Signal not Noise: How to give a Scientific Talk

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9/8/2026

With input from colleagues at SKI and WCM

Three Key Aspects of the Most Effective Presentations

The Story/Scientific Content

Slide preparation

Performance/delivery


PRACTICE IS
EVERYTHING
RUBIO


Practice makes
perfect


practice makes perfect
success
attitude
skill
mindset
goal
determination
strategy
information
skillful
practice
leader
motivation
improving
learning
lead
knowledge
idea
development
rehearsing
dedication
plan
perfection
repeat
decision
training
proficiency
teaching
performance
activity
experience
education
action



The structure of a great talk:

BUILD A STORY

Know your audience and plan your story targeted to them!

Fellow First years this week? The grad school? Your lab meeting? Scientific conference here at MSK? International Scientific conference?

Decide what is the one message that you want to deliver

What are your highlights? Everything is not equally important.

Choose the content that will tell your story

The GOAL isn't to show the audience how much you know or teach them EVERYTHING but to convey your KEY POINTS.
Make an outline for your talk, just like you would do for an essay.

Package it into a story (with a beginning – middle – end)

Sometimes this is chronological – the order that you did the experiments, but sometimes it is not .

Plan for the allotted time

The structure of a great talk:

What to deliver in your story

What is the problem?

Why should people care?

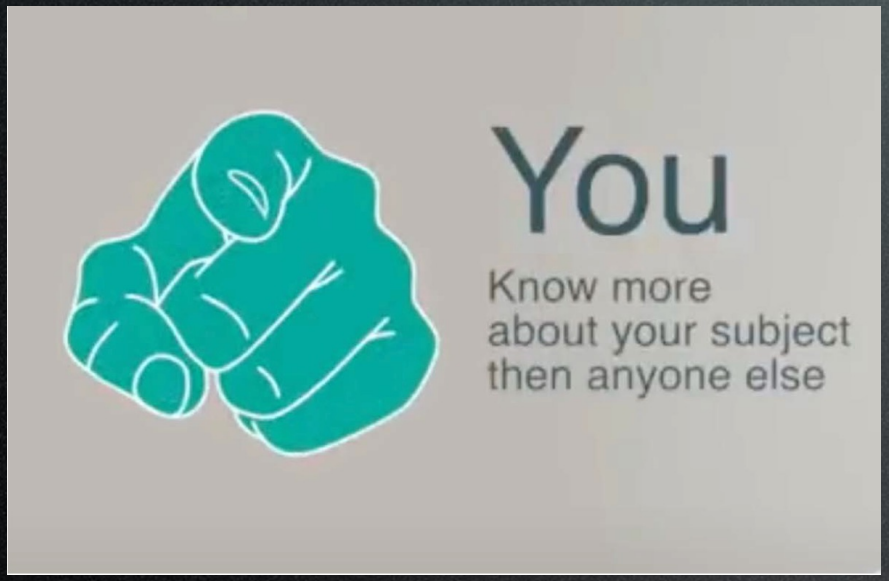
What is the approach?

What is new?

What is the message?

What is the impact?

Pitch your talk at the level where everyone will understand, whether they are an expert or not.





The structure of a good talk:

Start broad, get specific, end broad

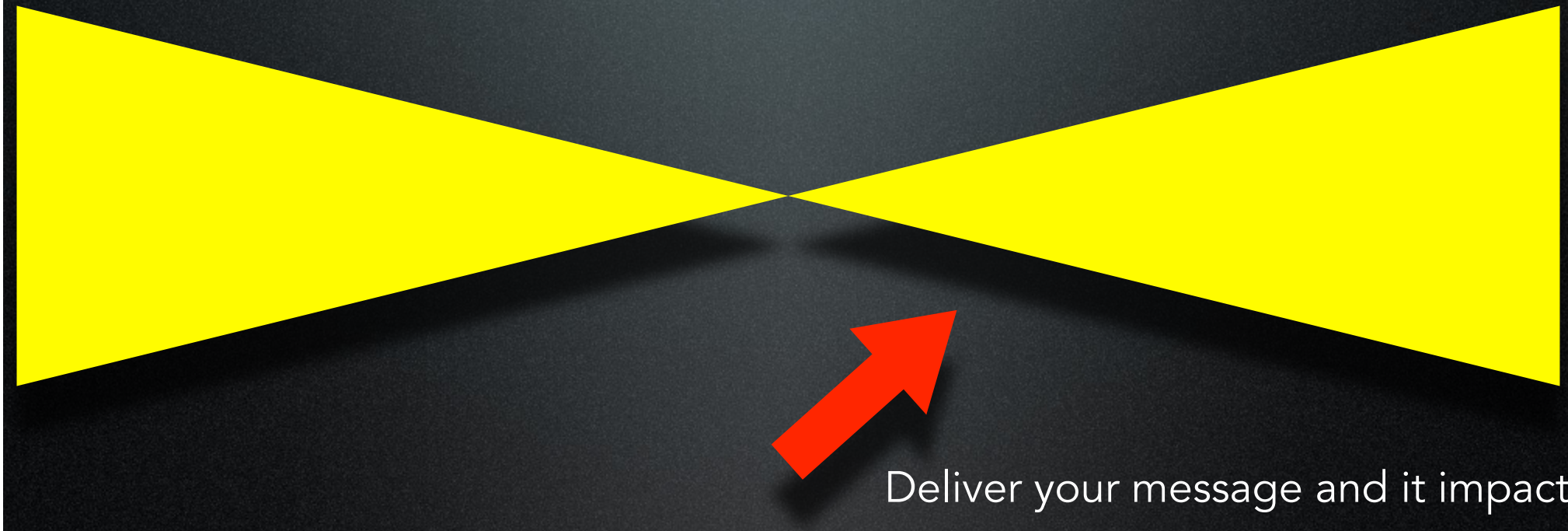


and get progressively more specific

Start with the big question

The structure of a good talk:

End with more specific conclusions,
then build back to the "big picture"



Deliver your message and it impact

Get progressively broader

The structure of a good talk:

Tell the audience *what you are going to tell them*

Tell them *what you want to tell them*

Tell them *what you told them*

The structure of a good talk:

Tell the audience what you are going to tell them.

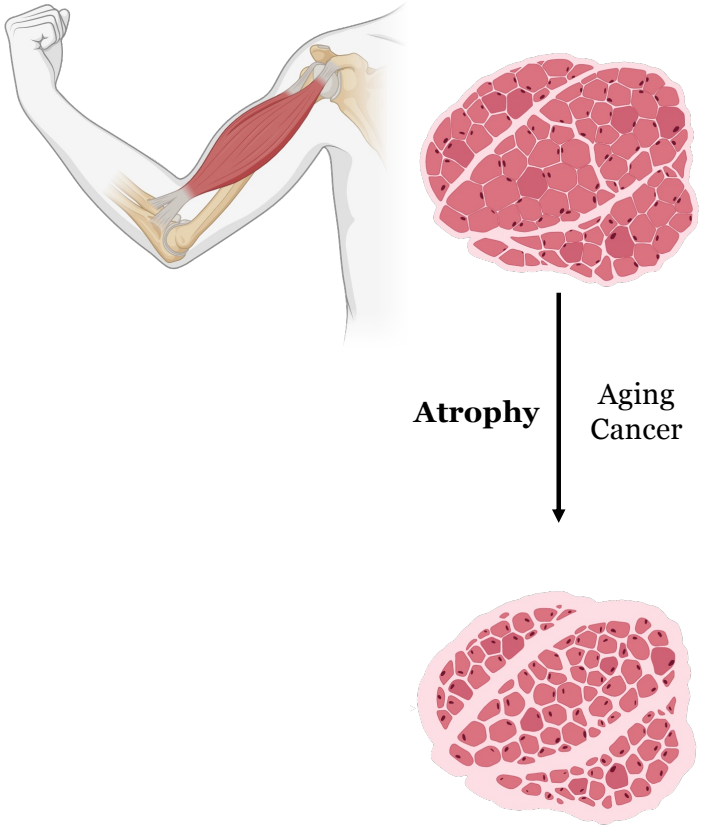
Set out your question: hook, why should we care

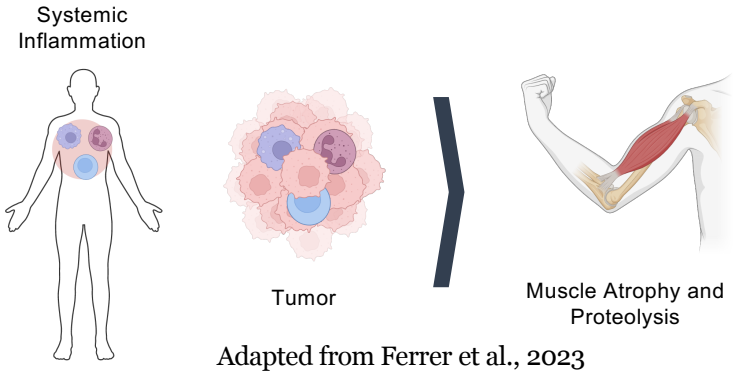
Example

From Isabelle Top's GSS last year

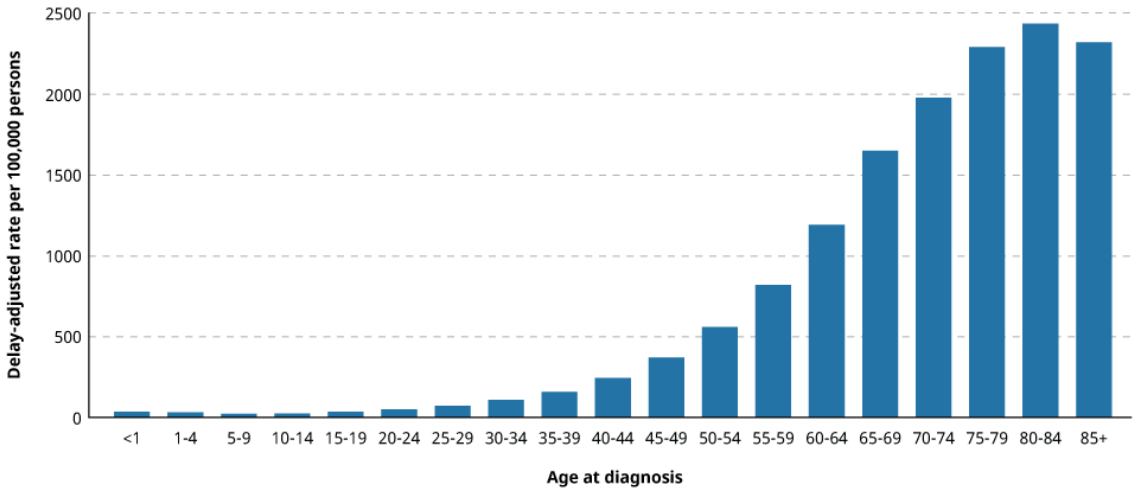
Muscle Wasting Impacts Mortality and Quality of Life

Background





Adapted from Ferrer et al., 2023



Age and Cancer Risk was originally published by the National Cancer Institute

Example

Skeletal Muscle has an amazing capacity for changing its size.



Development



Exercise

Disuse



Aging



Disease



The structure of a good talk:

Tell the audience what you are going to tell them.

