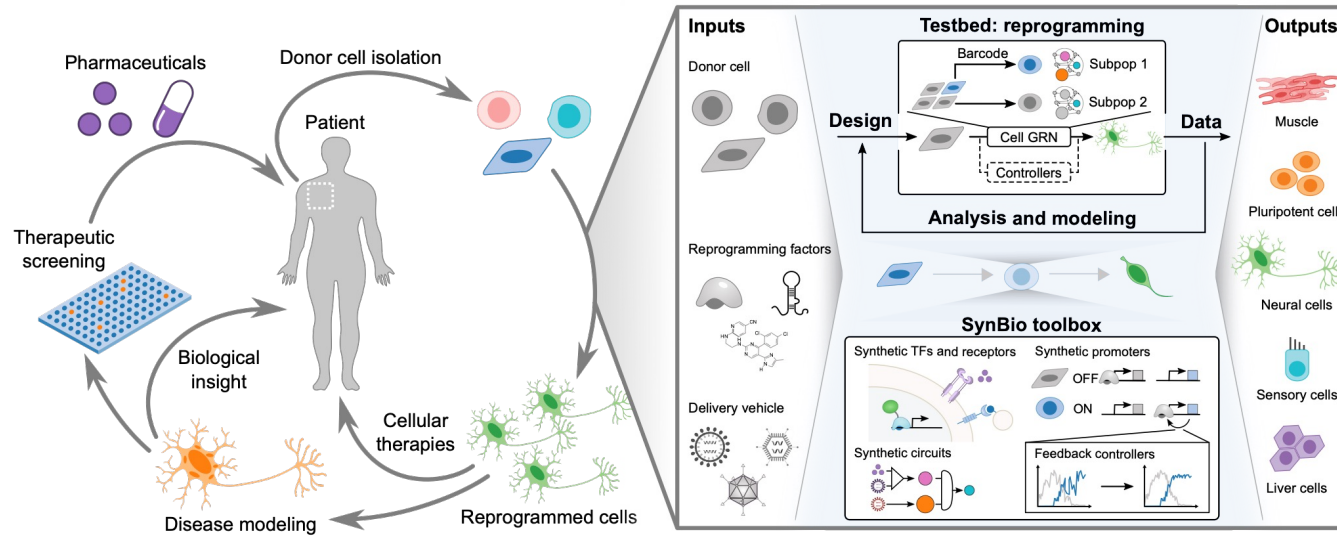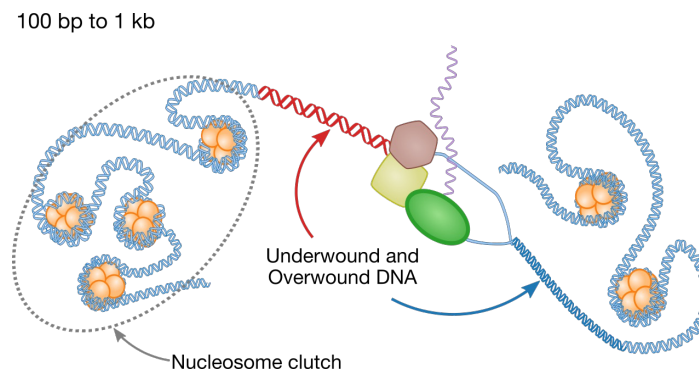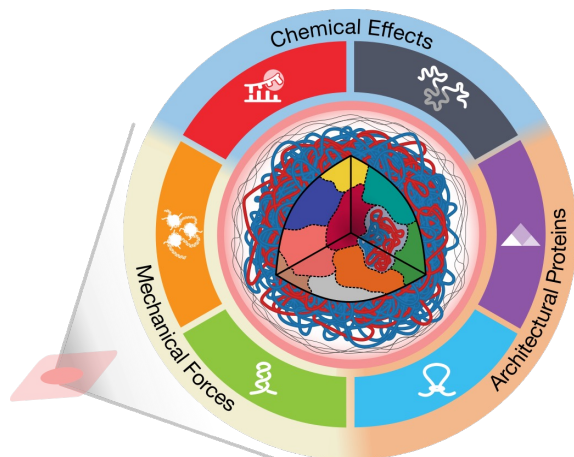# Graphic figure design

Nathan B. Wang

The Galloway Lab
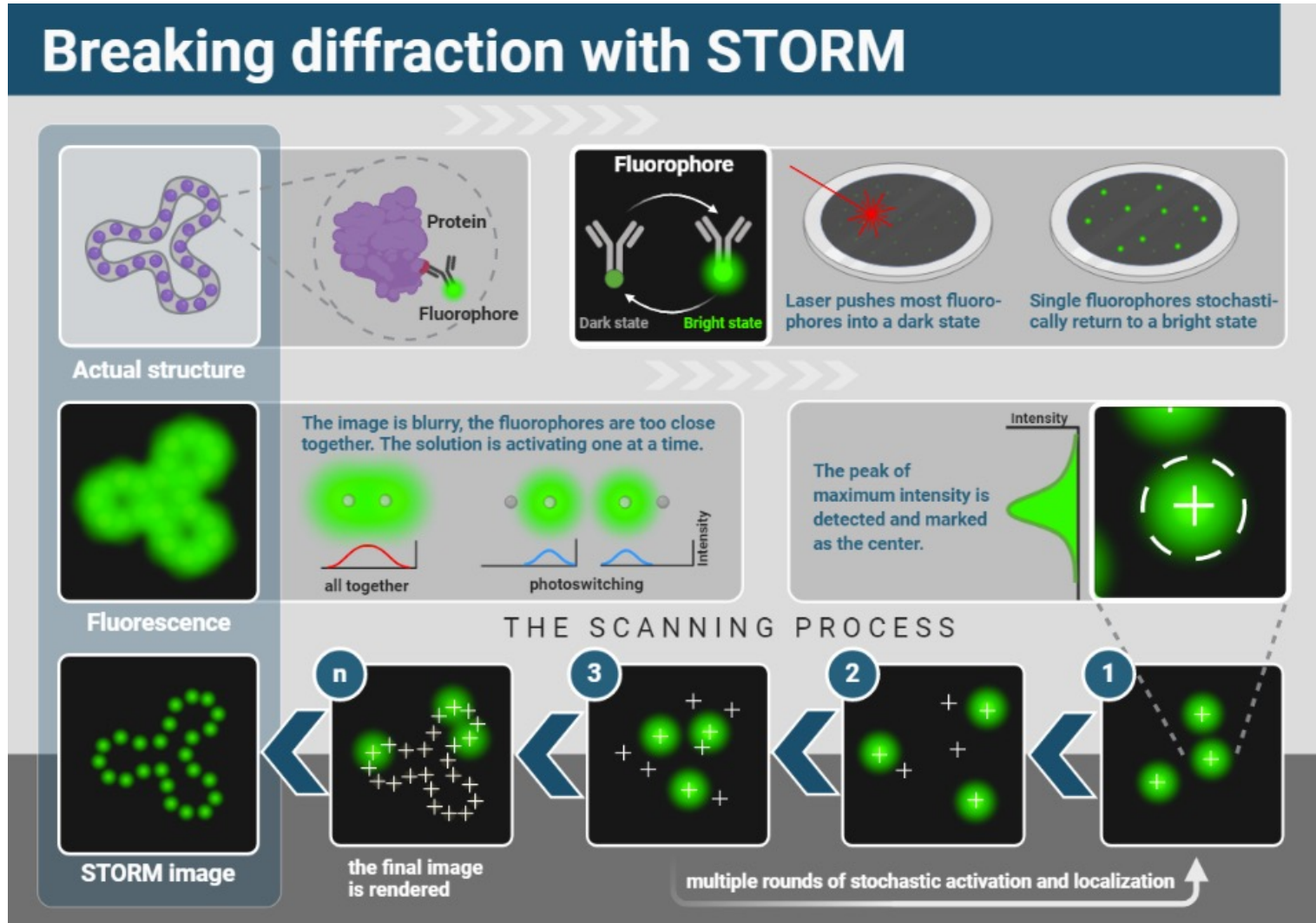MIT Department of Chemical Engineering

What do you keep in mind
when designing graphics?

Part 1

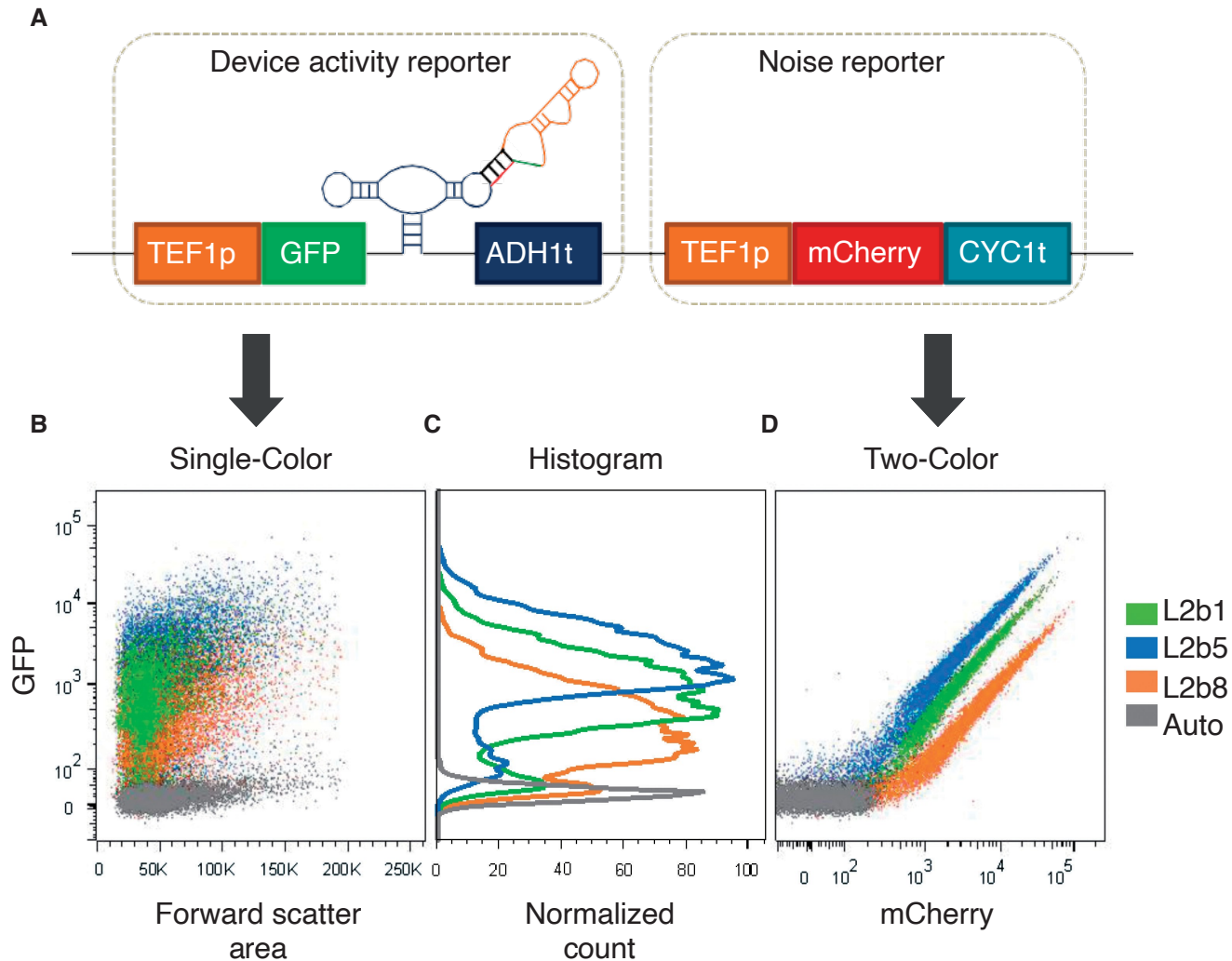Where and when do I include a figure?
What makes it a "good" figure?

Successful figures make ideas or information easy to understand

- BioRender's graphical abstract contest is a great example of these

# Successful figures make ideas or information easy to understand

- 2nd fluorescent reporter improves regulatory element screening in yeast[1]

1. Liang et al., *NAR*, 2012

Where and when do you include a figure?

