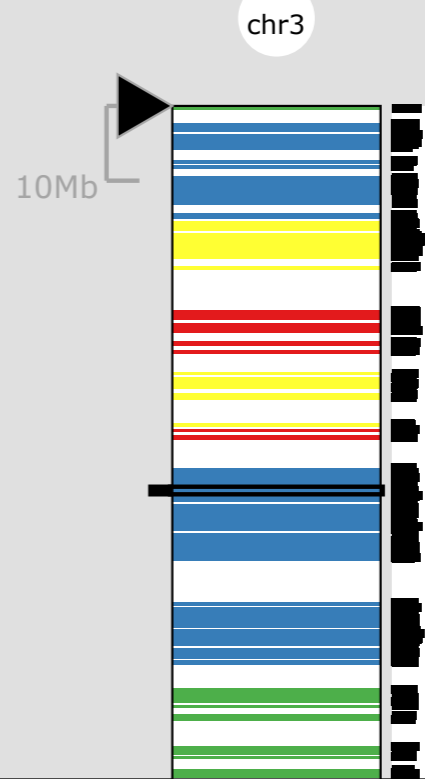
-task

- syntenic relationship: features on the same chromosome
 - *proximity and location*
 - *size*
 - *orientation*
 - *similarity*

source: Human
destination: Lizard

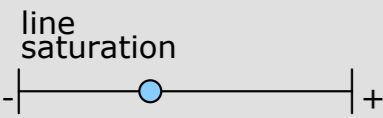


DEMO



orientation:
■ match
■ inversion

go to:



VISUAL ENCODING

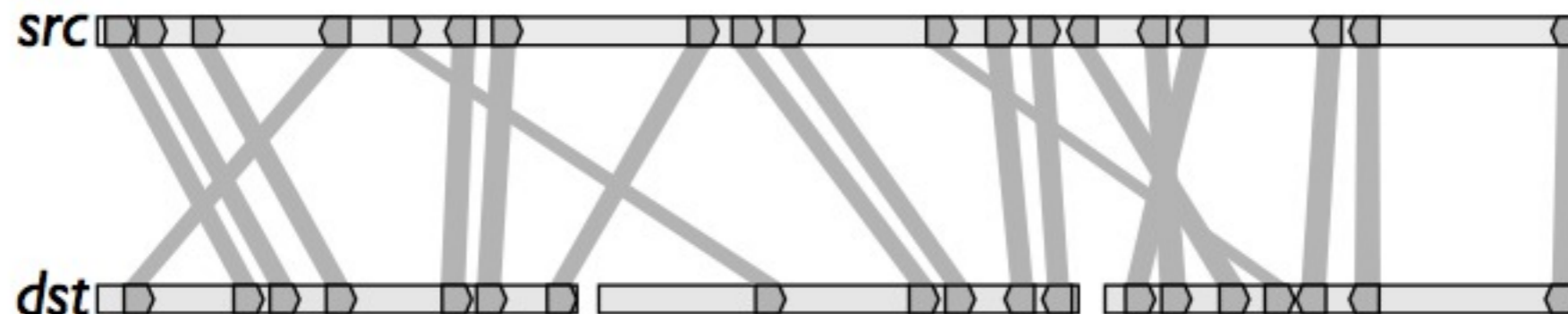
-color limits

- no info about destination
- <12 distinguishable colors


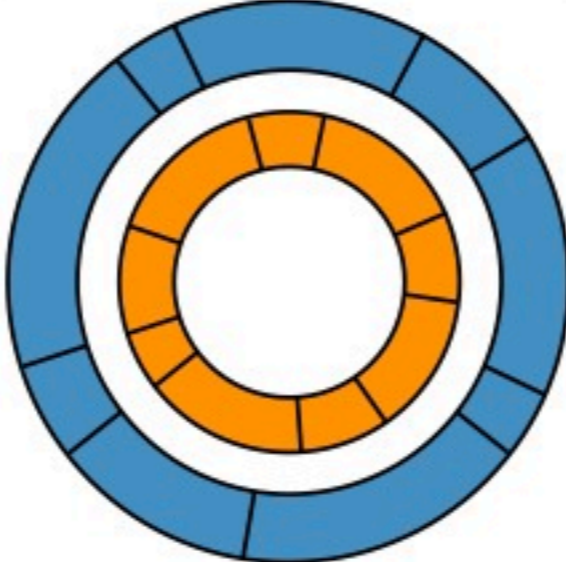
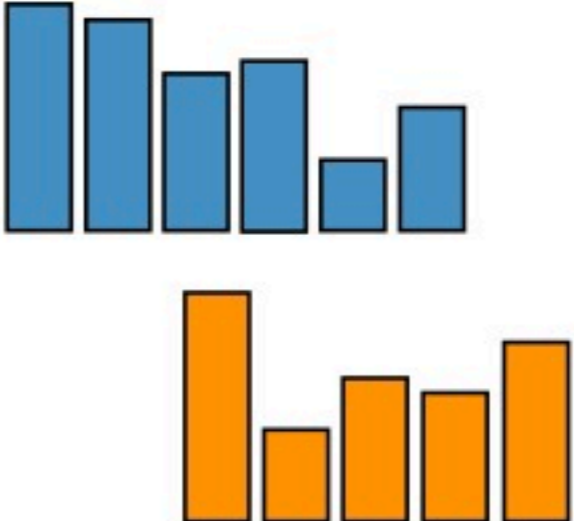

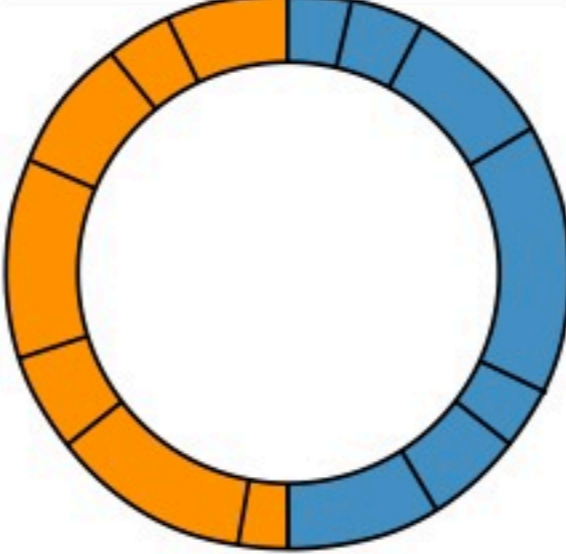
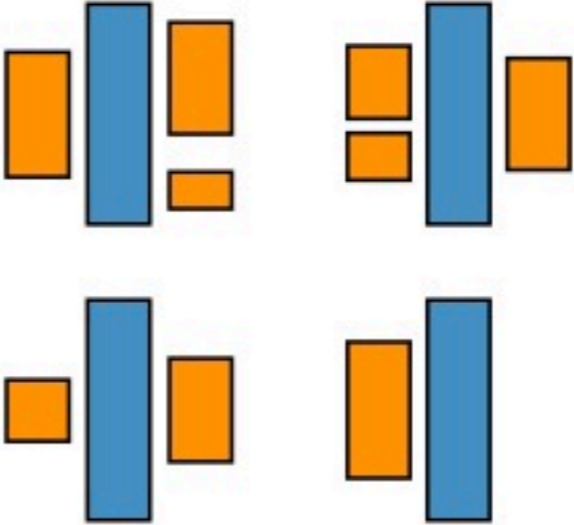


-connection limits

- visual clutter



TAXONOMY

		<i>contiguous</i>		<i>discrete</i>			
		<i>linear</i>	<i>circular</i>				
<i>separate</i>				<i>segregated</i>			
<i>combined</i>				<i>interleaved</i>			

TECHNIQUES

- multiple linked views**

- overview + detail: 3 levels**

- genome: separate-circular, color and connection
 - *edge-bundling*
- chromosome: rectangular, color
 - *more screenspace for details*
 - *histograms for block stats*
 - *annotations for marking feature positions*
- block: connection
 - *separate + contiguous histograms for feature stats*