Set out your question: hook, why should we care

Introduce the audience to the structure of your talk:
contents slide, questions

This slide can be repeated throughout your talk.

Tell the audience *what you are going to tell them* *Example*

Outline

- Professional Development Updates
- Background
- Figure Outline for Paper
- Summary and Next Steps

From Isabelle Top's recent committee meeting

Tell the audience *what you are going to tell them* *Example*

Today's menu:

1- Module organization

2- Developmental Biology matters to Cancer Biology.

3- Cell lineage/mosaic development vs environment/regulative development and *why signaling pathways provide a means to pattern/coordinate cell diversity*

4- Signaling and the Range of a signal.

5- Cell "competence" to receive a particular signal

6-Morphogen concept

7- Discuss how cells read and interpret graded information (the discussion paper!)

From one of my lectures

Tell the audience *what you are going to tell them.* *Example*

Central Questions

1. **How does cancer cachexia impact individual organ systems in adult Drosophila?**

2. **How do organ systems and tumor-secreted cytokine levels respond to suppression of oncogene activity?**

From S. Davis's final Engage Talk

The structure of a good talk:

Tell the audience what you are going to tell them.

Background/Introduction slide: How much?

Know your audience

Give the audience what they need to know
WHEN they need to know it.

"Background info" can be spread throughout the talk

The structure of a good talk:

Tell the audience *what you are going to tell them*

Talk outline slide; Menu for today; Key questions
Background as needed

Tell them *what you want to tell them*

Tell them *what you told them*

The structure of a good talk:

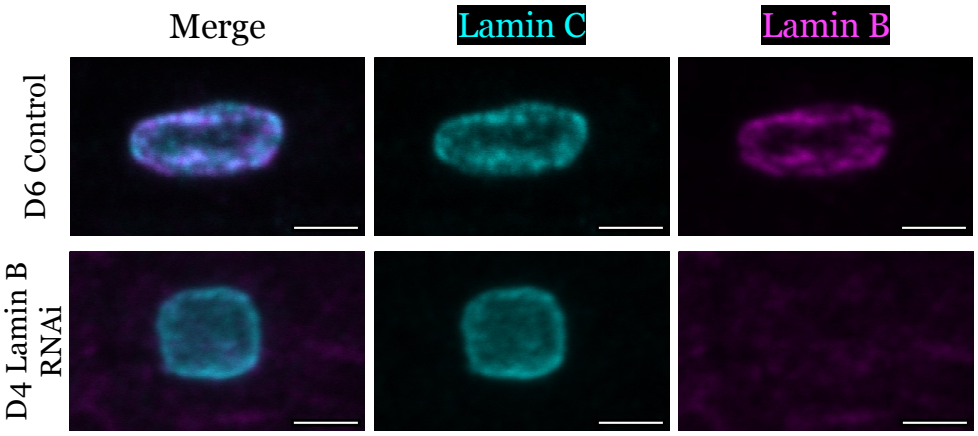
Build the body of the talk with series of slides that tell your story.



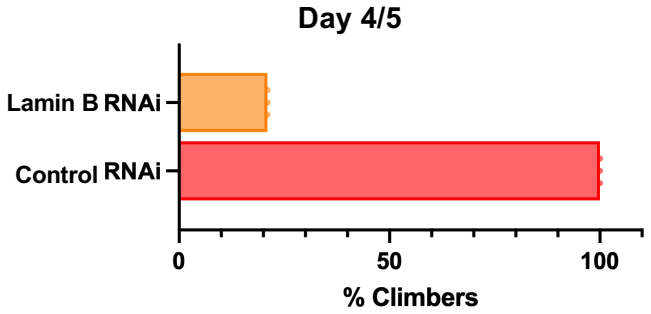
Every slide* within the talk starts with the transition from your previous slide, your intro to this slide , your explanation of the main point, then the conclusion from that slide, followed by the transition to the next slide.

* There are exceptions

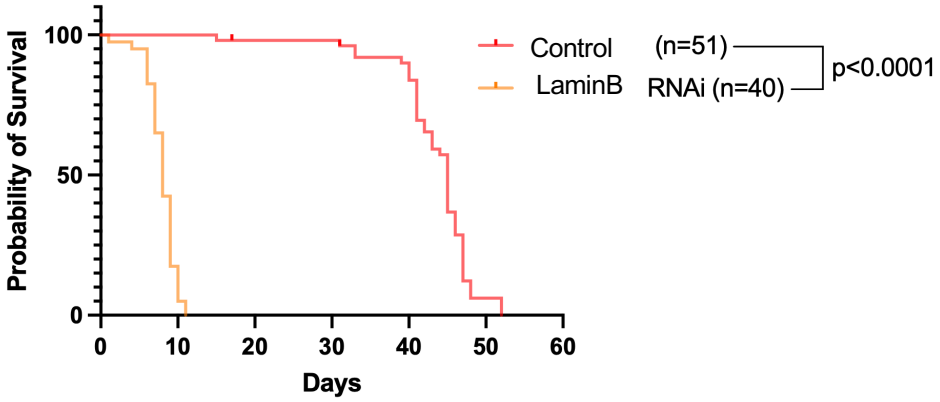
Loss of Lamin B Loss Causes Muscle Function



Scale Bar = 2 µm



N=14-17 flies in preliminary climbing experiment.



Lamin B RNAi = Dcr2;;Mef2-Gal4>Lamin Dm RNAi (VDRC 107419)



Control



Lamin B RNAi

From Isabelle Top's GSS last year

Males & Females

The structure of a good talk:

Build the body of the talk with series of slides that tell your story.

If you have multiple sections, do mini recaps at the end of each section instead of one long recap.

Rule of thumb – 1 minute per slide; so for a 10 min talk you have ~10 talk slides (minus title and acknowledgements)

Go slow!! Cut material if you are rushing.

Don't put things in your main slides because you are worried that a few people may ask.

If you have something on the slide, you need to talk about it. Remove if you don't

Don't assume that your audience will remember things from more than 2 slides ago. Repeat a slide if needed.

The structure of a good talk:

Tell the audience *what you are going to tell them*

Talk outline slide; Menu for today; Key questions
Background as needed

Tell them *what you want to tell them*

Tell them *what you told them*

The structure of a good talk:

Tell them what you told them.

If you have multiple sections, so mini recaps at the end of each section, instead of one big recap. But you will still need a summary slide at the end recapping everything.

Your conclusions should reinforce the highlights that you used to build your talk.

For GSK student seminars, include a future directions slide.

* There are exceptions

Tell them *what you told them.* *Example*

Developmental Biology:

A pluripotent science

induction, competence, positional information

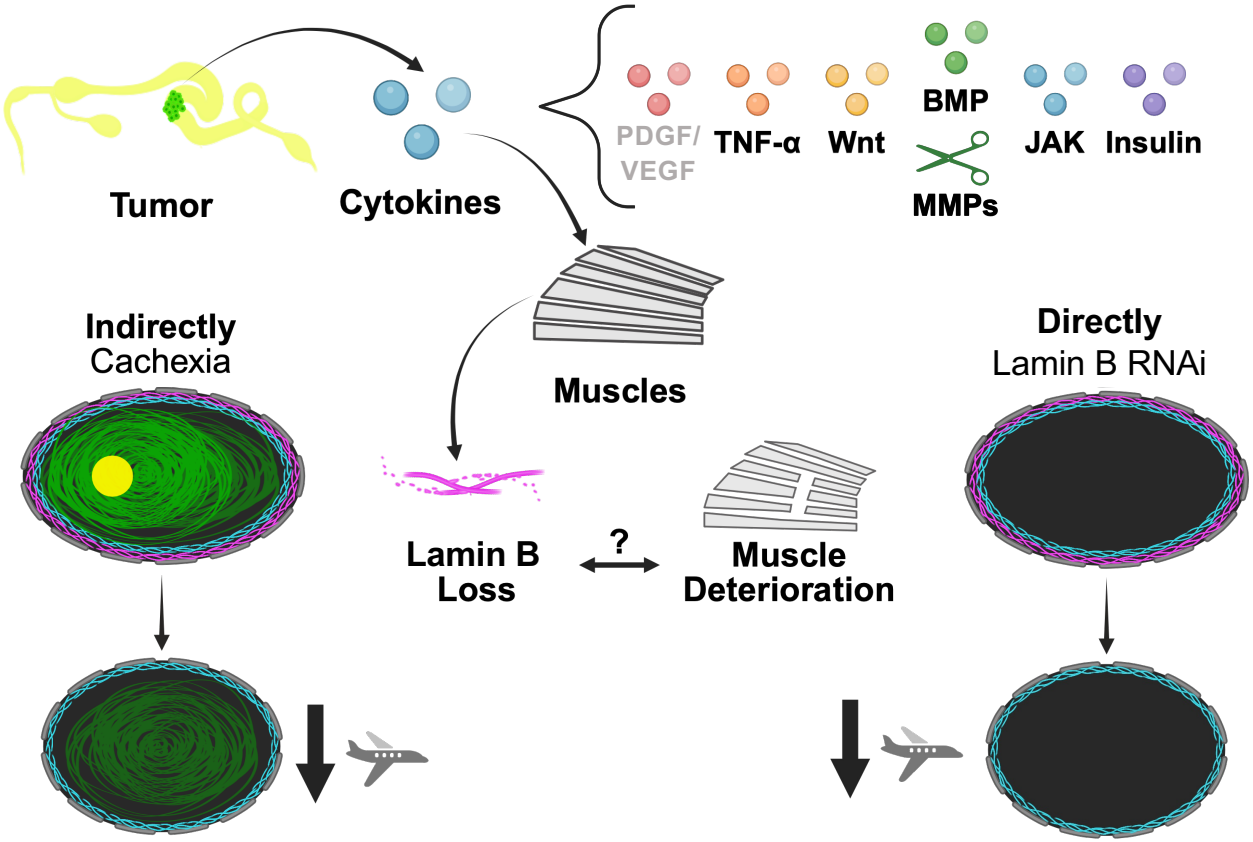
Signals are the perfect tool used to organize
cells in space (proliferation and death)

Ways to regulate signaling in vivo both the range of activity as well as the "type" of activity (collision of cell biology, signaling and development).