1. Is there a confusing process?

2. Would it help the audience understand something? (e.g. map out interconnected ideas)

3. Is it hard to visualize or describe if you haven't seen it before?
   - Where is it happening?

- More on this next week

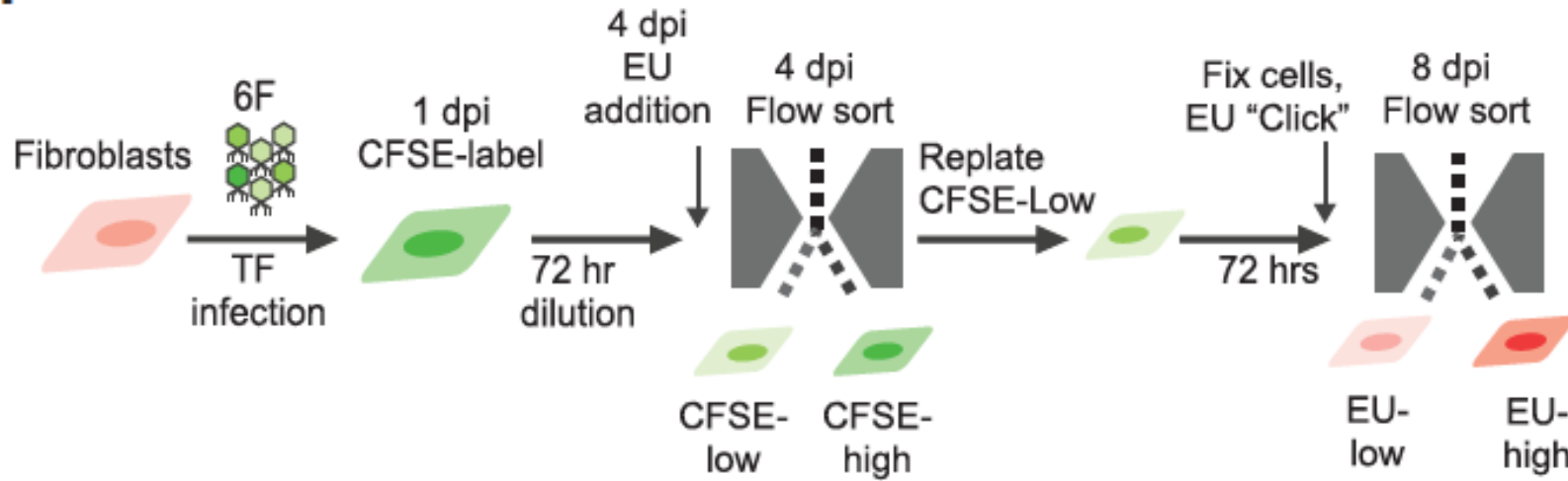# Figures that diagram a process
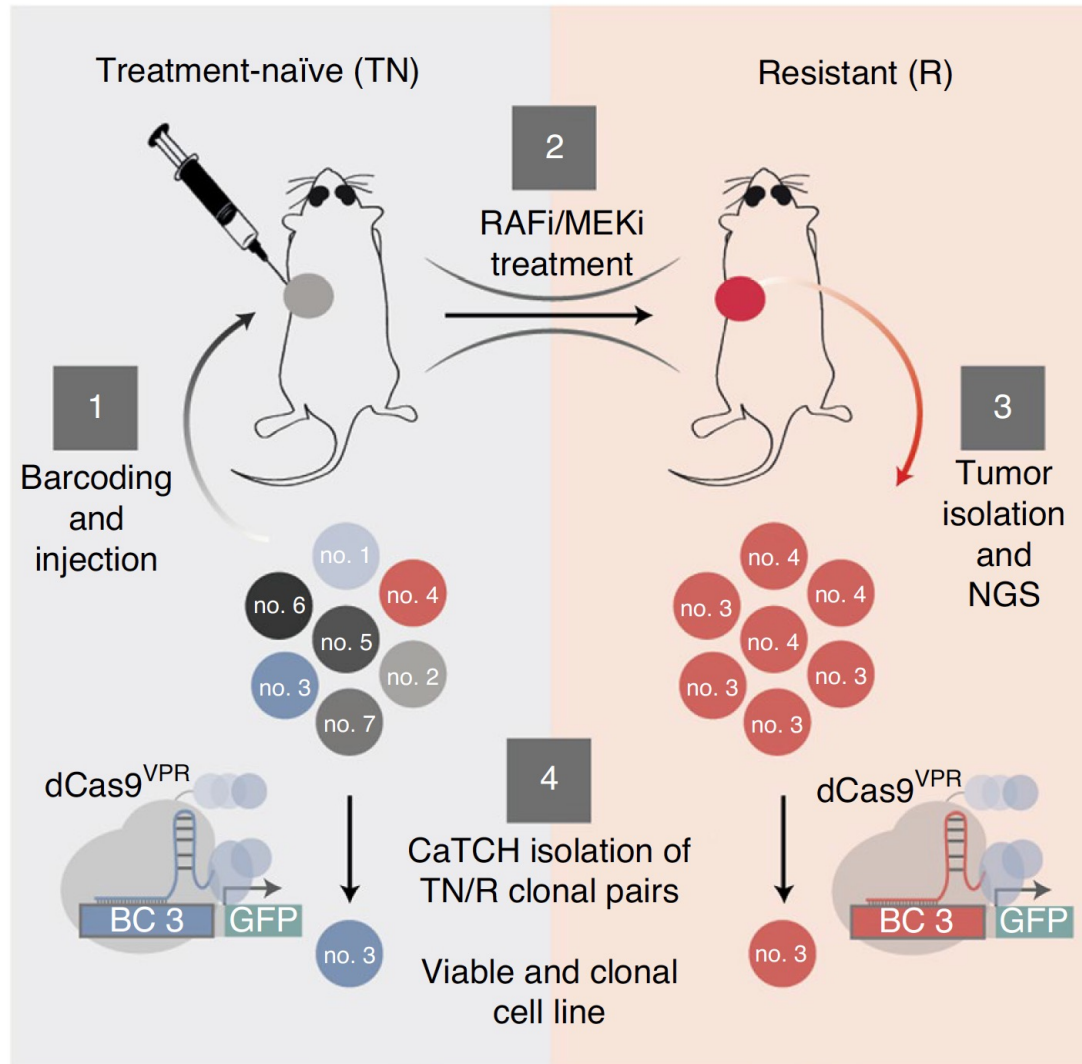
Isolating live cell clones from barcoded populations using CRISPRa-inducible reporters (Umkehrer et al., *Nat. Biotech.*, 2020)
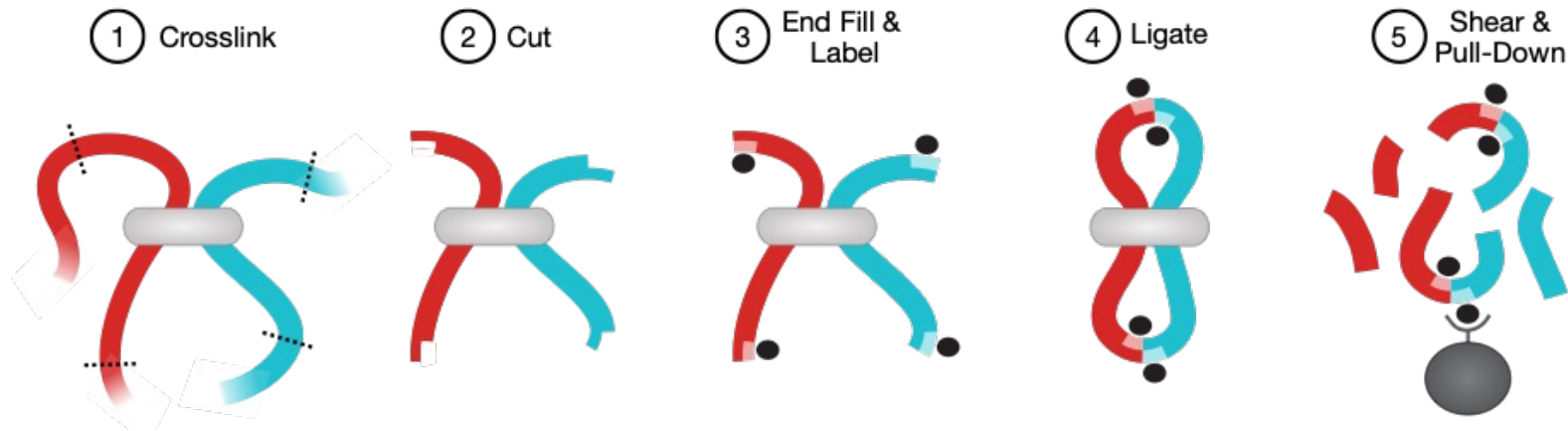
Figures that diagram a process

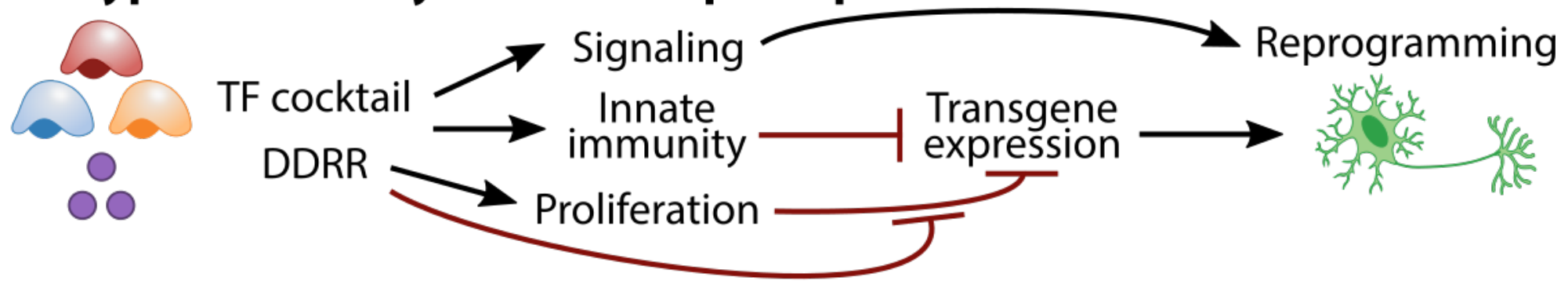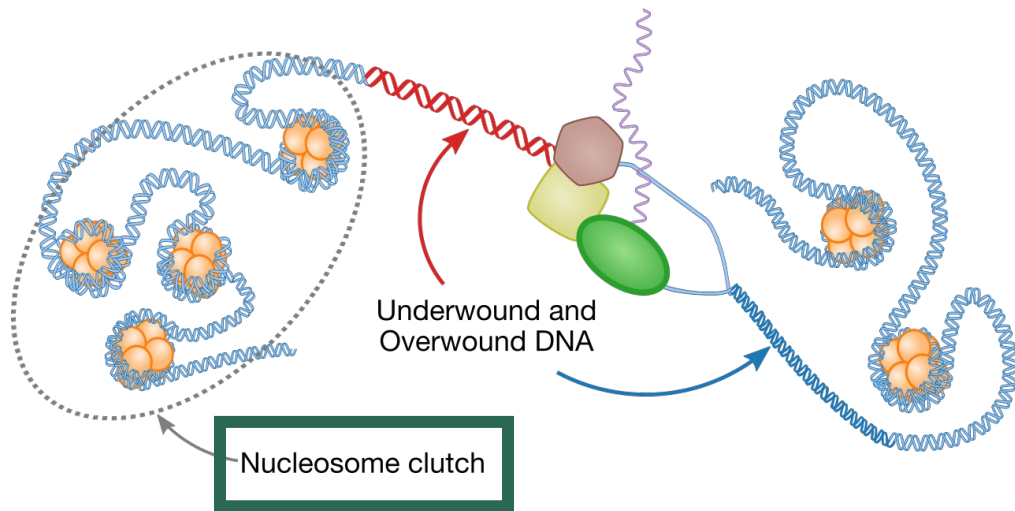Babo & Galloway et al., *Cell Stem Cell*, 2019)

Johnstone & Wang et al., *Cell Systems*, 2020)

Figures that clear up confusing ideas

A Hypothesized systems-level principles

TF cocktail → Signaling → Reprogramming

TF cocktail → Innate immunity ⊣ Transgene expression

DDRR → Proliferation

Transgene expression → Reprogramming

100 bp to 1 kb

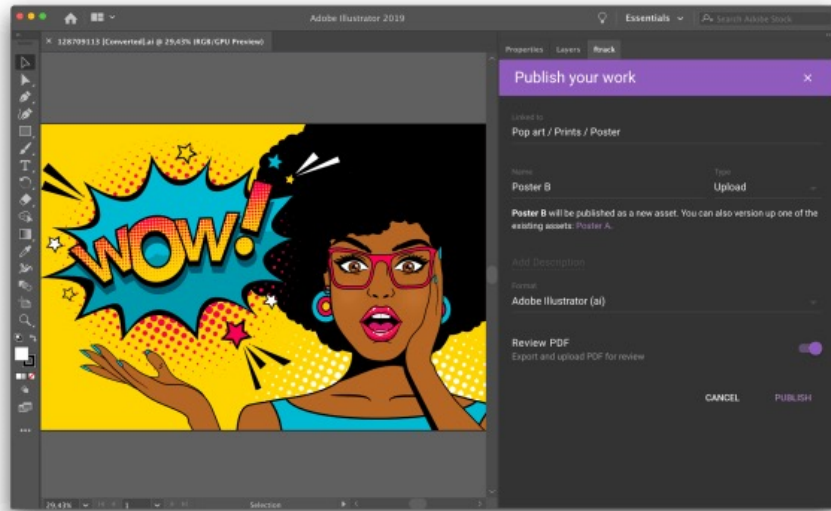Underwound and Overwound DNA
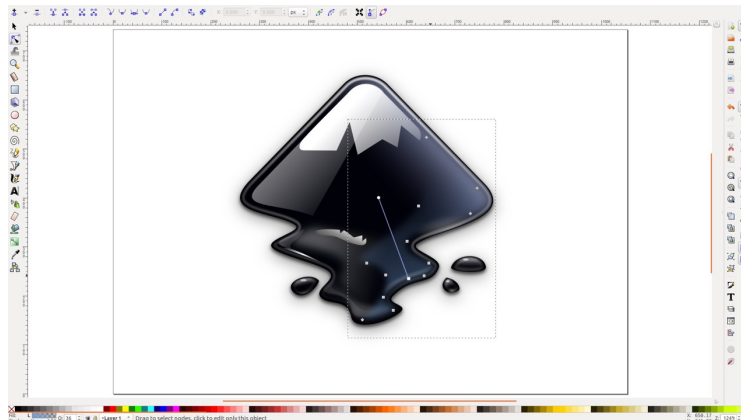
Nucleosome clutch

Part 2

How do I make this sketch a digital graphic?