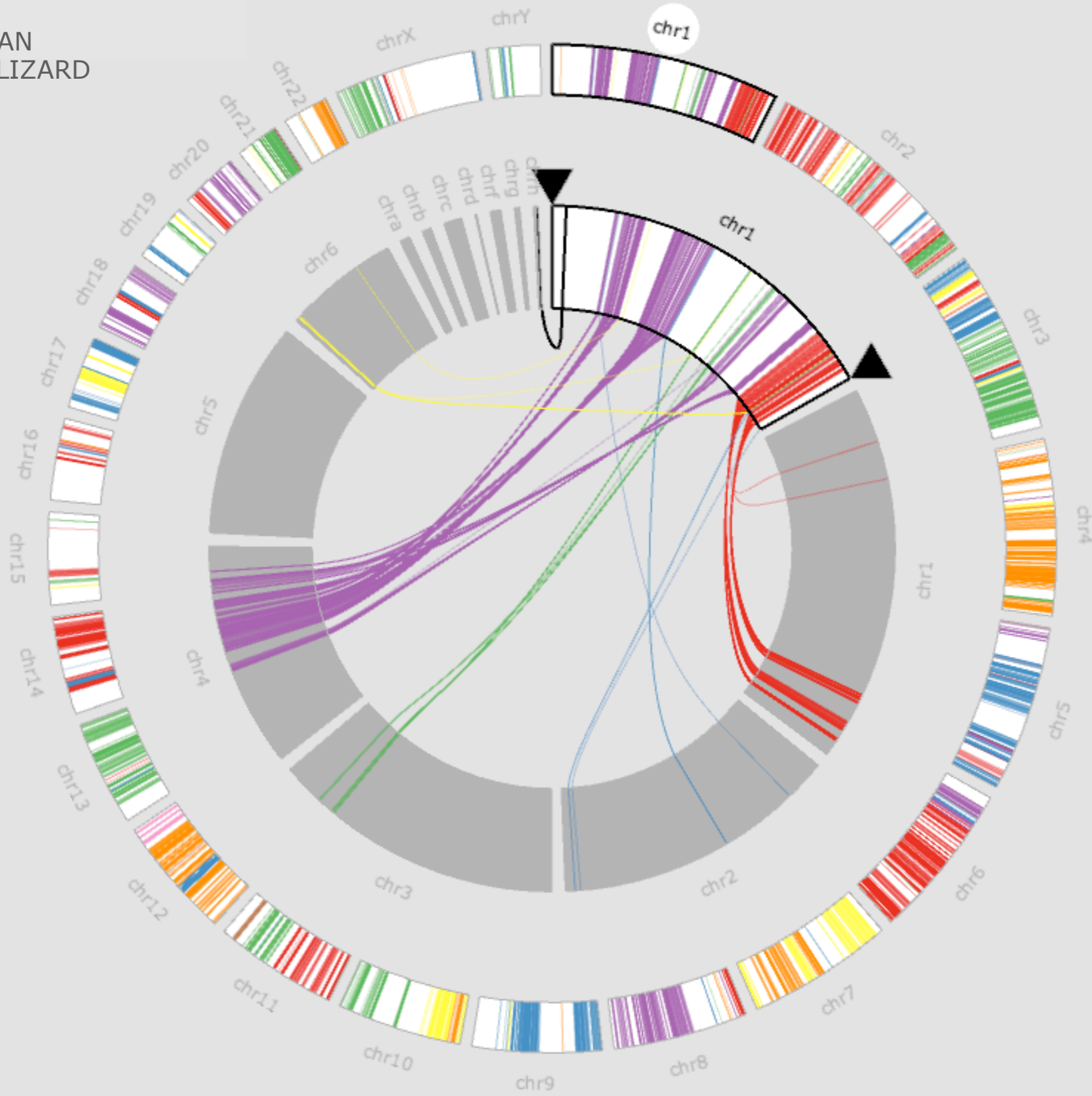
CASE STUDY



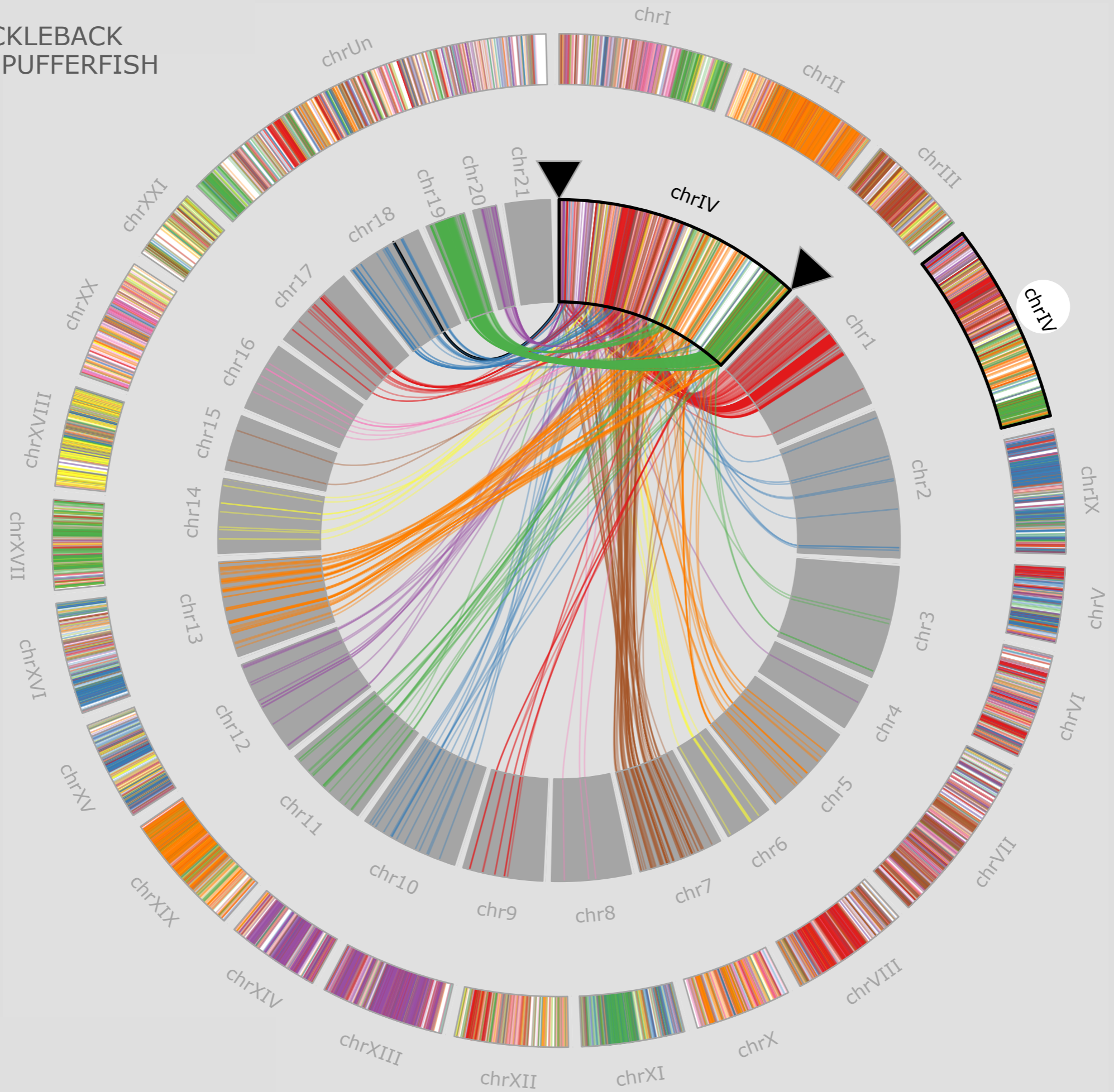
MANFRED
GRABHERR



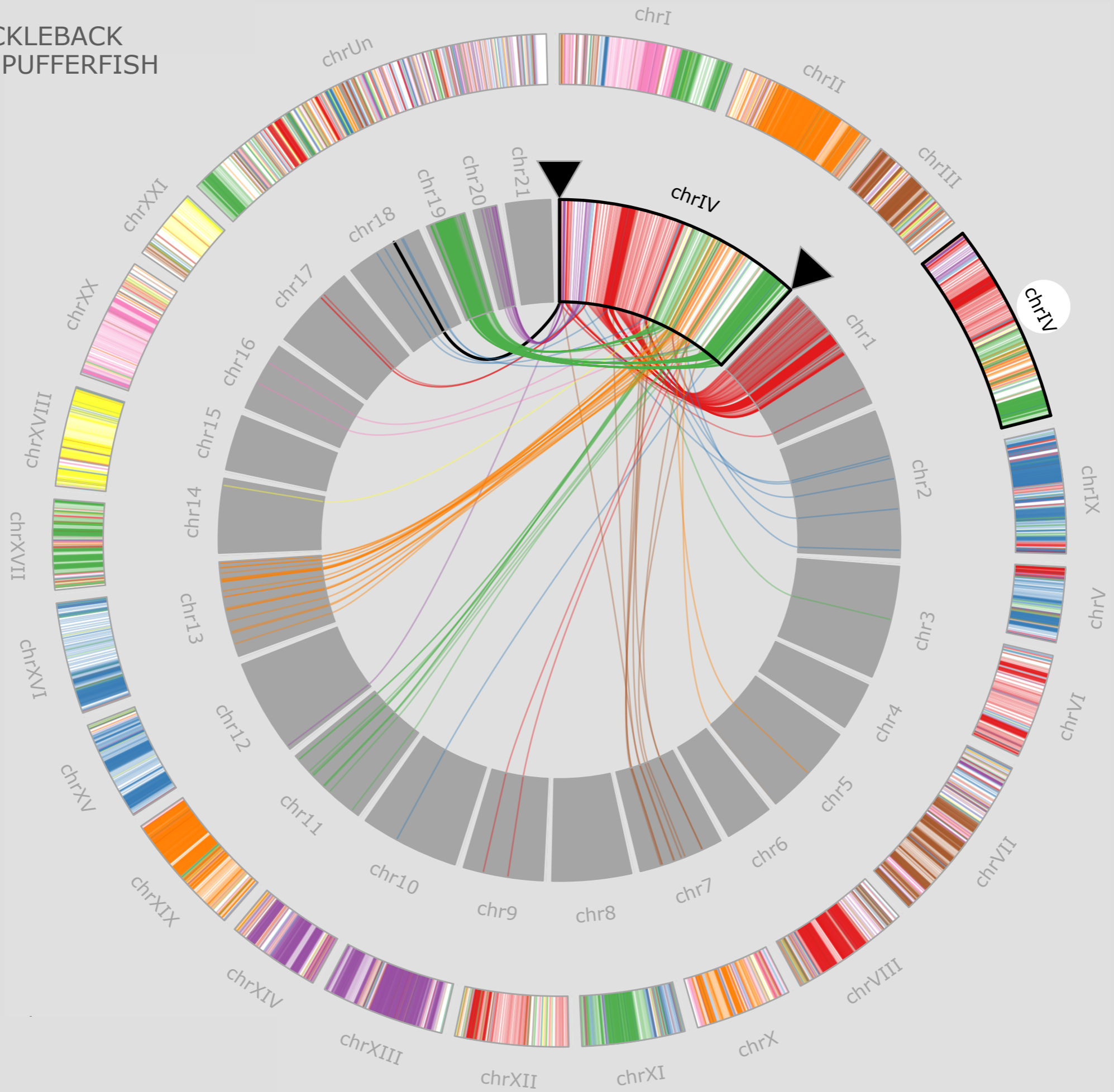
source: HUMAN
destination: LIZARD



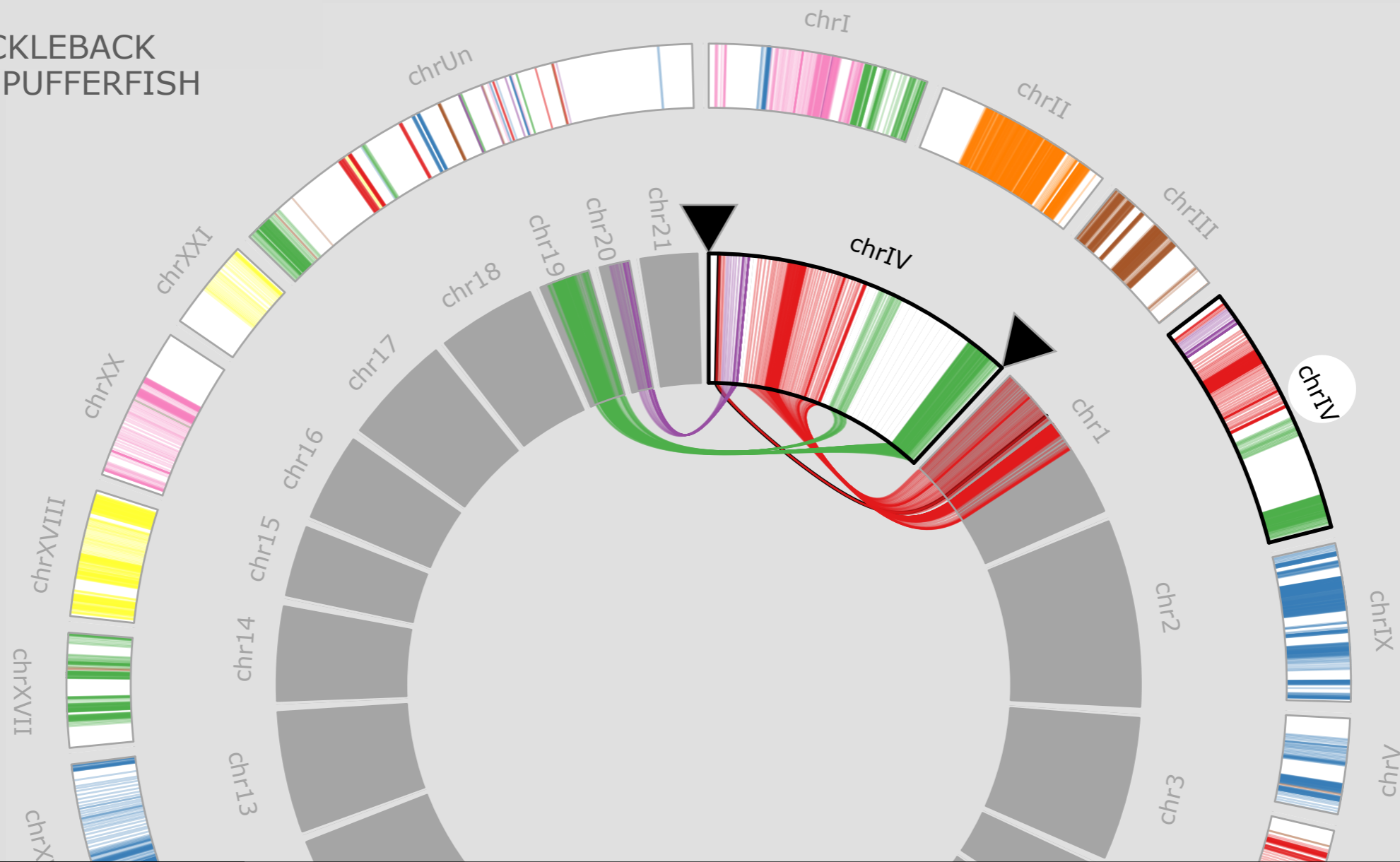
source: STICKLEBACK
destination: PUFFERFISH



source: STICKLEBACK
destination: PUFFERFISH



source: STICKLEBACK
destination: PUFFERFISH



“Honestly ... I don't think I would ever have gotten here.”



KEY IDEAS

- power of linked views for multiscale**
- abstraction from domain to generic problems**
- visual encoding choices according to known limitations**
- clutter reduction via edge bundles**
- two levels of task**
 - block reliability vs higher level science
- thoughts?**

L19

REQUIRED READING

NONE!

- **Interactive Visualizations of English Usage in Public Media.** Yuan Fang and Zhan Wang
- **The "friend" analyzer.** Chao Yang and Ian Jensen
- **Color Palette Extraction.** Clifton Brooks
- **Happiness visualization.** Nguyen Thanh Hoa and Lin Zhang
- **Collaborative Network Analysis and Visualization.** Samira Daruki and Swetha Machanavajhala
- **Visualization of earthquake data.** Chenxu Ding and Mingwang Tang