Special inducers = morphogens

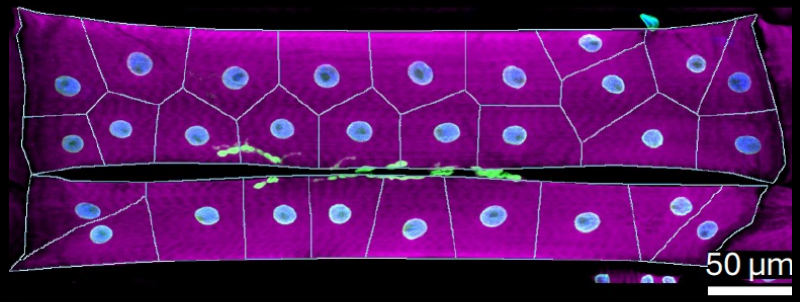
Molecular definitions of gradients/signaling activity…
more complexity revealed…

Summary



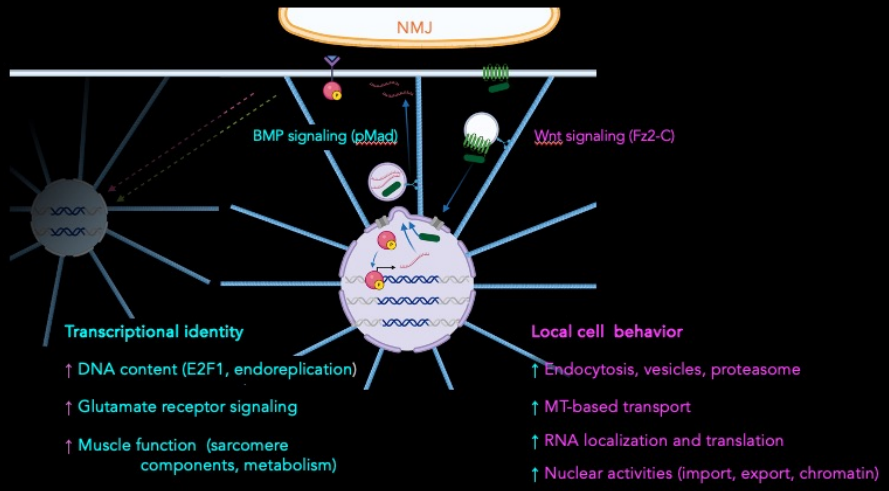
From Isabelle Top's GSS last year

Tell them *what you told them.* *Example*



Summary :

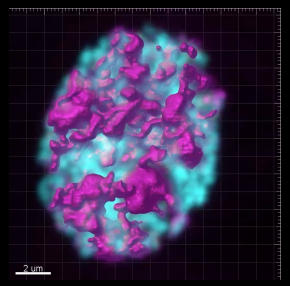
Nuclei within the muscle cell syncytium are heterogeneous but are arranged and a distinct pattern in flies (and in mammals).



Synaptic nuclei with conserved feature of muscle nuclei in flies and mammals.

Synaptic nuclei are established by NMJ-derived signals

BMP signaling regulates the local increase in DNA content in flies via transcriptional regulation.



Wnt-Fz-C signaling regulates the cell behaviors in flies by the local increase in endocytosis, vesicle trafficking and RNA localization.

The structure of a good talk:

Tell the audience *what you are going to tell them*

Talk outline slide; Menu for today; Key questions

Tell them *what you want to tell them*

Tell them *what you told them*

Summary slide

Designing effective scientific presentations:

Structuring your Talk

We may not be experts at public speaking….

But we are experts at listening to talks!

Designing effective scientific presentations:

Using PowerPoint and Structuring your Talk

Audience wants:

To learn some interesting and novel science

To listen to speakers that are credible and knowledgeable

To be responsive to speakers that are enthusiastic and passionate

To listen to a talk that is well organized, logical, and can be followed

To hear a talk that gives enough background to understand, makes us want to see the data, allows us to interpret that data, and make our own decision about the conclusions.


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RUBIO


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perfect


practice makes perfect
success
attitude
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strategy
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skillful
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leader
motivation
improving
learning
lead
knowledge
idea
development
rehearsing
dedication
plan
perfection
repeat
decision
training
proficiency
teaching
performance
activity
experience
education
action

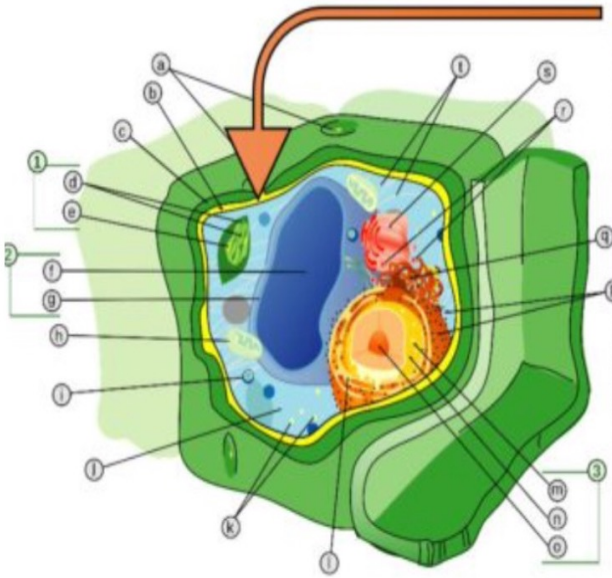


Three Key Aspects of the Most Effective Presentations

The Story/Scientific Content

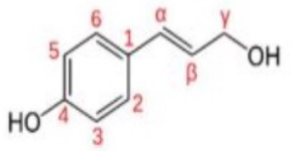
Slide preparation

Performance/delivery

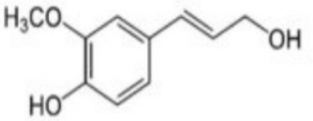


c. Cell wall 1. Chloroplast d. thylakoid membrane
e. Starch grain 2. Vacuole
f. Vacuole g. Tonoplast
h. Mitochondrion(mitochondria)
i. Peroxisome
j. Cytoplasm
k. Small membranous vesicles
l. Rough endoplasmic reticulum 3. Nucleus m. Nuclear pore
n. Nuclear envelope
o. Nucleolus
p. Ribosomes
q. Smooth endoplasmic reticulum
r. Golgi vesicles
s. Golgi body(Golgi apparatus)
t. Filamentous cytoskeleton

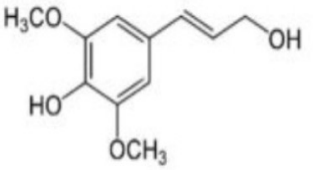
1



2



3



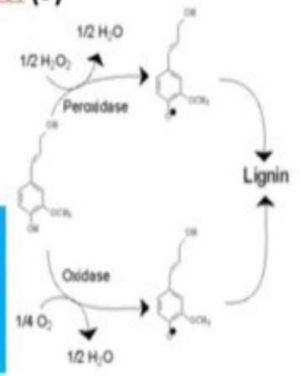
The three common monolignols: paracoumaryl alcohol (1), coniferyl alcohol (2) and sinapyl alcohol (3)

!!! Lignins are polymers made by cross-linking phenolic precursors

1813 Discovered by P. de Candolle
1930 Used as superplasticizers
1952 lignin is a network polymer
1976 The Chemical Reactivity

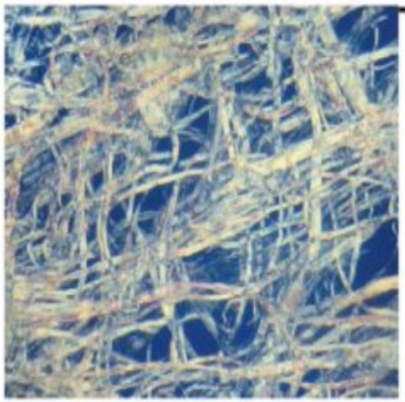
Lignin constitutes:

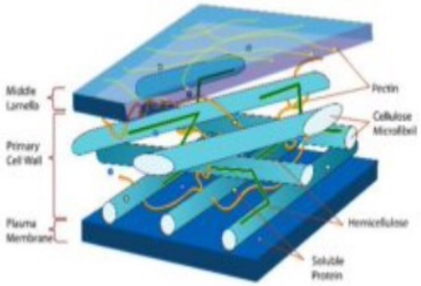
- **30%** of non-fossil organic carbon
- **20 to 35%** of the dry mass of wood.



polymerisation of coniferyl alcohol to lignin.

Wood pulp





Kraft recovery process

1. $Na_2SO_4 + 2\,C \rightarrow Na_2S + 2\,CO_2$
2. $Na_2CO_3 + Ca(OH)_2 \longleftrightarrow 2\,NaOH + CaCO_3$
3. $CaCO_3 \rightarrow CaO + CO_2$
4. $CaO + H_2O \rightarrow Ca(OH)_2$

Powerpoint Basics:

1. What font to use?

Use Sans Serif on slides:

This font is Avenir. This font is Arial. This font is Helvetica.

This font is Futura. This font is Calibri.

Sans Serif fonts have been proven to be easier to read on a projected screen

Serif Fonts:

This font is Times New Roman. This font is Courier.

Serif fonts take longer to read on slides,
but easier to read when looking down to read

Powerpoint Basics:

1. What font to use?

Type size should be a minimum of 18pt or larger up to 36 point, not larger:

18 point

20 point

24 point

28 point

32 point

36 point

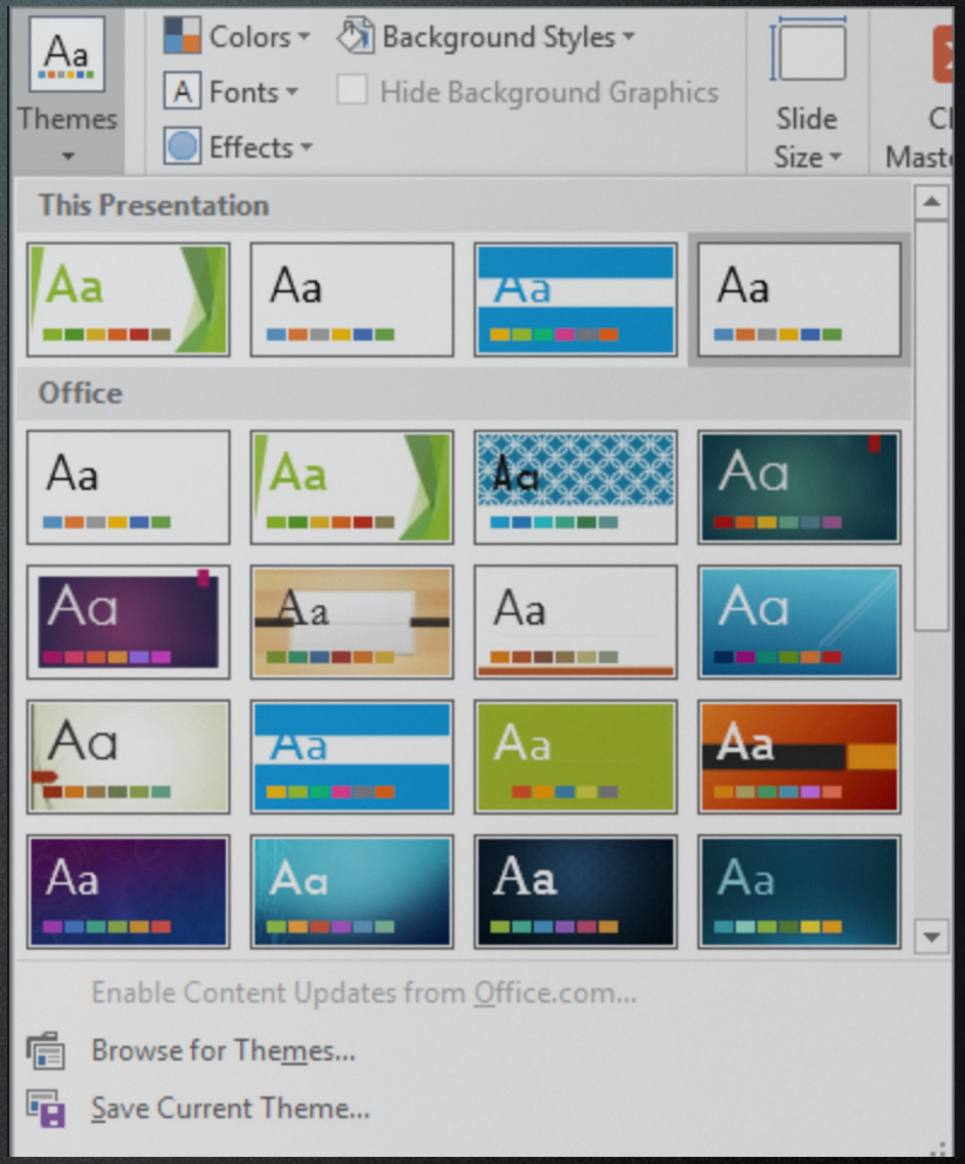
Can use 14pt for references

Powerpoint Basics:

2. What Color to use?

Simple backgrounds

Contrasting Font



Powerpoint Basics:

2. What Color to use?

Light text against a dark background

Powerpoint Basics:

2. What Color to use?

Dark text against a light background

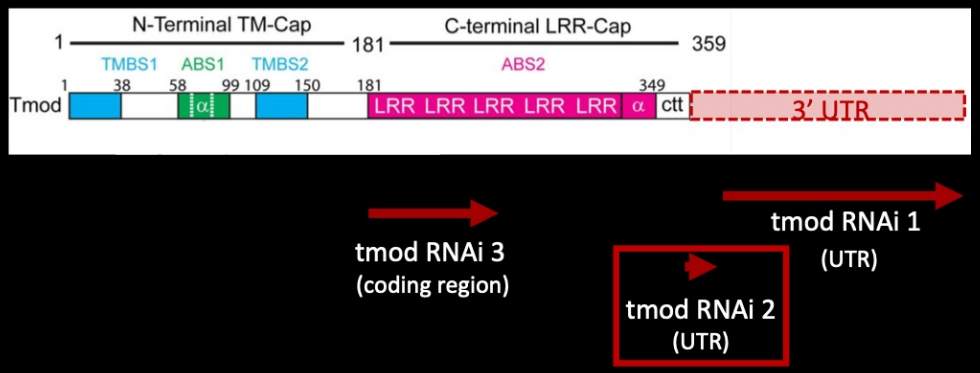
Powerpoint Basics:

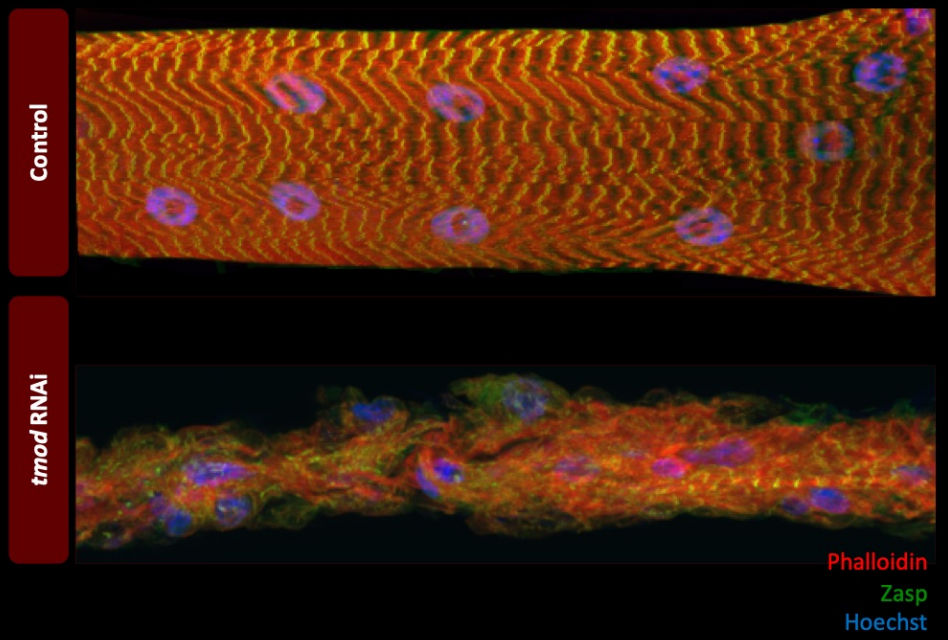
2. What Color to use?

All fluorescent images should have a black background

tropomodulin (tmod) is important for muscle structure

Muscle specific drivers:
UAS-dcr;; Dmef2-Gal4, Zasp::GFP
UAS-dcr;; Mhc-Gal4, Zasp::GFP





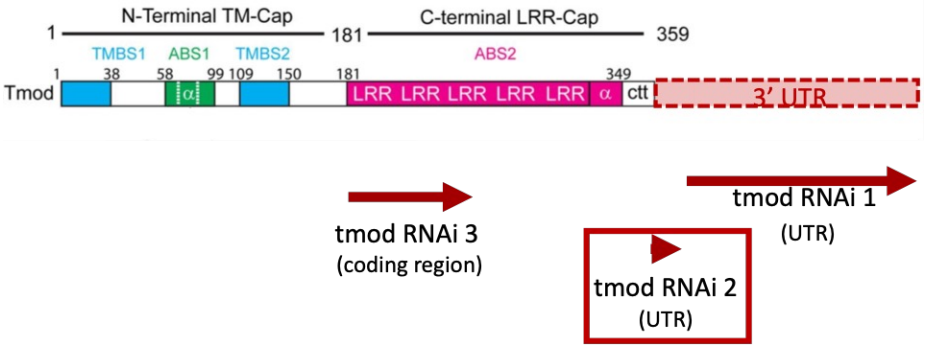
Zapater I Morales, C et al., 2023 PMID 3680912

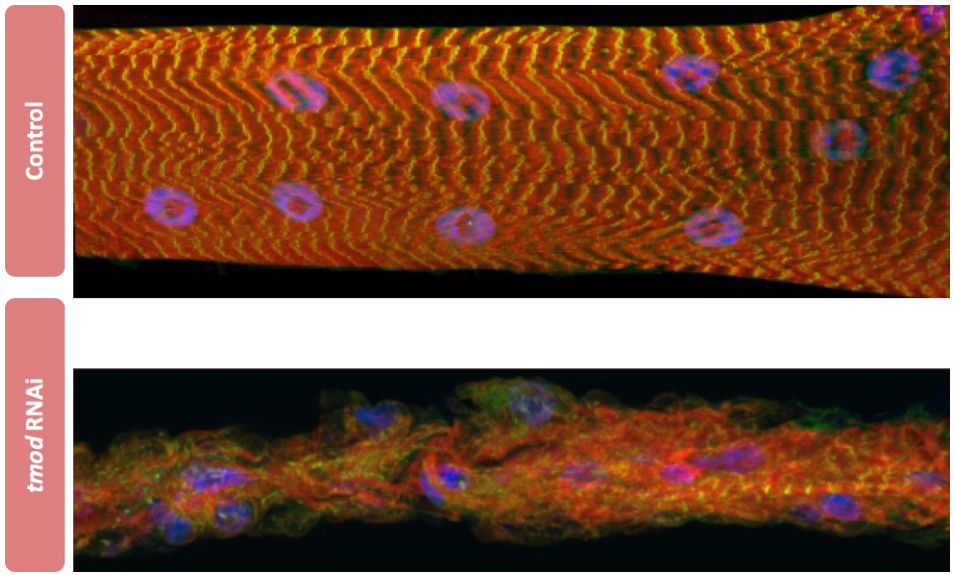
Powerpoint Basics:

2. What Color to use?

tropomodulin (tmod) is important for *muscle structure*

Muscle specific drivers:
UAS-dcr;; Dmef2-Gal4, Zasp::GFP
UAS-dcr;; Mhc-Gal4, Zasp::GFP





Zapater I Morales, C et al., 2023 PMID 3680912

Powerpoint Basics:

2. What Color to use?

When selecting colors, take into consideration those who are colorblind.

8% of males are colorblind

https://davidmathlogic.com/colorblind

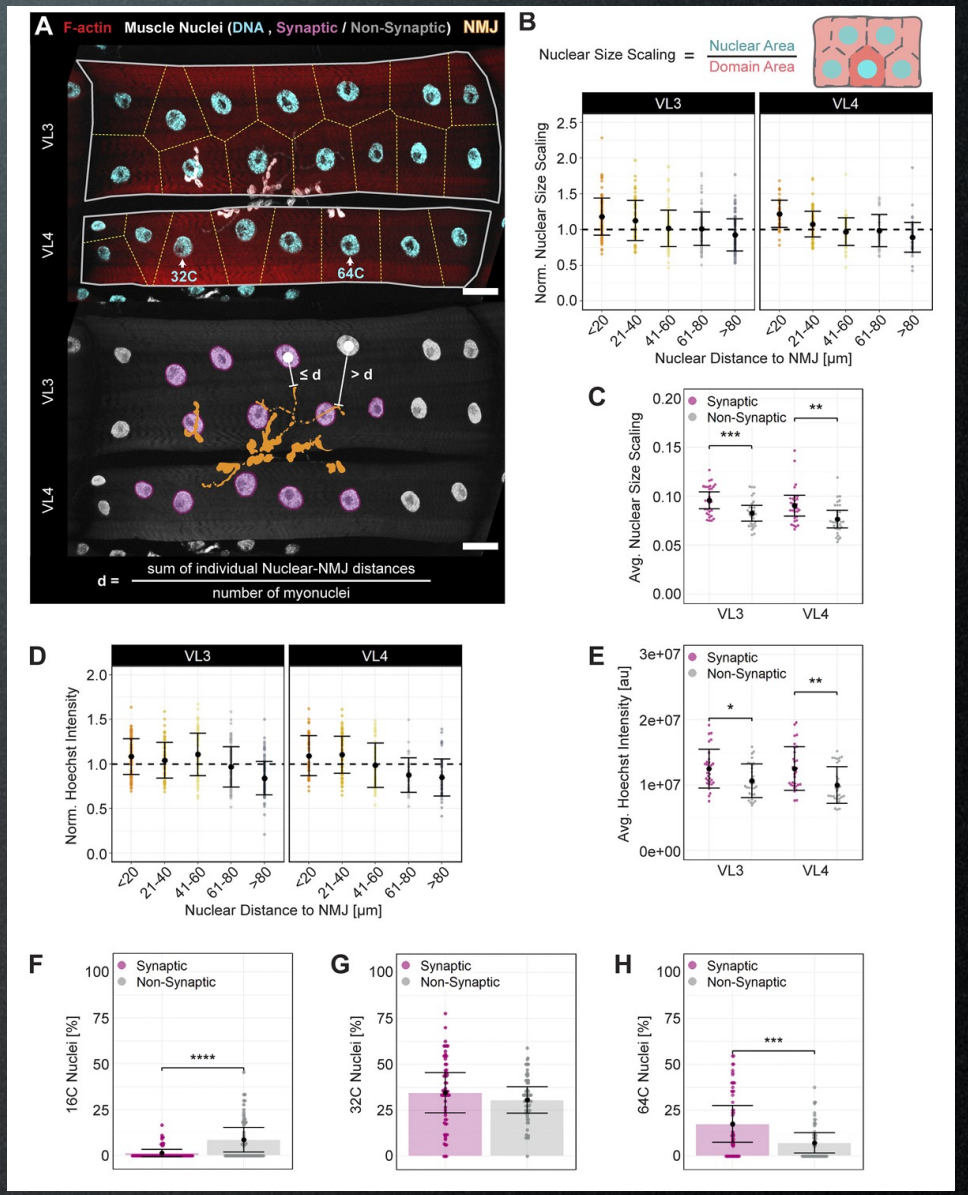
https://www.molecularecologist.com/2020/04/simple-tools-for-mastering-color-in-scientific-figures/ -