Programs

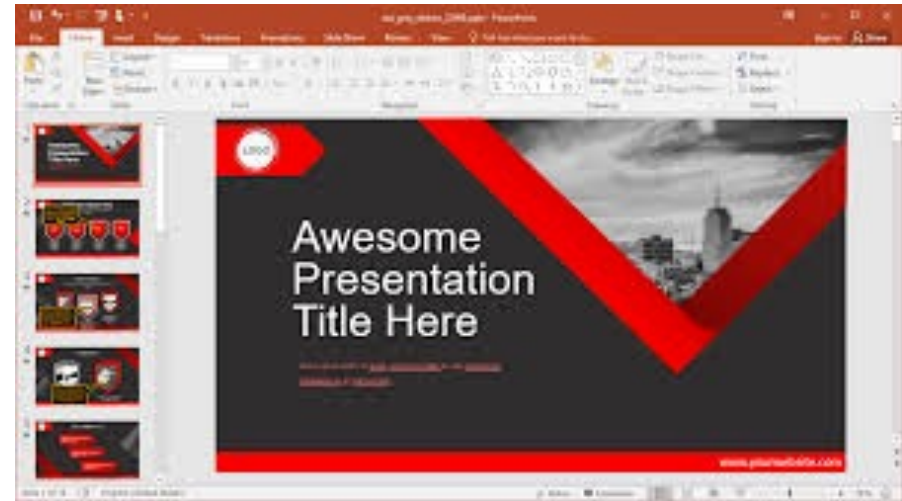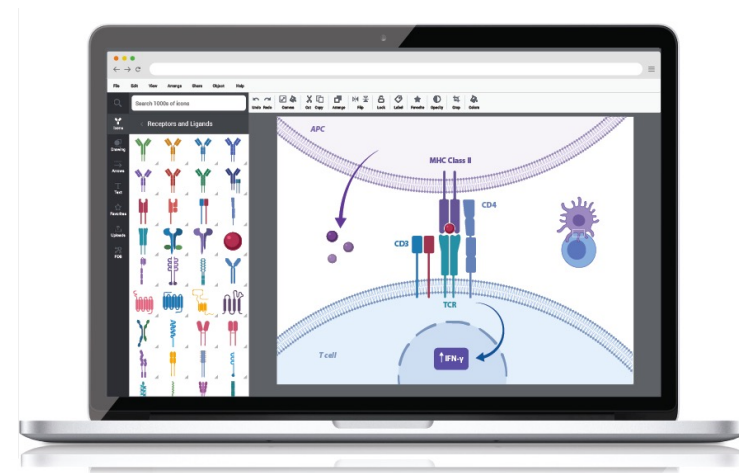1. Adobe Illustrator

2. Inkscape

3. PowerPoint

4. BioRender

General guideline of when to start deciding on details

Big picture

Small details
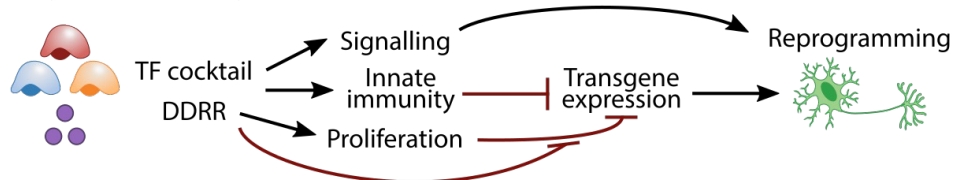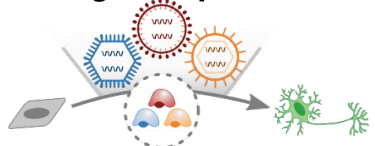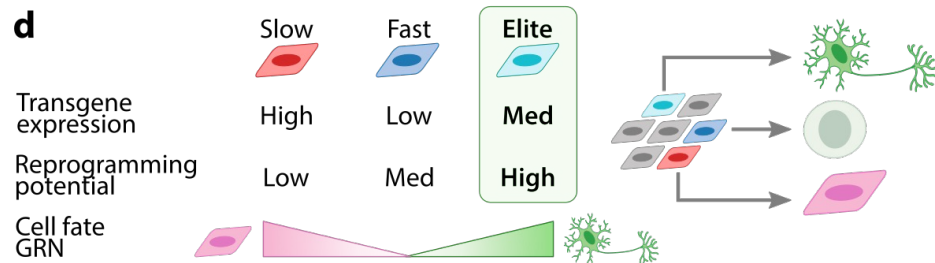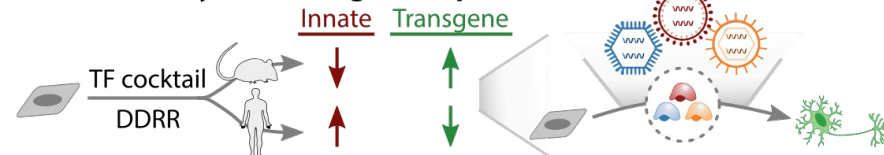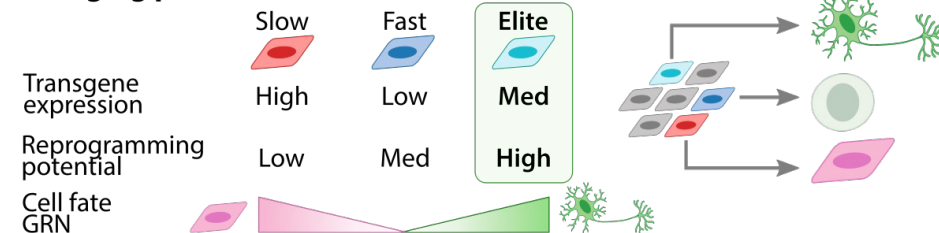
1st Level

- Size
- Layout
- Color palette
- Font

2nd Level

- White space
- Level of physical/scientific accuracy
- Color separations/overlays

3rd Level

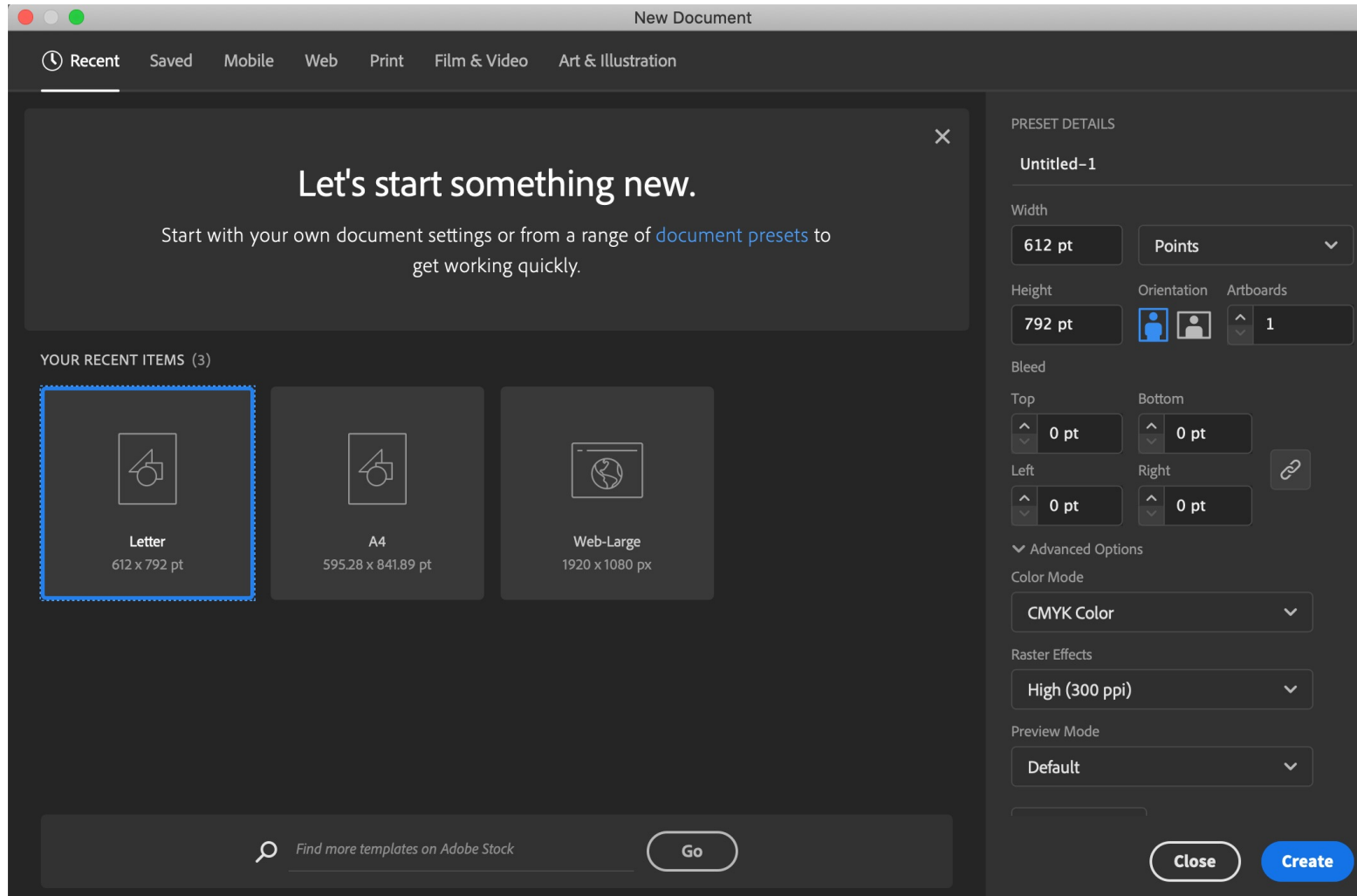- White space (yes again!)
- Alignment
- Embellishments (outlines, shadows, effects, etc.)

1ˢᵗ level

Size

1ˢᵗ level

Layout

1st level

Font
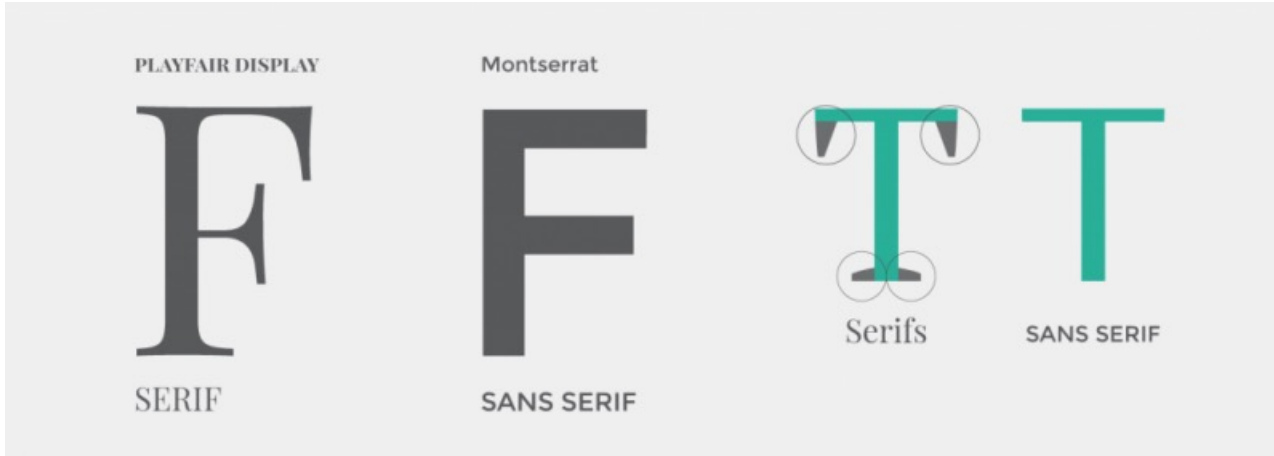
Color palette

White space

- White space
- Level of physical/scientific accuracy
- Color separations/overlays