Powerpoint Basics:

3. Layout

Make your slides:

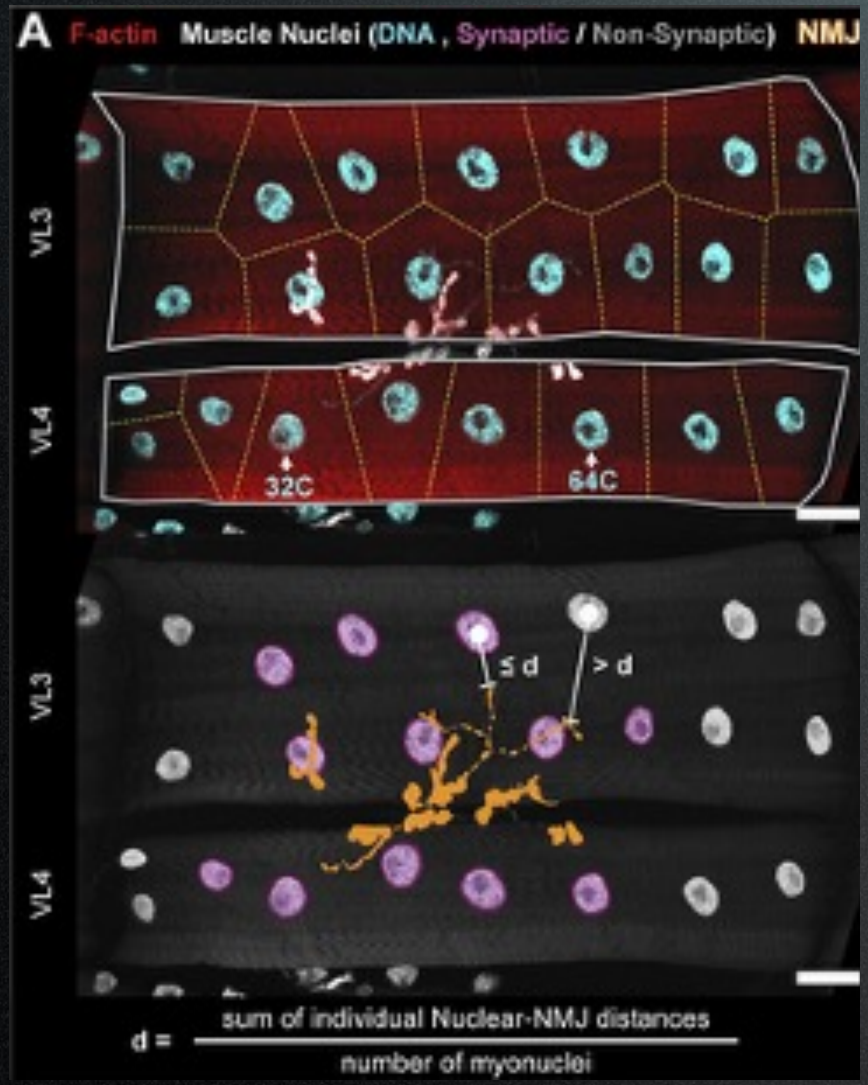
Do not use a Figure directly from a paper

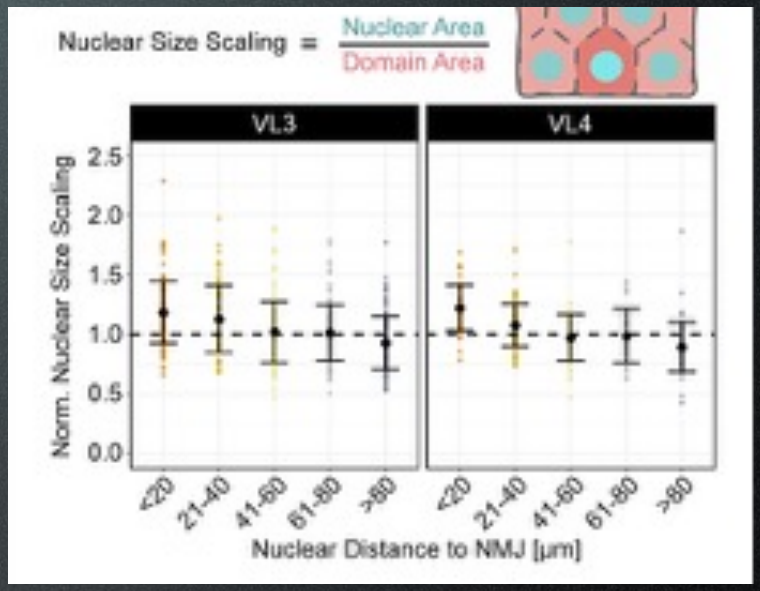


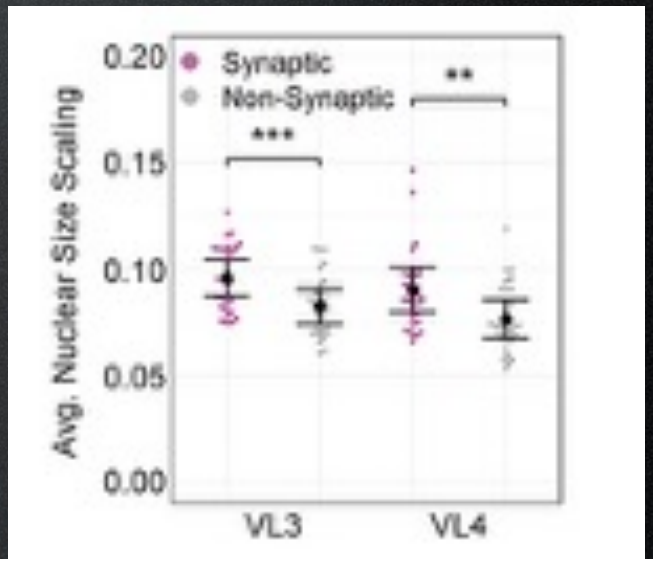
Von Saucken et al., 2025 PMID 39475469.

Powerpoint Basics:

3. Layout



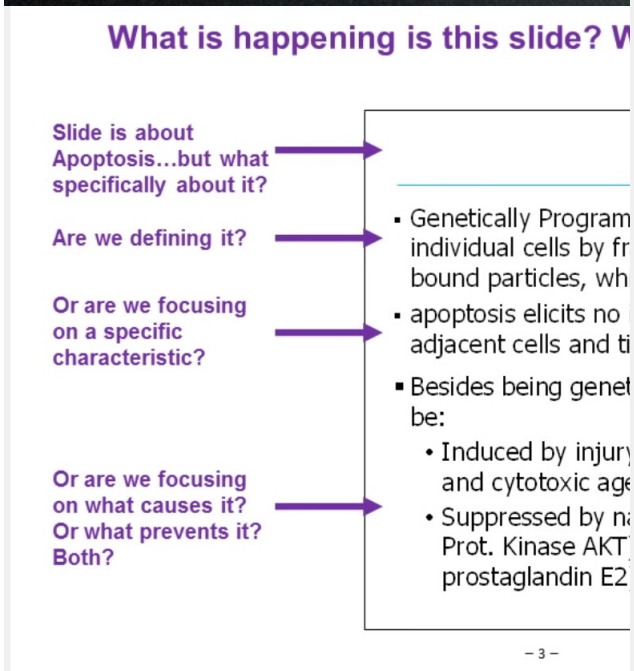


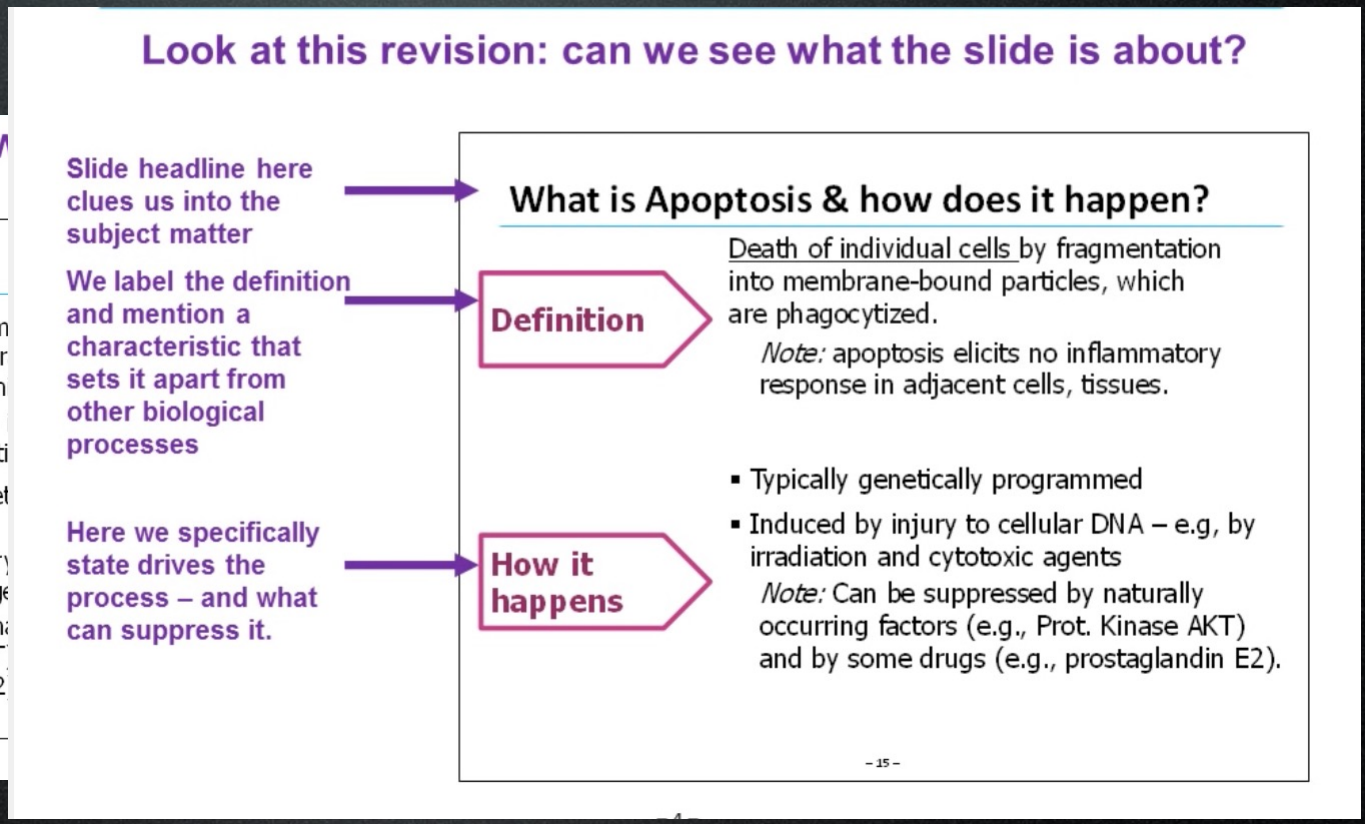


Powerpoint Basics:

3. Layout

Each slide should have a MAIN point, so that the viewers know why they are looking at that particular slide.

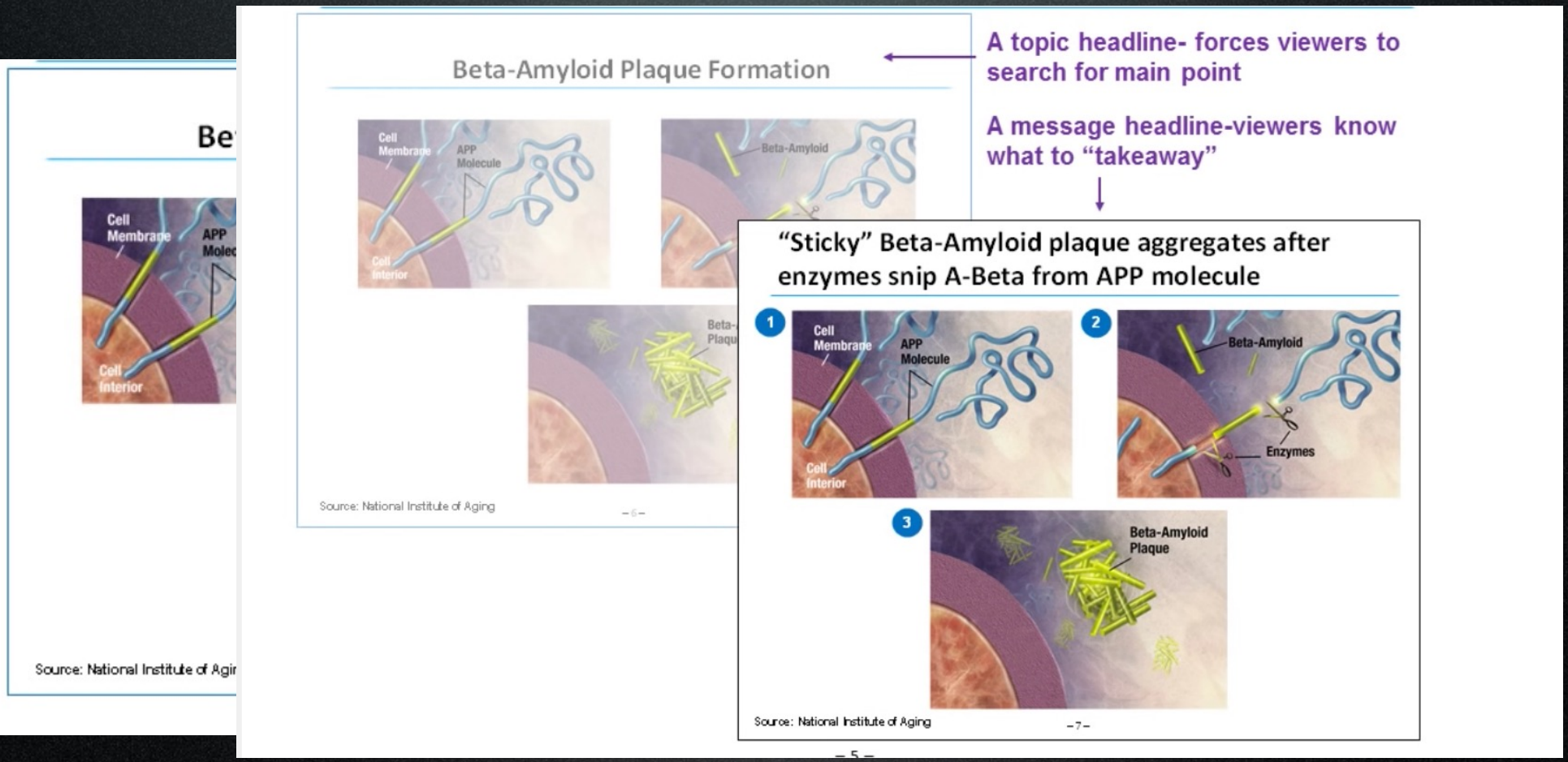




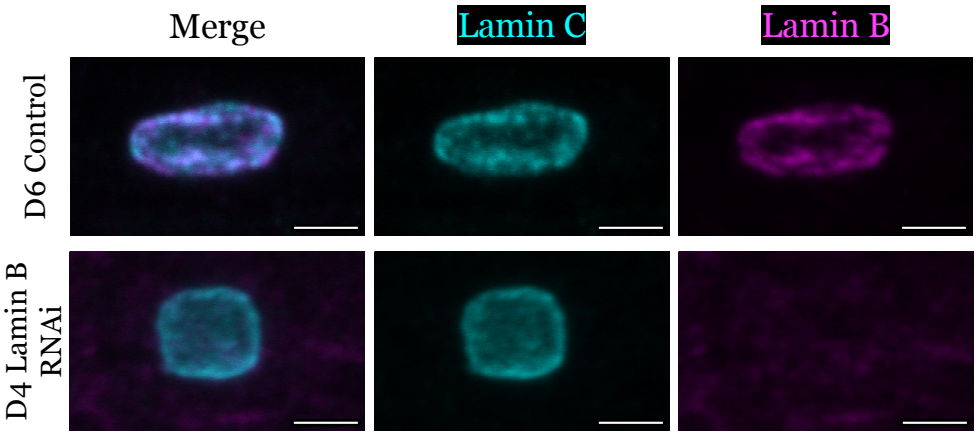
Powerpoint Basics:

3. Layout

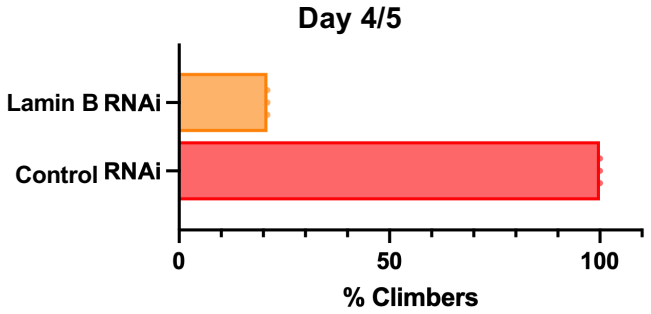
Every slide title should be a statement that tells the key message of the slide.



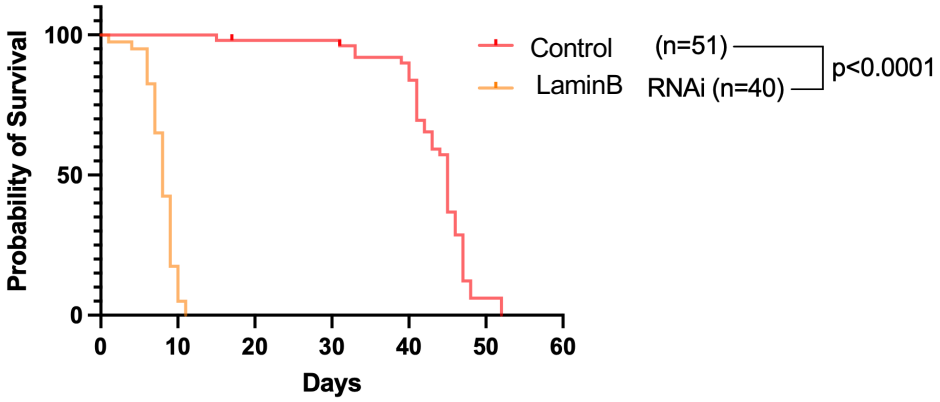
Loss of Lamin B Loss Causes Muscle Function



Scale Bar = 2 µm



N=14-17 flies in preliminary climbing experiment.



Lamin B RNAi = Dcr2;;Mef2-Gal4>Lamin Dm RNAi (VDRC 107419)



Control



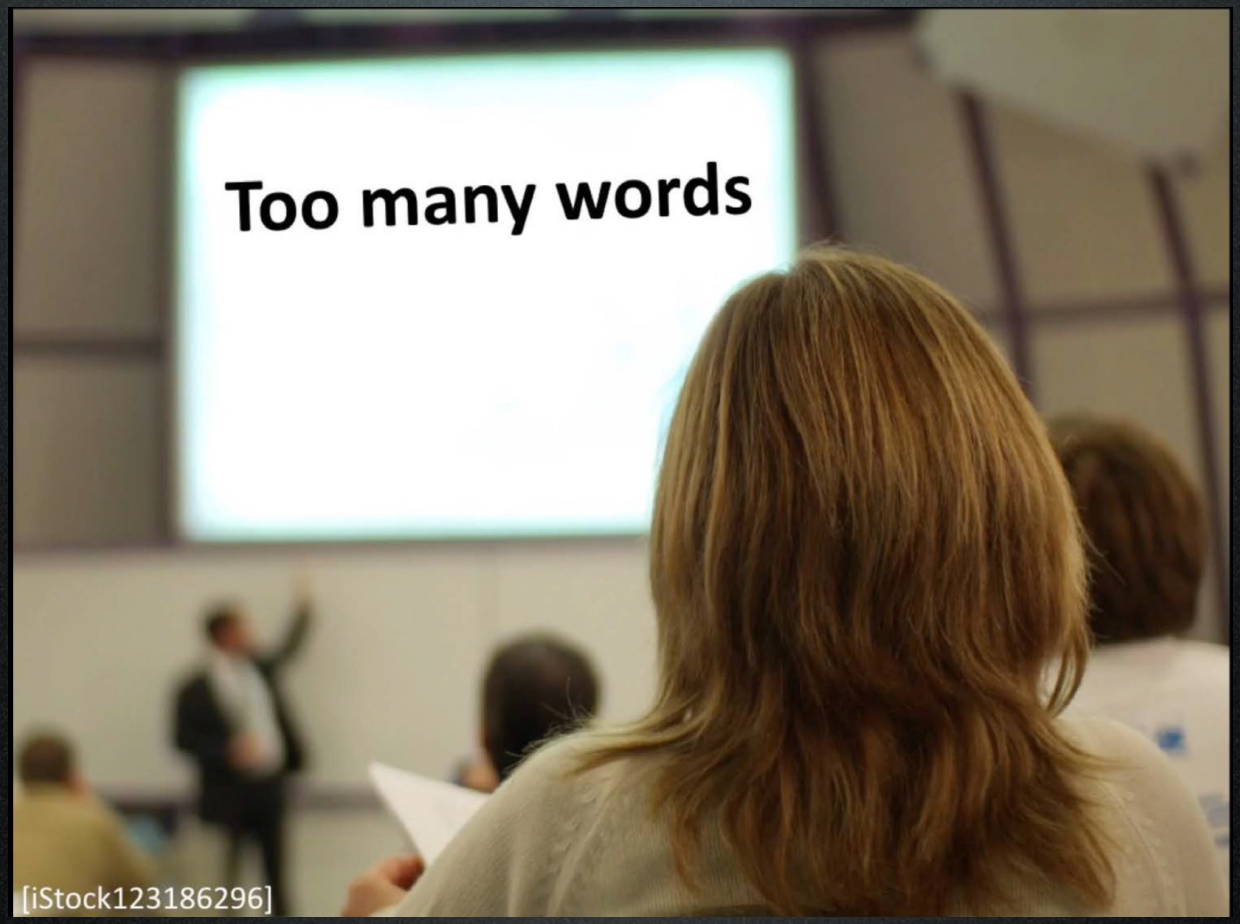
Lamin B RNAi

From Isabelle Top's GSS last year

Males & Females

Powerpoint Basics:

3. Layout



Ideal gas bearings for MTM

Load Tolerant – capable of handling both normal and extreme bearing loads without compromising the integrity of the rotor system.