Lack of white space

MACKENZIE JANE MAYER, MBA
Montréal, Toronto | 486.528.6060
mackenzie.mayer@gmail.com

A STRATEGIC BRAND ENTHUSIAST, WHO PLACES EMPHASIS ON CUS
TOOL FOR PROPELLING THE SUSTAINABLE GROWTH OF AN

WORK EXPERIENCE

Airbnb Montreal | **Trip Designer, Luxury Retreats Ambassador**
- Creator of the trip designer playbook, a post training referen
  hospitality language that informs the way in which the Trip l
  with guests
- Qualify potential guests and match them with the home and
  their travel parameters
- Coordinate the itinerary details with preferred vendors to en
  along the customer journey
- Assisted the vendor relations team in a business developmer
  in the luxury segment in over 100 regions where Luxury Reti
  present portfolio of luxury homes

Tuck Shop Trading Co. Toronto | **Store Manager**
- Generated external business opportunities across North Ame
  seeking partners and affiliates for Tuck Shop Co.
- Strategized the daily social media posts that promote the cul
  upcoming events
- Source additional local collaborative brands, maintaining tha
  with Tuck Shop Co.'s production values, which are to keep p
  sustainable

Don't

Good spacing

MACKENZIE JANE MAYER, MBA
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mackenzie.mayer@gmail.com

A STRATEGIC BRAND ENTHUSIAST, WHO PLACES EMPHASIS ON CUS
TOOL FOR PROPELLING THE SUSTAINABLE GROWTH OF AN

WORK EXPERIENCE

Airbnb Mont
Trip Designer, Luxury Retreat Ambassador   Fe
- Creator of the trip designer playbook, a post training reference
  hospitality language that informs the way in which the Trip D
  guests
- Qualify potential guests and match them with the home and d
  their travel parameters
- Coordinate the itinerary details with preferred vendors to ensu
  along the customer journey
- Assisted the vendor relations team in a business development
  the luxury segment in over 100 regions where Luxury Retreats
  portfolio of luxury homes

Tuck Shop Trading Co.
Store Manager   Fe
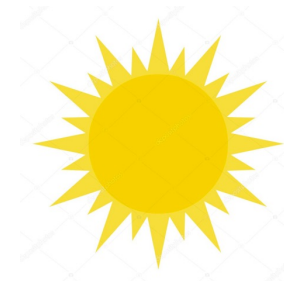- Generated external business opportunities across North Ameri
  seeking partners and affiliates for Tuck Shop Co.

Do

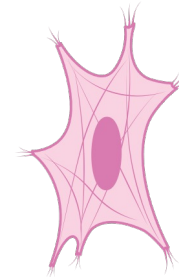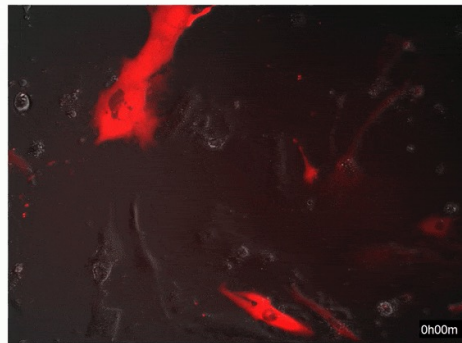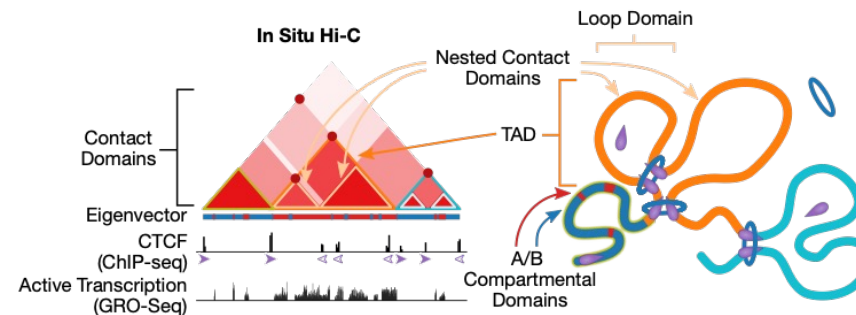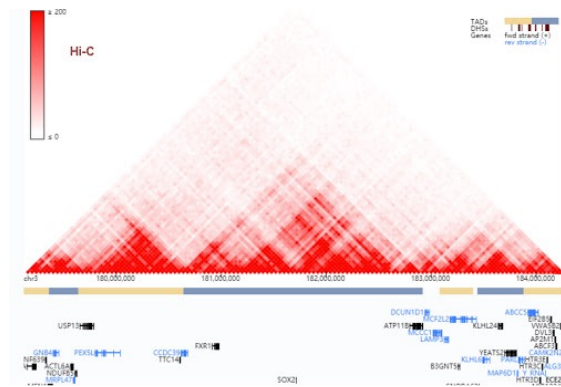# Level of accuracy

- White space
- Level of physical/scientific accuracy
- Color separations/overlays

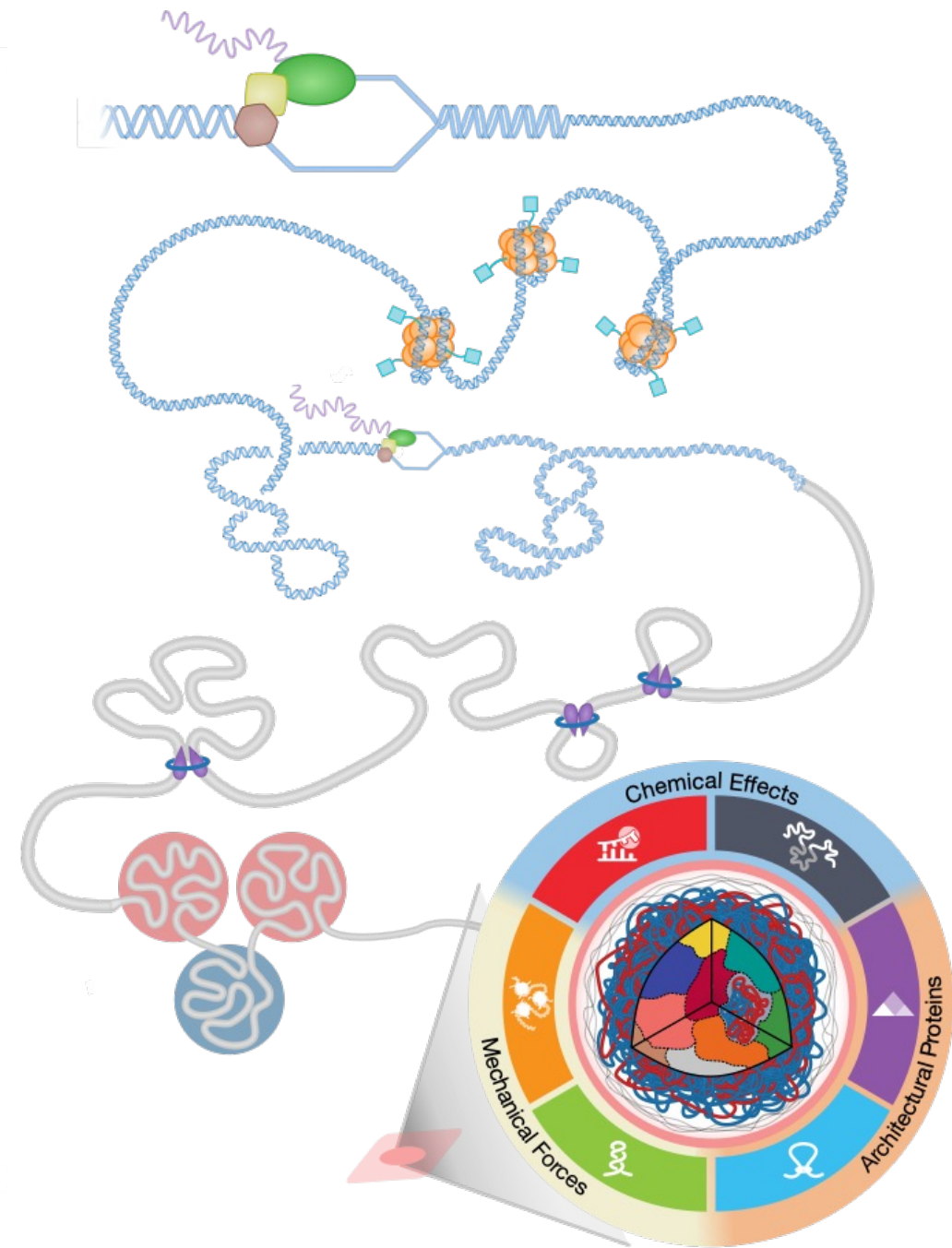More specific and accurate

Hey! Real cells have protrusions!

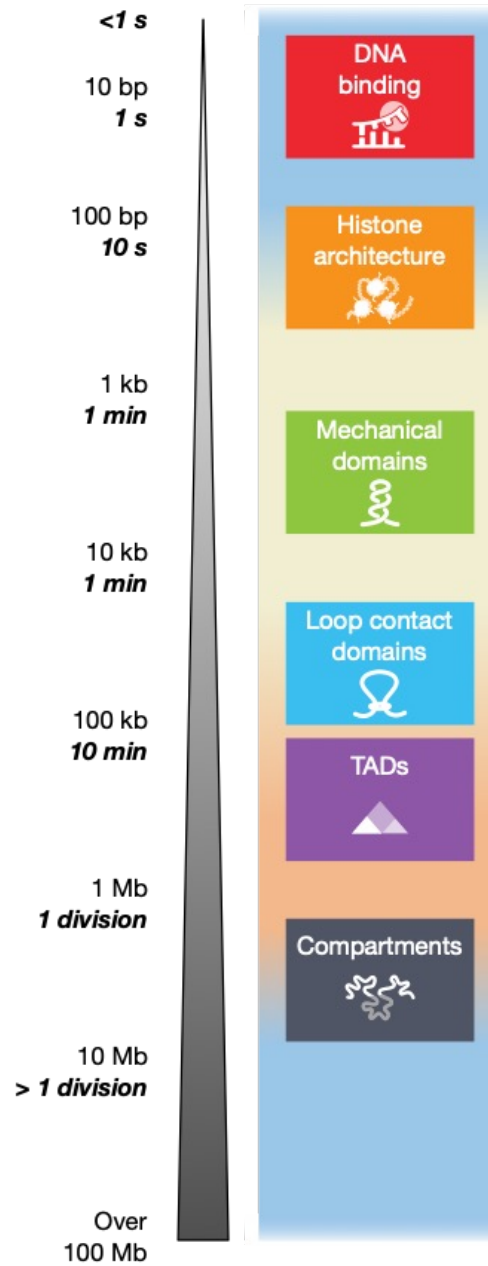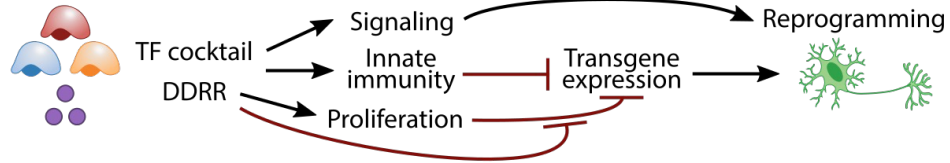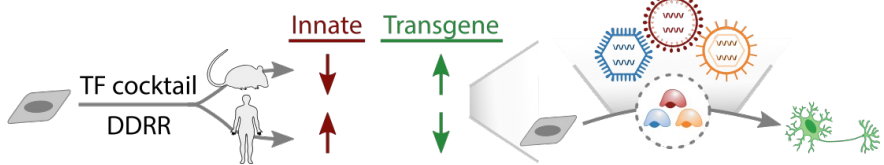**a** **Time and genomic length scales**

3rd level: whitespace

- White space (yes again!)
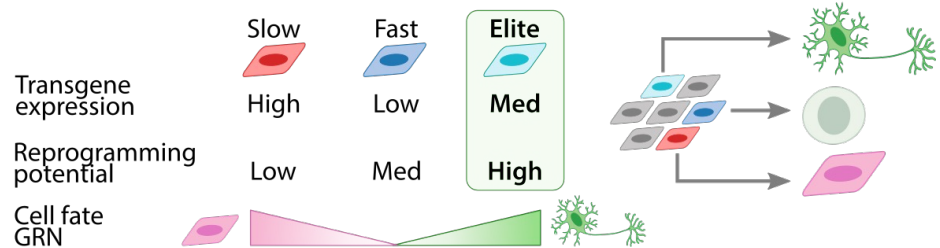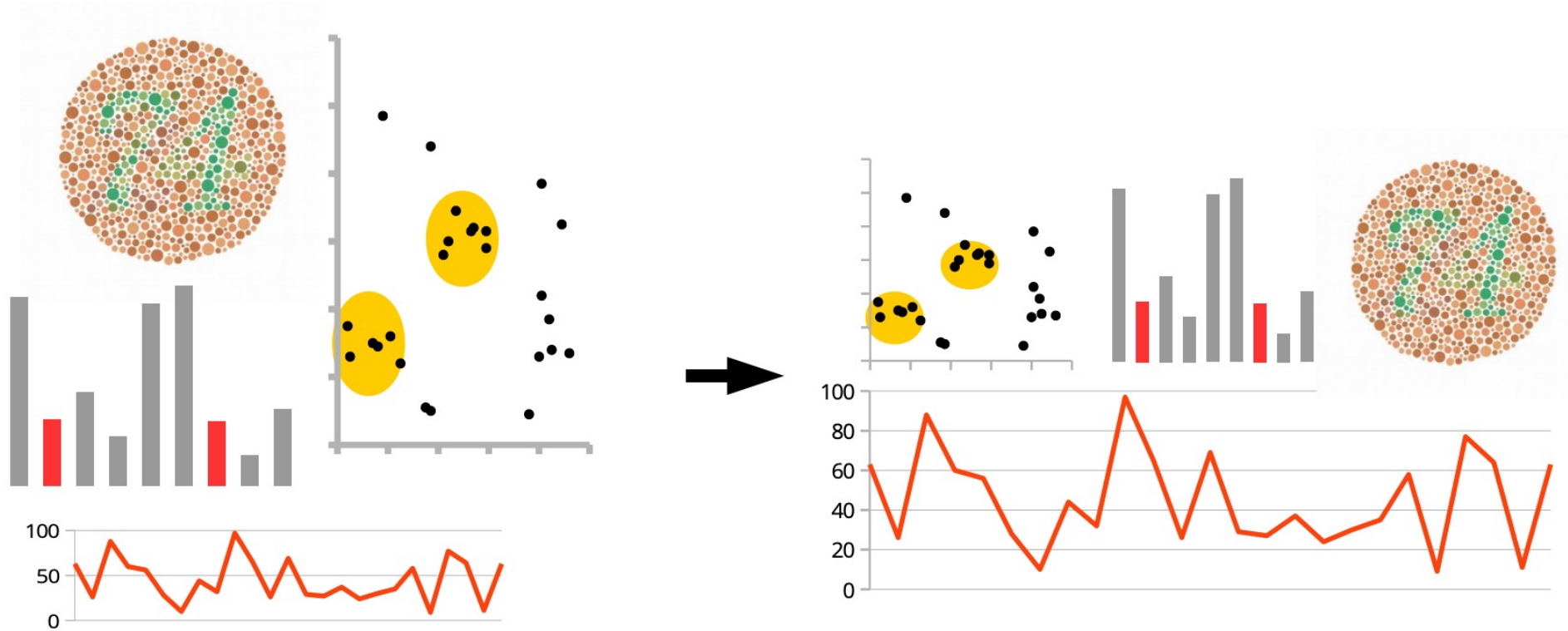- Alignment
- Embellishments (outlines, shadows, effects, etc.)
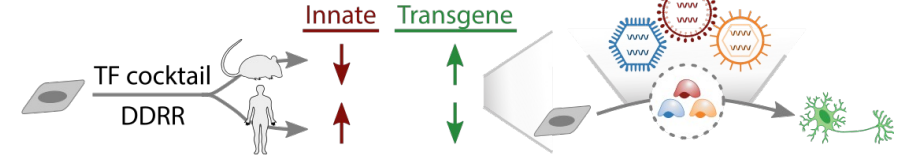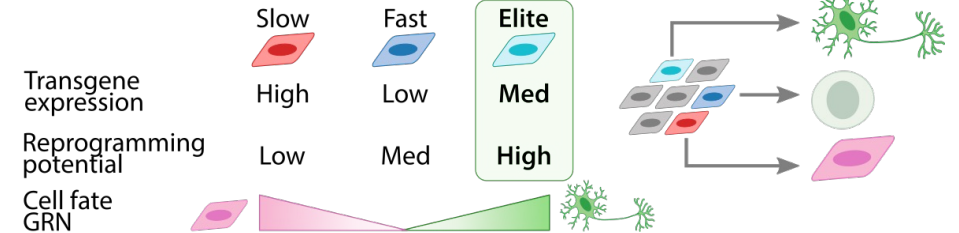
Alignment

- White space (yes again!)
- Alignment
- Embellishments (outlines, shadows, effects, etc.)

https://bioinformatics-core-shared-training.github.io/effective-figure-design/DesigningEffectiveScientificFigures_Zabala_afternoon_v00.pdf

Embellishments

- White space (yes again!)
- Alignment
- Embellishments (outlines, shadows, effects, etc.)
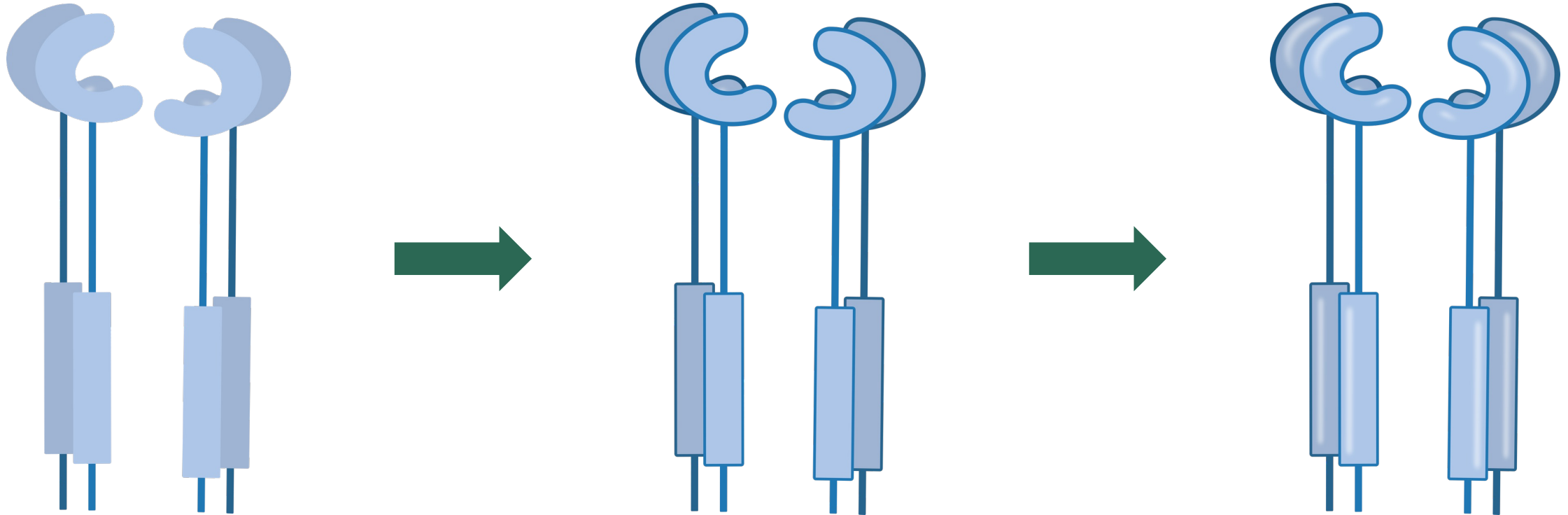
Aesthetically pleasing science figures should draw from elements of art
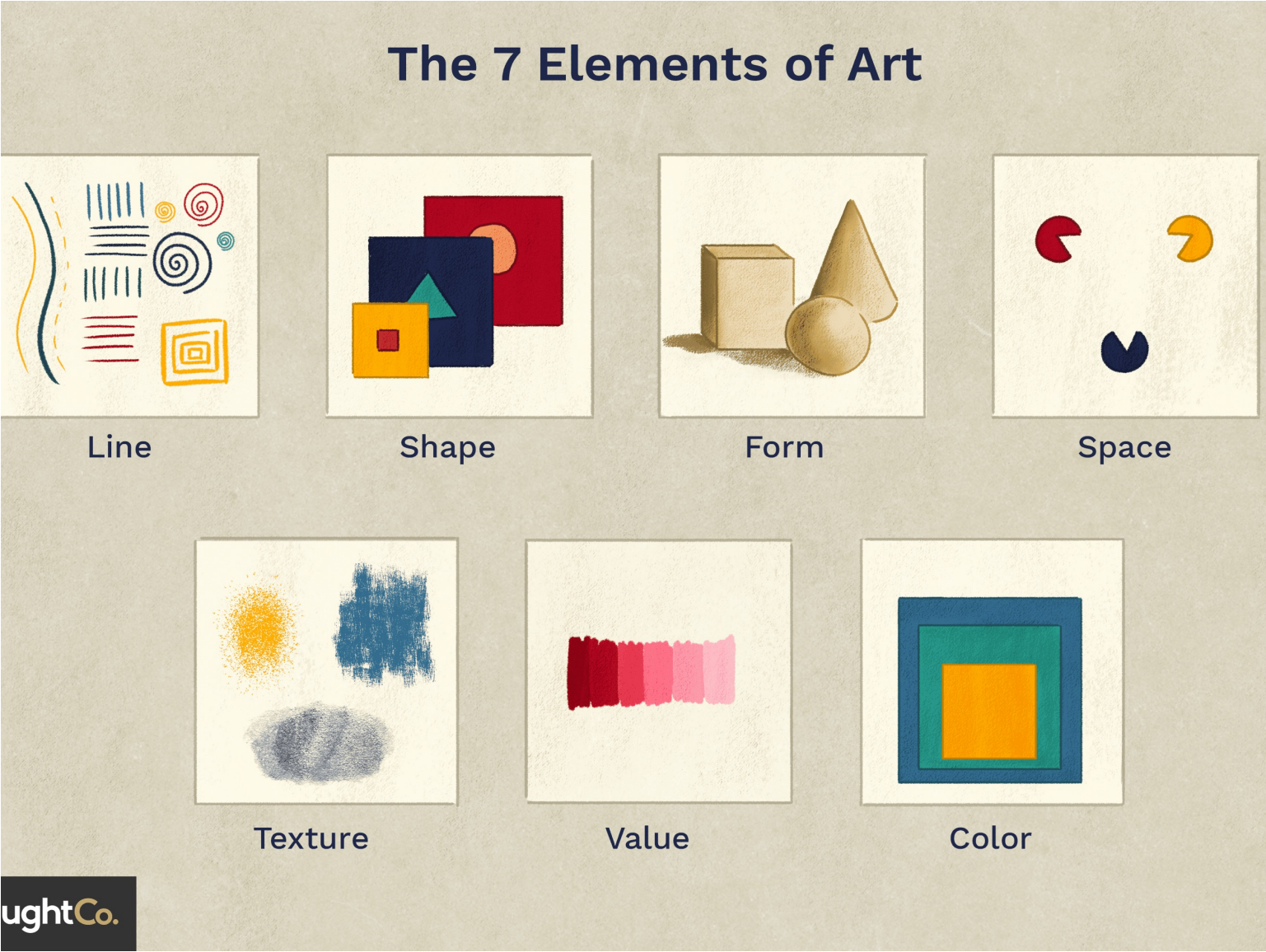
Lines can be implied or abstract
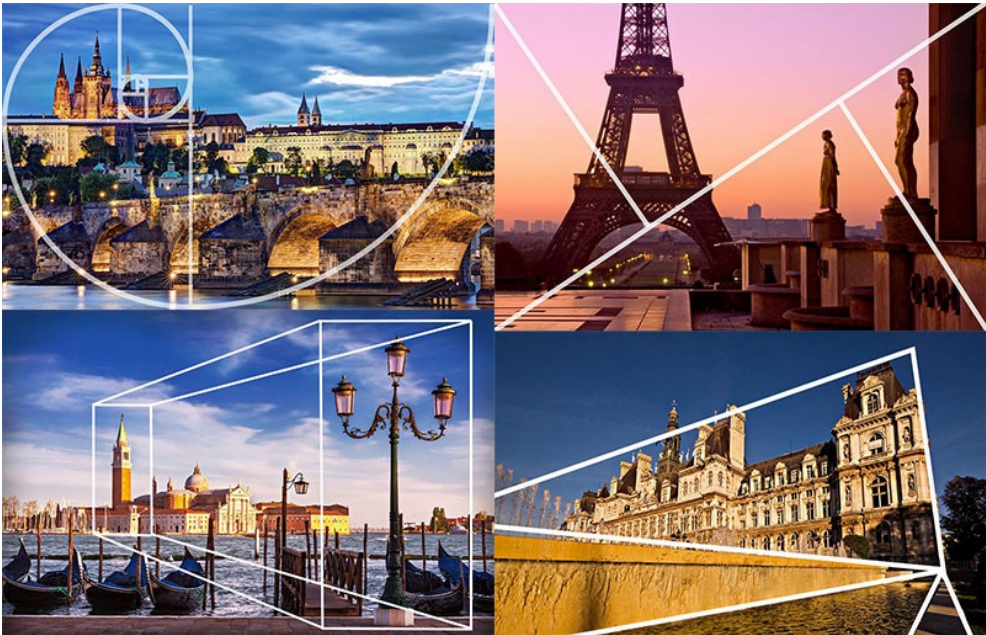
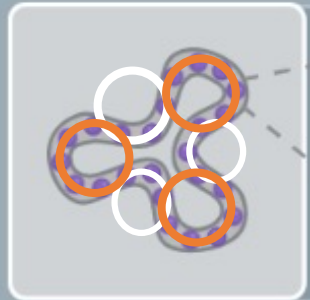*Oranges and Blueberies*, Watercolor, Chris Krupinski
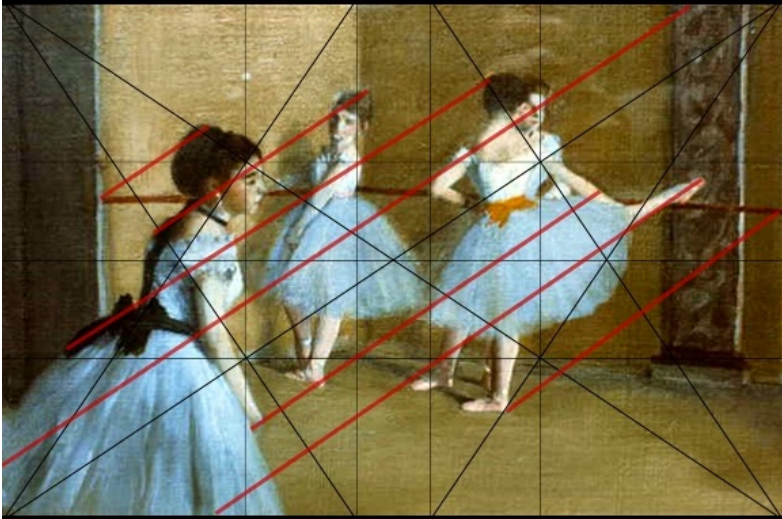
Line:
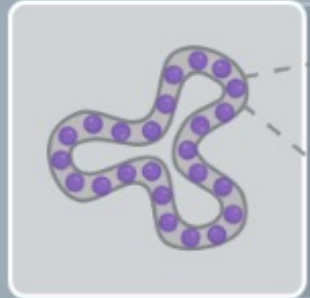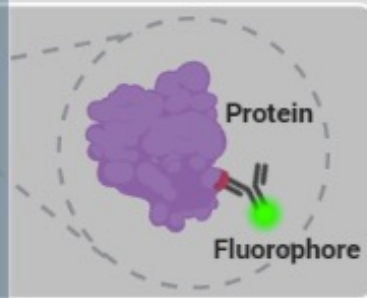
- Physical lines (rectangles, arrows)
- Lines made by negative space (gaps)
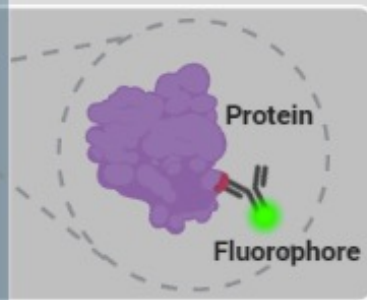- Lines made by color contrast