Simple – low cost, small geometry, low part count, constructed from common materials, manufactured with elementary methods.

High Rotor Speeds – no specific speed limit (such as DN) restricting shaft sizes. Small Power losses.

Good Dynamic Properties – predictable and repeatable stiffness and damping over a wide temperature range.

Reliable – capable of operation without significant wear or required maintenance, able to tolerate extended storage and handling without performance degradation.

+++ Modeling/Analysis (anchored to test

Review of Test Data Indicates Conservatism for Tile Penetration

- The existing SOFI on tile test data used to create Crater was reviewed along with ST5-67 Southwest Research data
  - Crater overpredicted penetration of tile coating significantly
    - Initial penetration to described by normal velocity
      - Varies with volume/mass of projectile (e.g., 2500ft/sec for 3cu. in)
    - Significant energy is required for the softer SOFI particle to penetrate the relatively hard tile coating
      - Test results do show that it is possible at sufficient mass and velocity
    - Conversely, once tile is penetrated SOFI can cause significant damage
      - Minor variations in total energy (above penetration level) can cause significant tile damage
  - Flight condition is significantly outside of test database
    - Volume of ramp is 1920cu in vs 3 cu in for test

How to Help STEM

- Brings students into the **STEM** fields earlier
- Establish broad coalitions among critical stakeholders
- Modernize the image of engineering
  - Engineers are "creative", "socially responsible"
  - Humanitarian Engineering
- Increase visibility of engineers
- Bring kids on campus through camps etc.
- Develop mentoring programs
  - College students and K-12 kids

National Science Foundation

Dynamic Stochastic Optimal Power Flow (DSOPF): A Vision or Target for Research to Integrate the "Nervous System" of Power Infrastructure

- DSOPF02 started from EPRI question: can we optimally manage&plan the whole grid as one system, with foresight, etc.?
- Closest past precedent:Momoh's OPF integrates&optimizes many grid functions – but deterministic and without foresight. UPGRADE!
- ADP math required to add foresight and stochastics, critical to more complete integration.
- New teams needed, forming: DSOPF04





Leadership and Quality Assurance in Applied Computing, Engineering, and Technology Ed

Project Background

Insert Project Name Here

- What is the story of your project? (*Note: the Project Charter should have this information.*)
  - When did project begin? (Overall timeline)
  - What was the motivation for the project? (e.g., what device, tool, or process is the project partner currently using?)
  - What goal or end are you trying to achieve with the project?
  - Who are the stakeholders?
  - What is the context of the project?

Insert Team Name Here

Insert Sponsor Name/Logo Here

Numerical Methodology

- Steady state models used, convergence was assessed through monitoring of:
  - Equation RMS and maximum residual values
  - Inlet and exit mass flow
  - Area-averaged pressure and velocity at turbine exit
- Turbulence model
  - Shear Stress Transport (SST) model
  - CFX Automatic wall treatment employed
    - Switches between wall functions in a low-Reynolds number near wall formulation
    - Requires $y^+<1$, and at least near-wall nodes
- Boundary conditions

Powerpoint Basics:

3. Layout

Are slides with lots of words just boring
or is there more to it?

Powerpoint Basics:

3. Layout

Spoken word and writing are processed in the same part of the brain

(Paivio, 1980s)

The topography of shark skin is inhospitable to biofilms



"Spoken Words"

Written Words

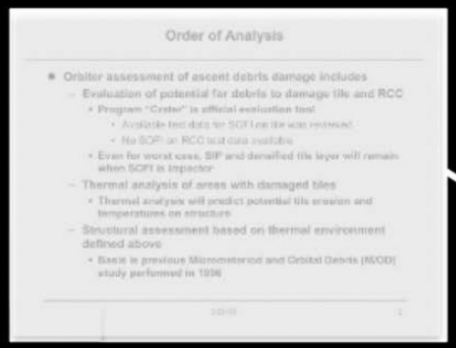


Powerpoint Basics:

3. Layout

If audiences try to process too many words simultaneously, cognitive overload occurs

i.e. comprehension problems



Written Words

"Spoken Words"



[Image: Dengjia Yu]

[Sweller, Cambridge, 2005]



[Image: Dengjia Yu]

Powerpoint Basics:

3. Layout

Try to include a simple image (schematic/one piece of data) instead of lots of text on every slide.

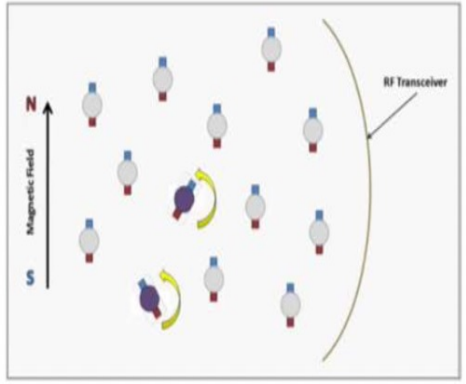
Aim to deliver the same content through all three channels at the same time:

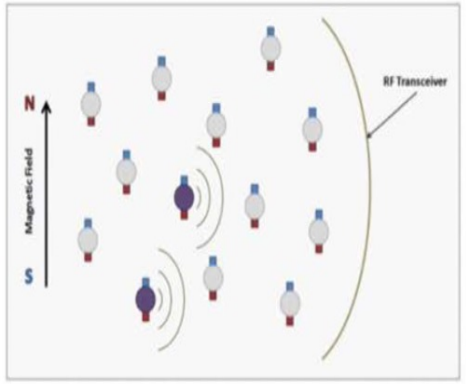
Images- (processed in a different part of the brain)
Readers
Listeners

Scientific evidence of benefits of text-light slides

When Gradient Magnets Turn Off

- Field from superconducting magnet realigns atoms with RF energy
- These atoms move to lower energy state and release RF wave
- Transceiver can detect these waves
- The frequency of RF wave depends on molecule containing the H atom



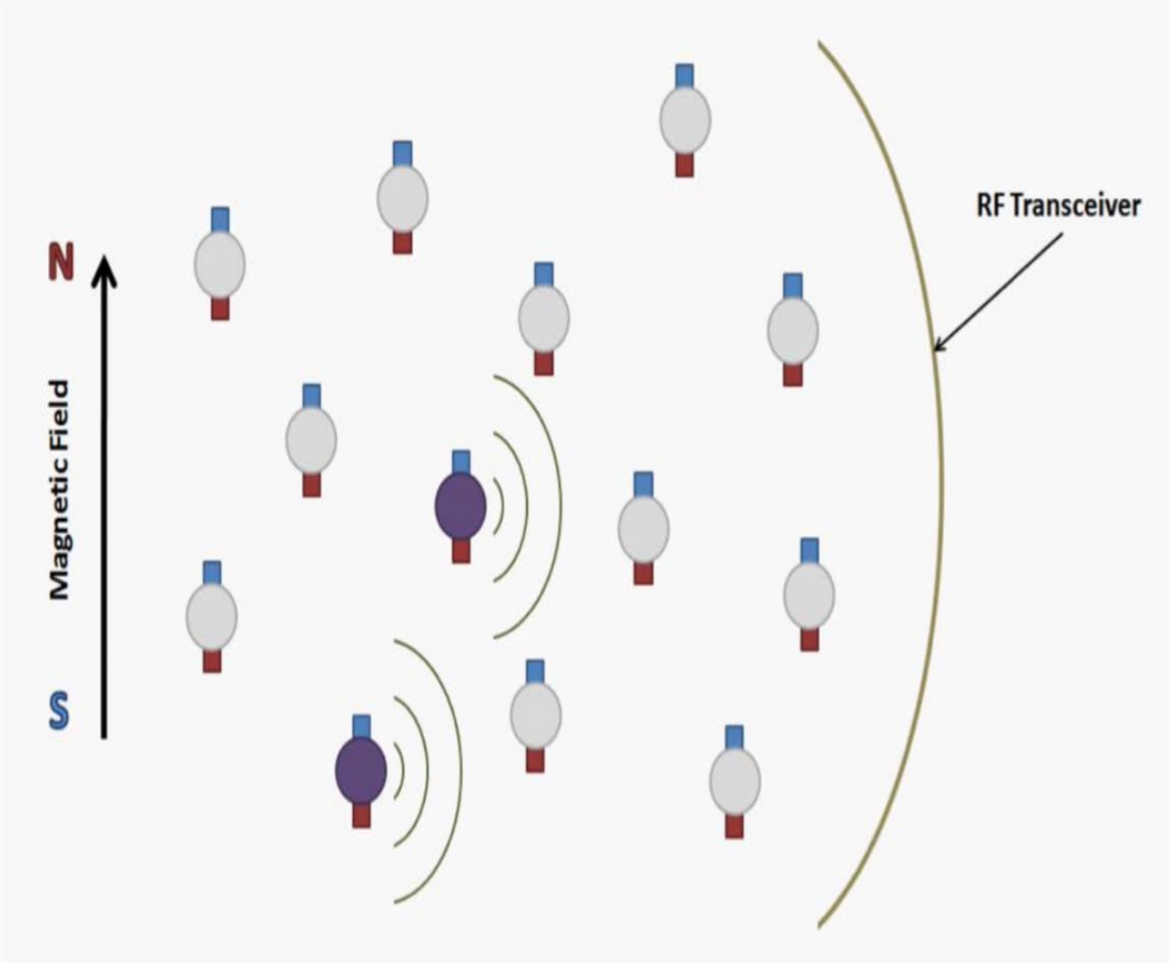


ENGR HEALTH

[Garner et al., *Technical Communication*, 2010]