Shape:

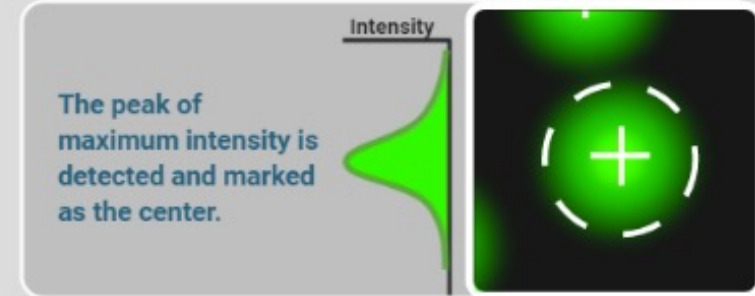- Use smaller shapes to make more sophisticated ones

Form:

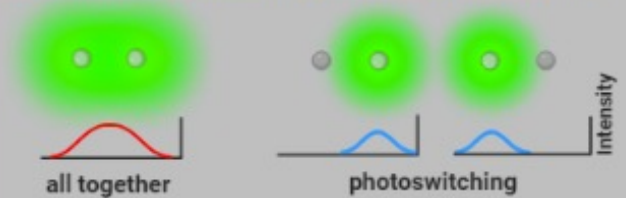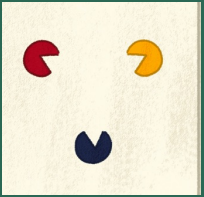- Form refers to when shapes acquire depth and become 3D.
- Each glowing thing is a sphere.
- Form can add sophistication but can also be left out for a minimalistic approach.
- The purple spheres have form. The green circle in dark state does not.

Breaking diffraction with STORM

Actual structure

Protein

Fluorophore

Fluorophore

Dark state — Bright state

Laser pushes most fluoro-phores into a dark state

Single fluorophores stochasti-cally return to a bright state

Fluorescence

The image is blurry, the fluorophores are too close together. The solution is activating one at a time.

all together

photoswitching
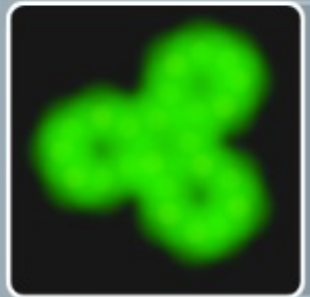
Intensity
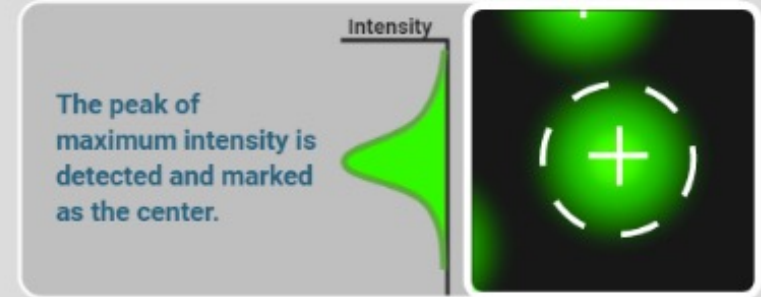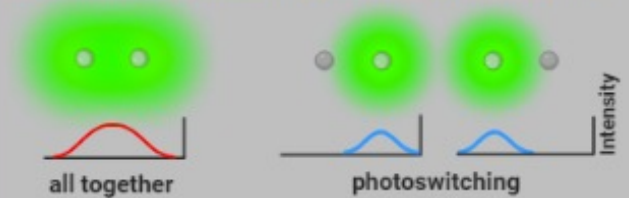
The peak of maximum intensity is detected and marked as the center.

Intensity

THE SCANNING PROCESS

STORM image

the final image is rendered

n

3

2

1

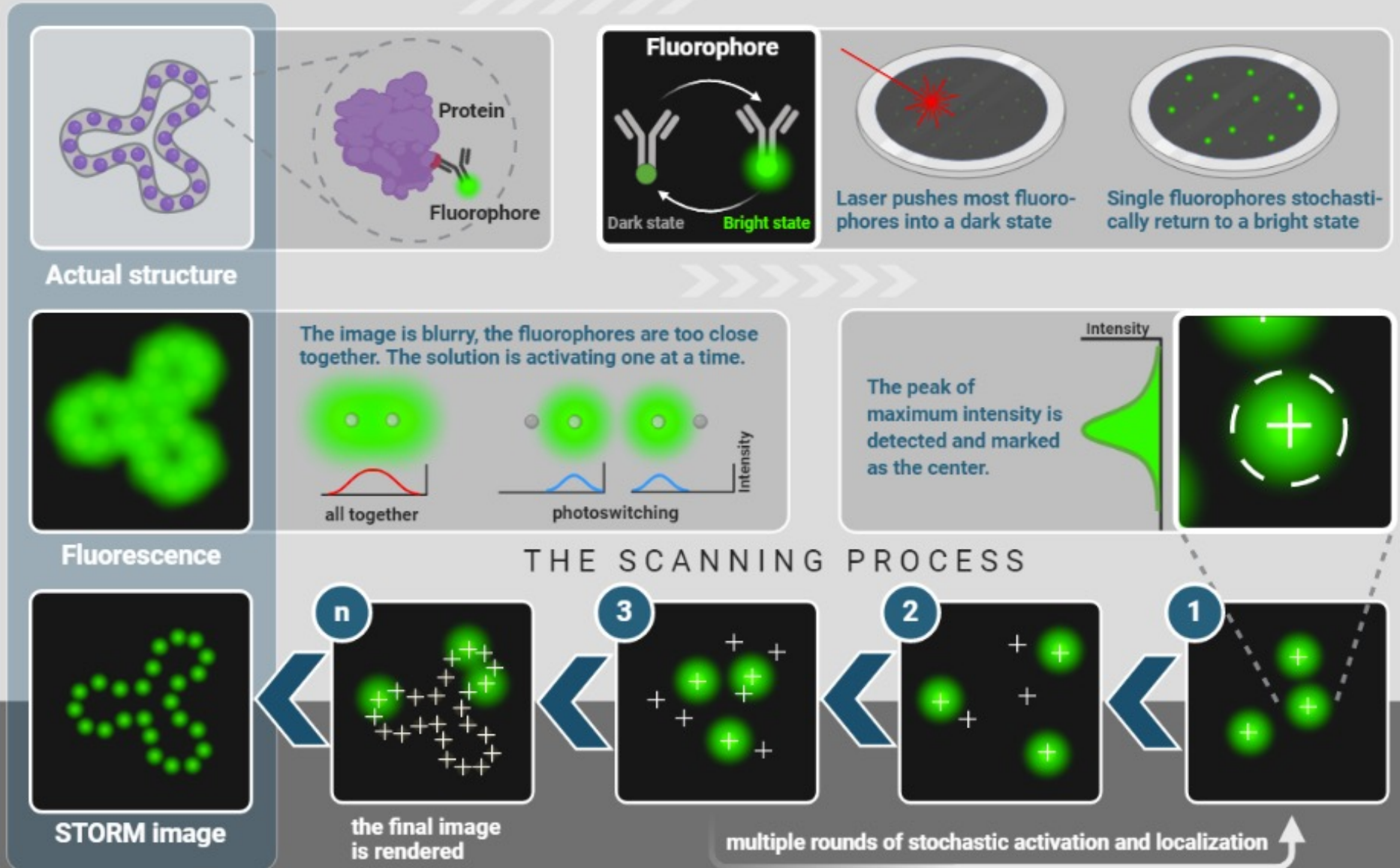multiple rounds of stochastic activation and localization
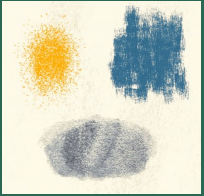
Space:

- Space is area you use for a specific purpose and includes negative space.
- Here the designer made positive space by using rectangles to establish mid and foreground.
- They also used rectangles to establish negative space.
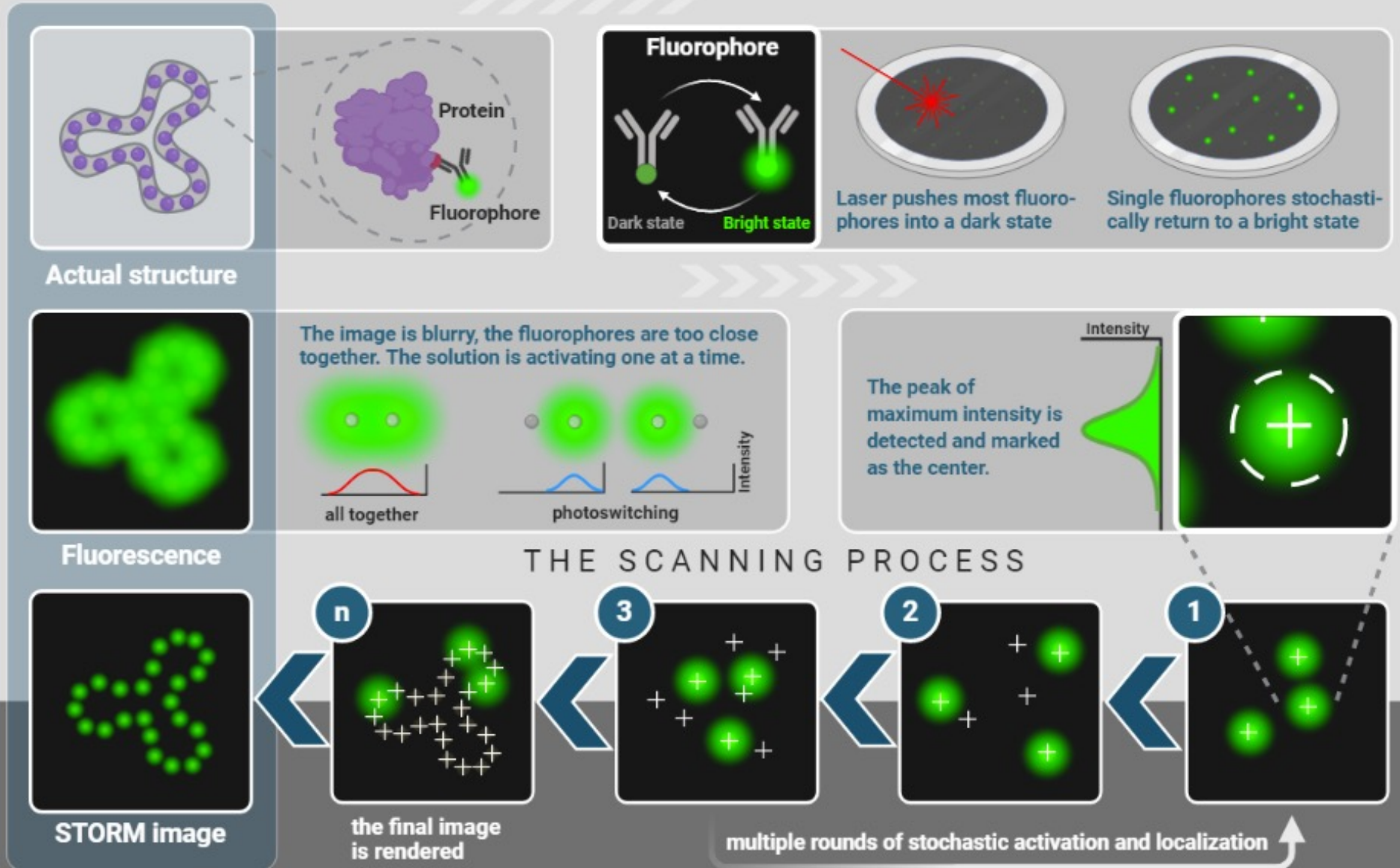

Breaking diffraction with STORM

**Actual structure**

Protein

Fluorophore

Fluorophore

Dark state — Bright state

Laser pushes most fluorophores into a dark state

Single fluorophores stochastically return to a bright state

Fluorescence

The image is blurry, the fluorophores are too close together. The solution is activating one at a time.

all together

photoswitching

Intensity

The peak of maximum intensity is detected and marked as the center.

Intensity

THE SCANNING PROCESS

STORM image

n
the final image is rendered

3

2

1

multiple rounds of stochastic activation and localization

Texture:

- Here the texture of the protein is implied to be smooth and globular.
- The texture of the laser appears intense and focused while the green is more soft and diffuse.
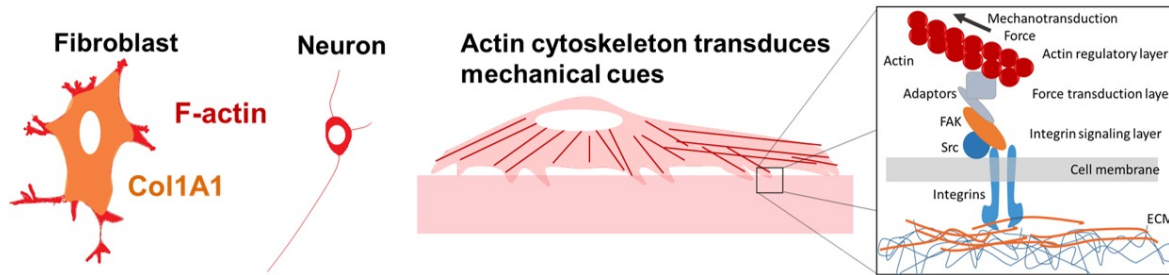
Color and Value:
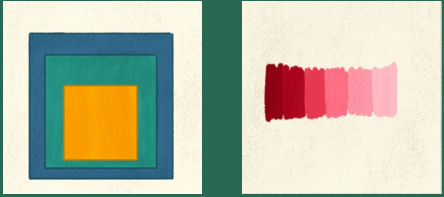
- Color of greens all match – the dark state is similar but a darker green
- Color of red all together vs. blue photoswitching (doesn't matter that laser is red)
- Protein has darker purple for shadows
- Dark state vs. bright state colors
- Dark blue rectangle on the left
- The gradient of the arrow helps draw the eye

- Sketch things out and use them as guides
- Iterate through designs!
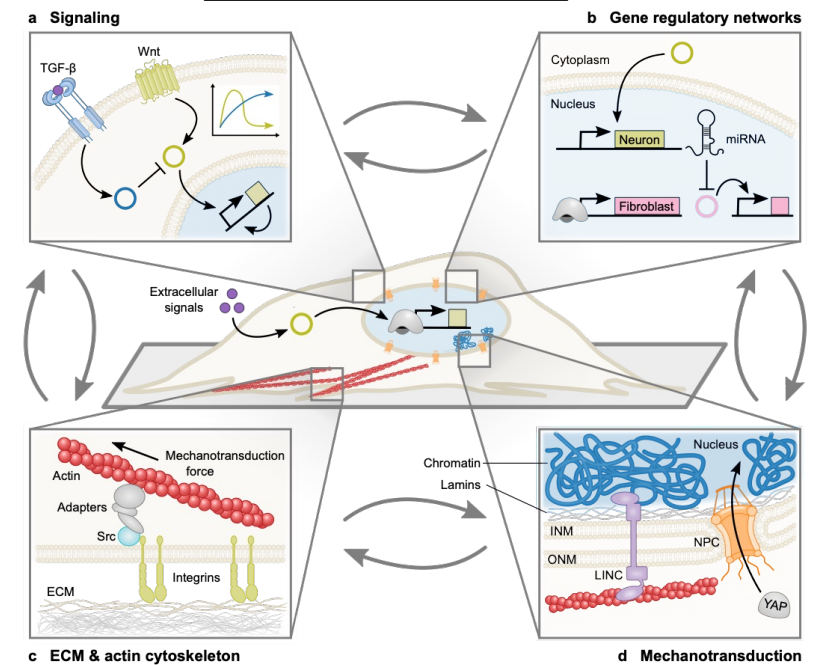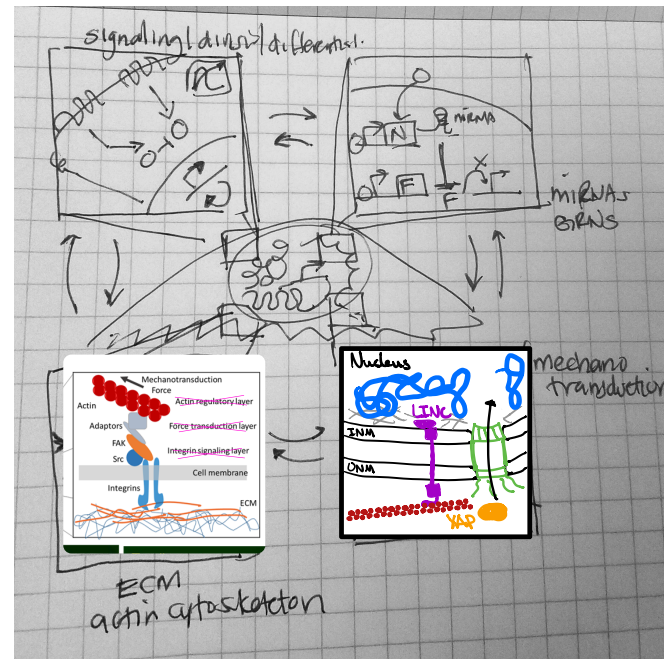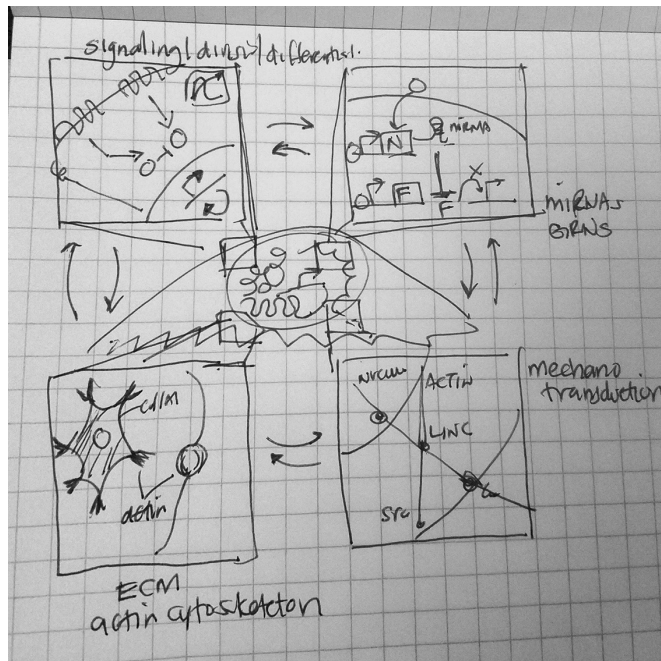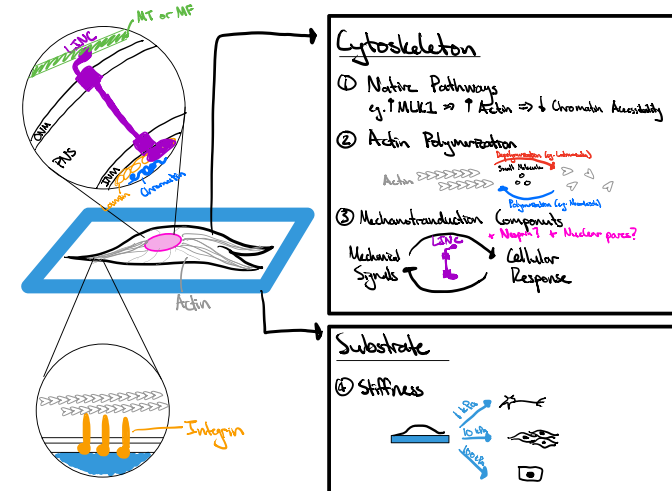
- Reuse components when you can
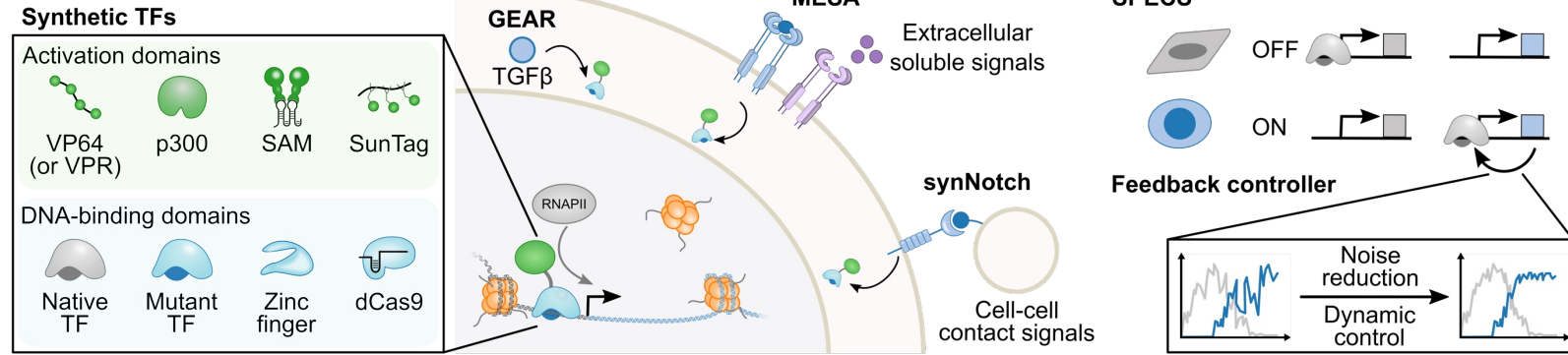
Final tips

- Version control!!!

Simplify to highlight 3 challenges
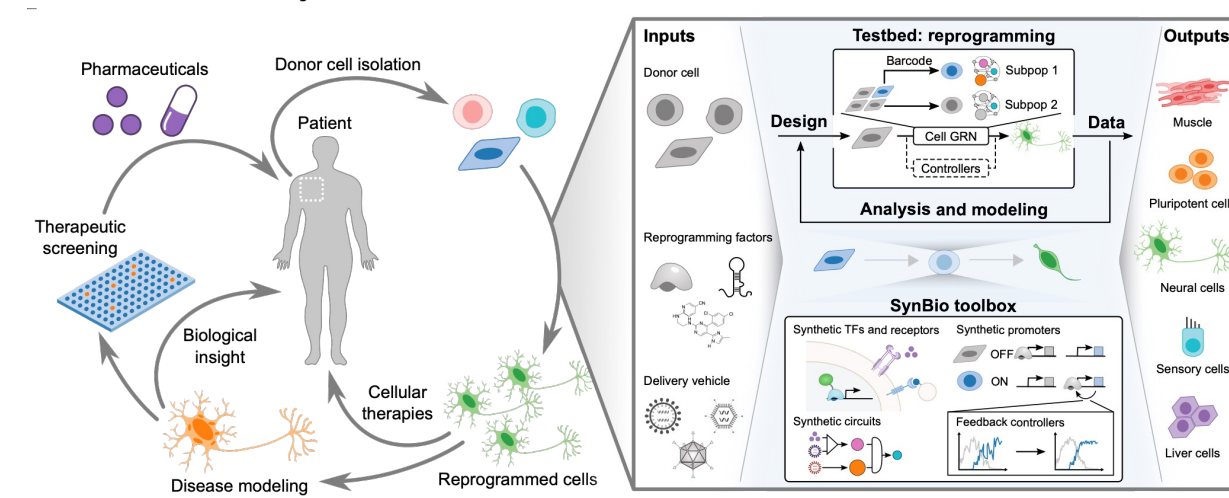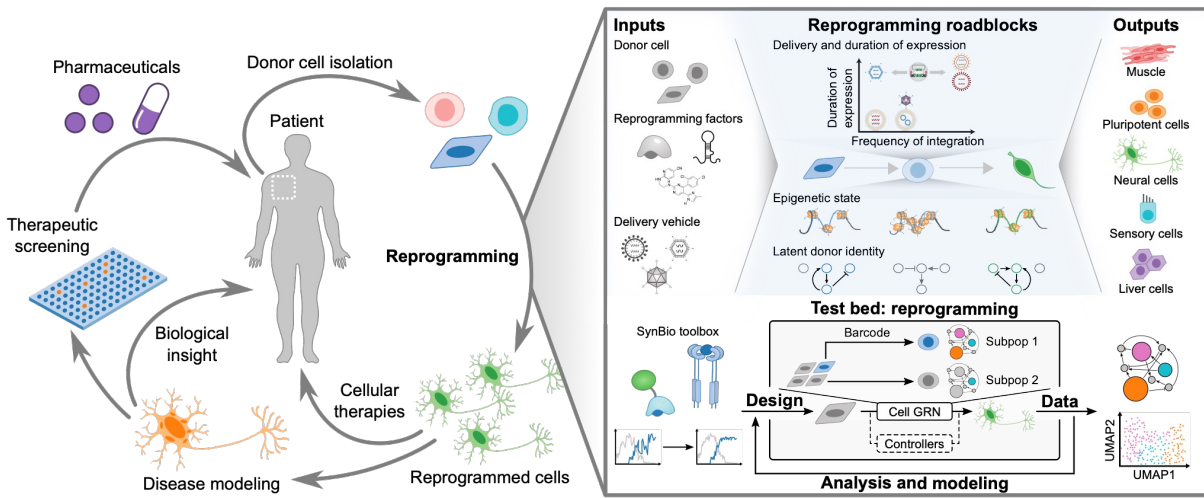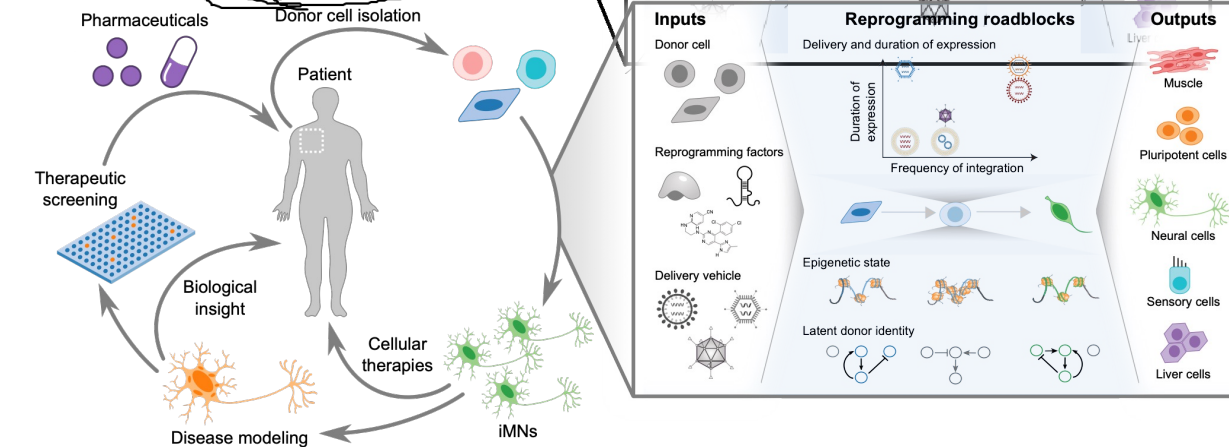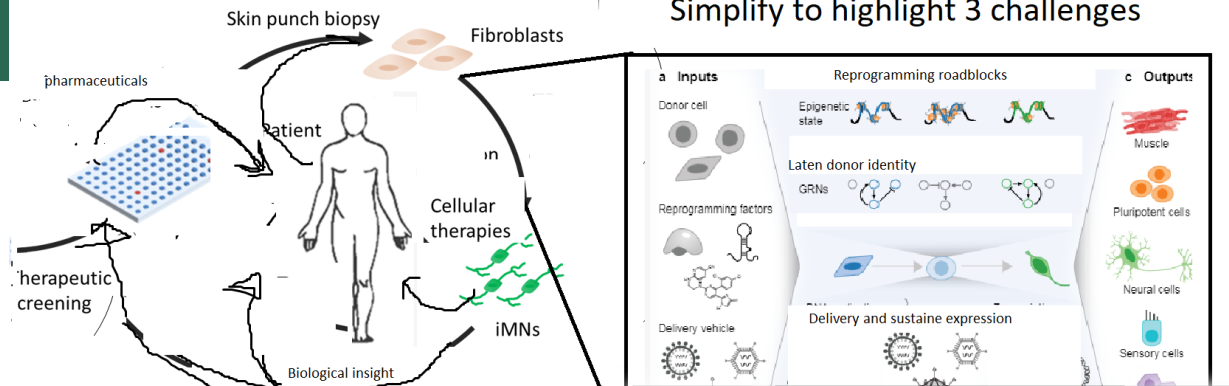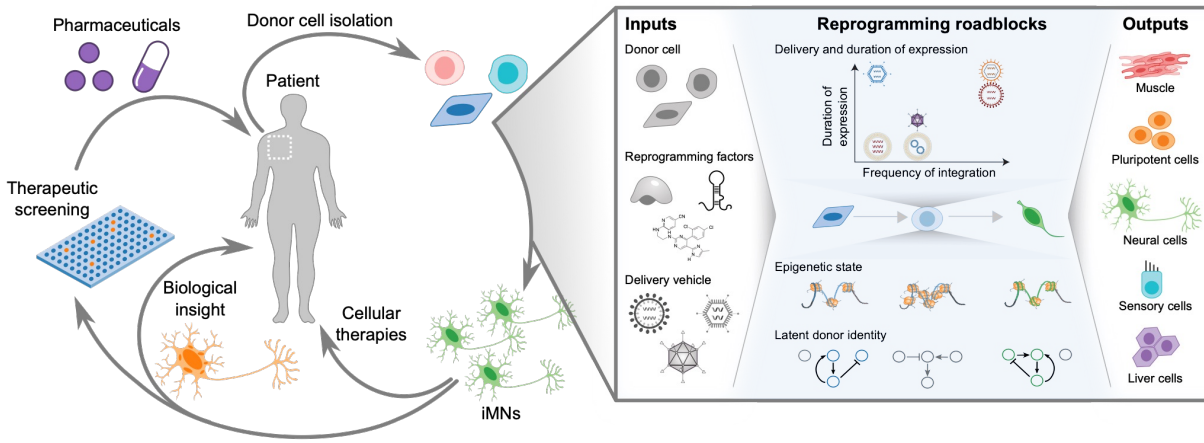
Final tips

- Use boxes to group together text or drawings
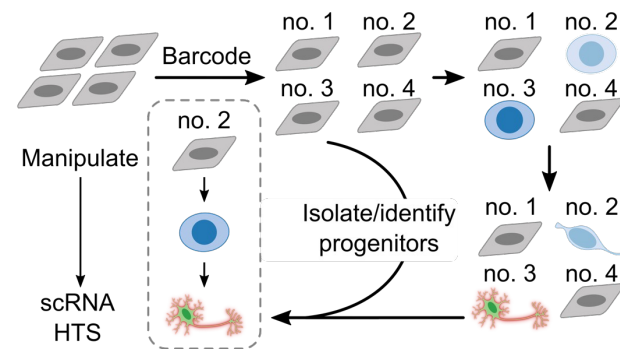

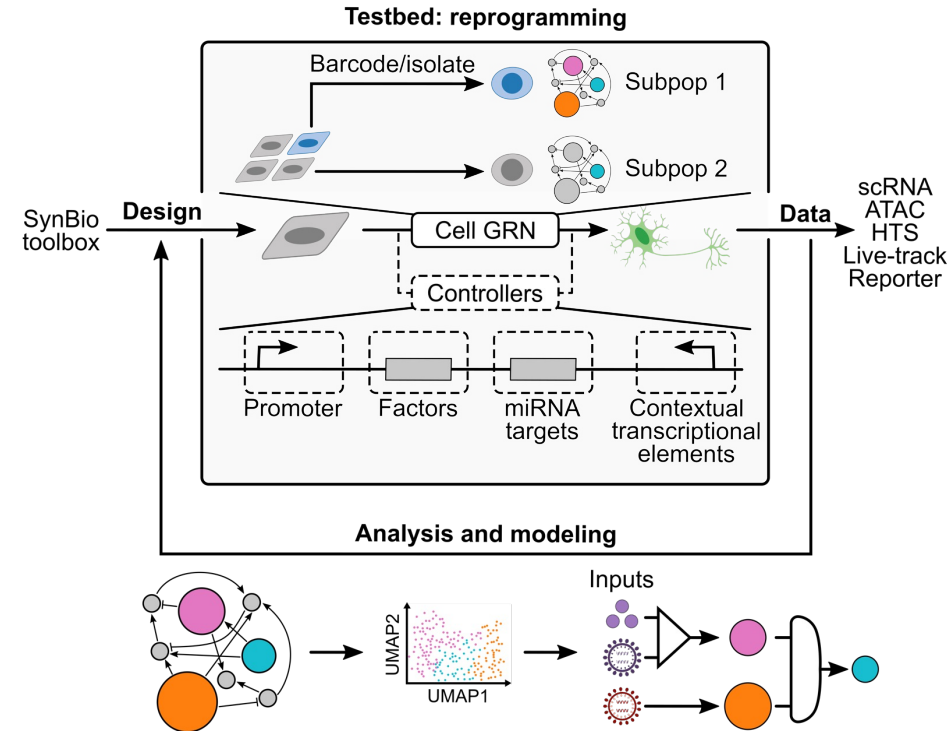**a** **Synthetic biology tool box**

b **Synthetic reprogramming consortia**
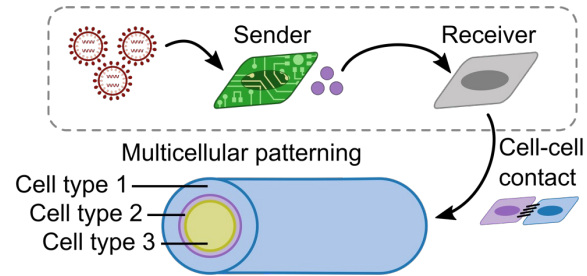
c **Design-test-build**

d **Lineage tracing and barcoding**

Final tips

- Avoid diagonal arrows
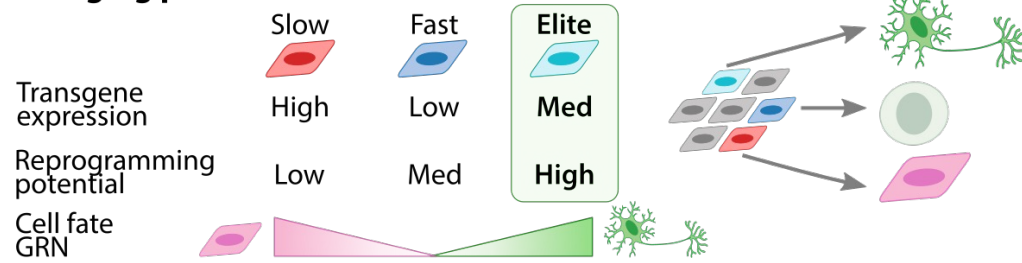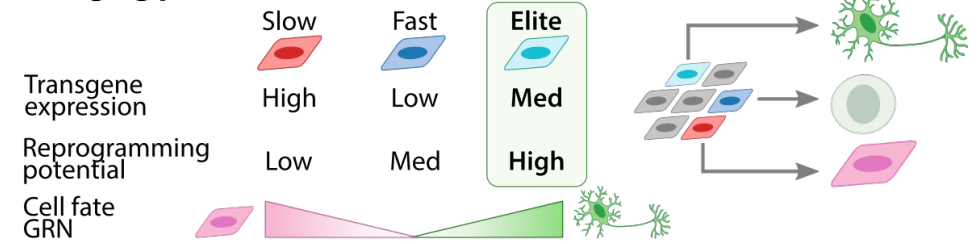
Final tips

- Use visuals to emphasize certain ideas or aspects