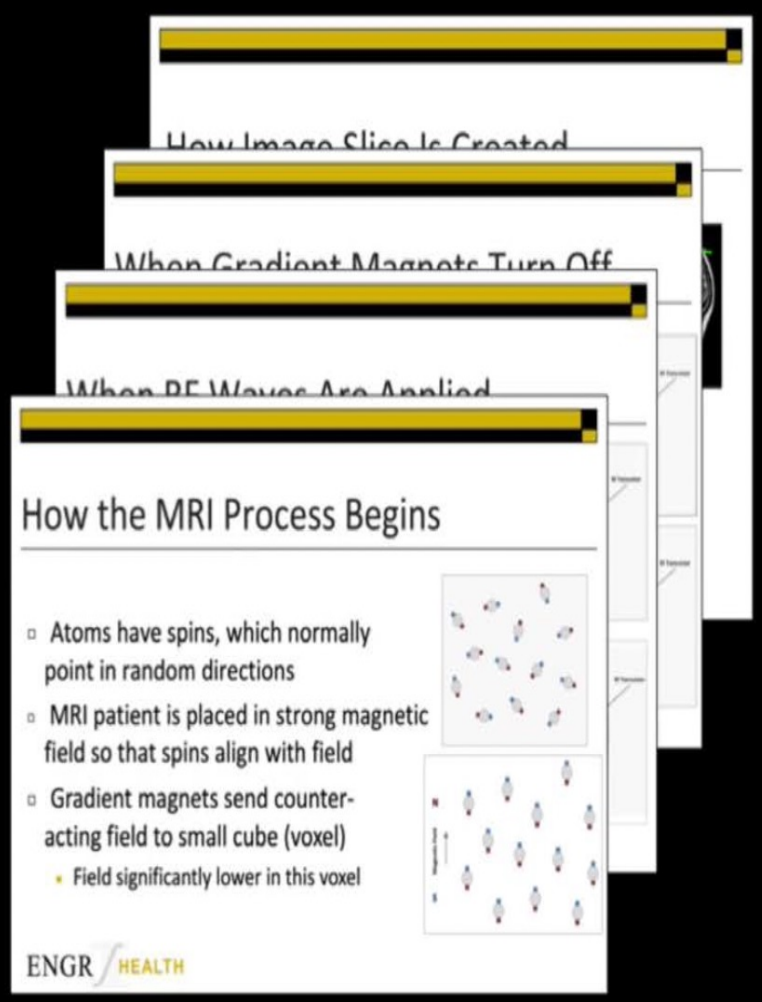
Scientific evidence of benefits of text-light slides

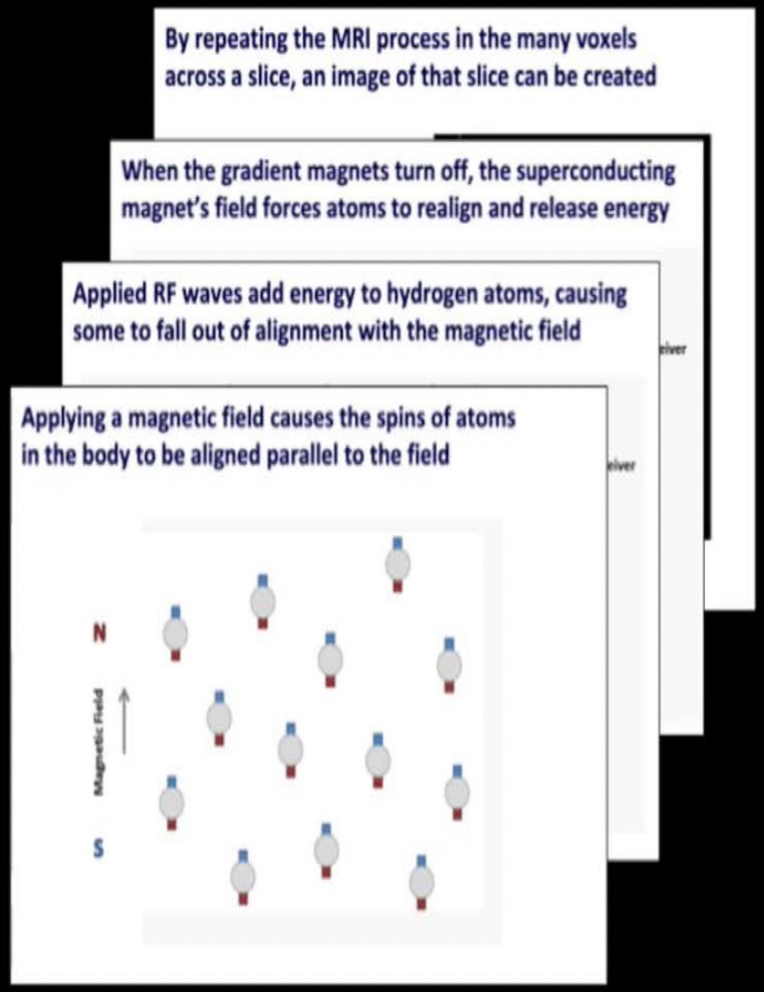
When the gradient magnets turn off, the superconducting magnet's field forces atoms to realign and release energy



[Garner et al., *Technical Communication*, 2010]

Increased comprehension of text-light slides





10 X higher misconception rate

[Garner et al., *Technical Communication*, 2010]

Powerpoint Basics:

3. Layout

Remove text (other than the title and labelling) as possible.

Slides are NOT your speaker's notes.

Slides are visual aids for the audience.

Powerpoint Basics:

3. Layout

If you must have text: limit text blocks to two lines.

Lists should contain no more than 3 items.

Powerpoint Basics:

3. Layout

"Unveil" list items one at a time.

Item 1

Item 2

Item 3

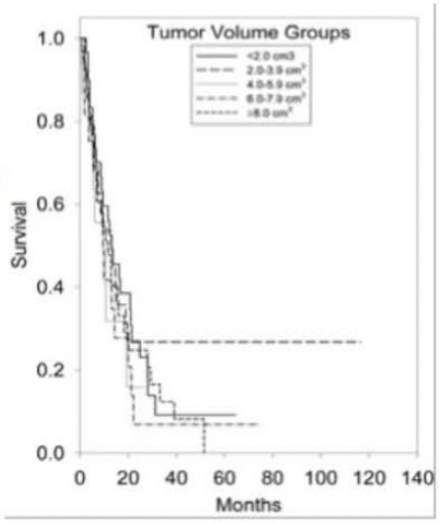
Hallmarks of Cancer

- For 2+ decades, we have known that cancer cells and tumors exhibit hallmarks ranging from sustained proliferative signaling to inducing angiogenesis (Hanahan & Weinberg 2000)
- New hallmark: deregulated cellular energetics (Hanahan & Weinberg 2011)



Hanahan & Weinberg, Cell, 2011

Changes in survival



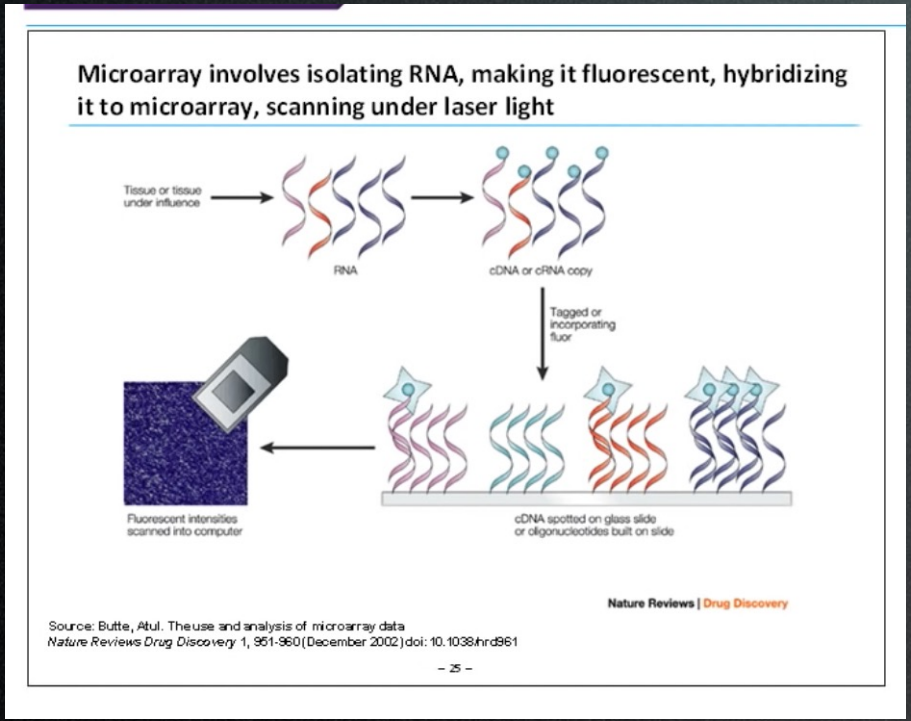
Wikimedia Commons / Ellis

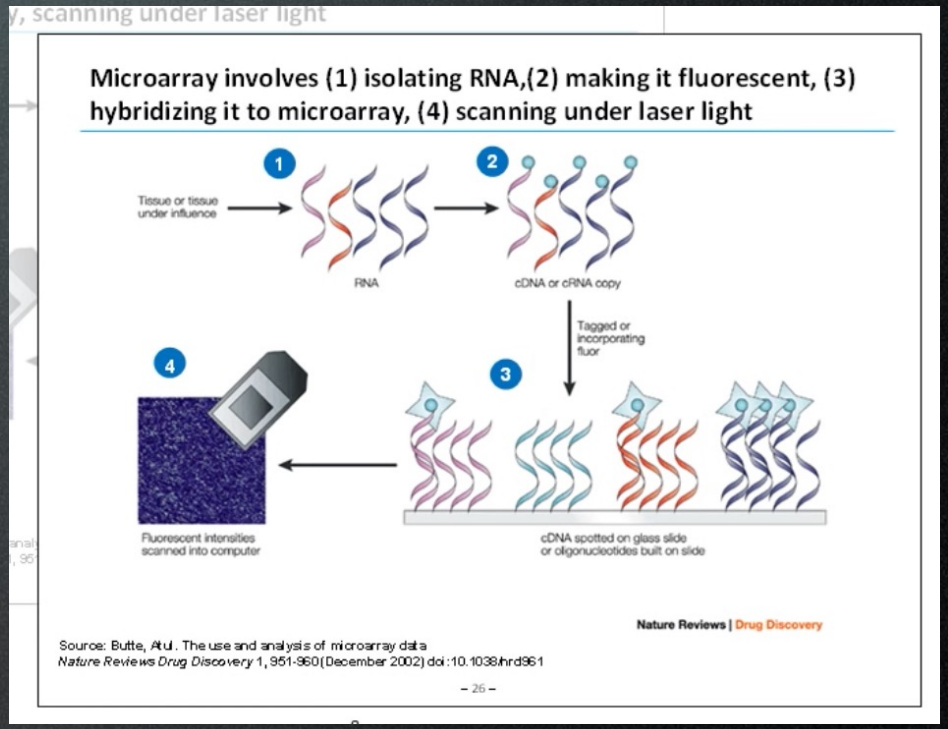

Much text
not readable
[iStock123186296]

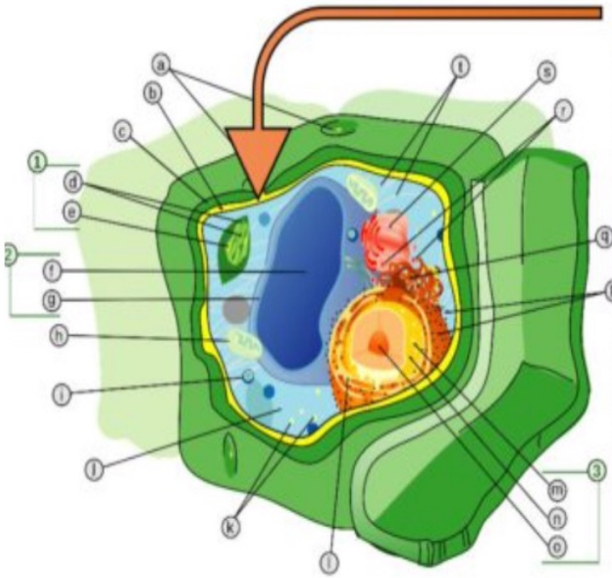
Powerpoint Basics:

3. Layout

Use numbers, letters, arrows to show the viewer the flow or steps of a process.

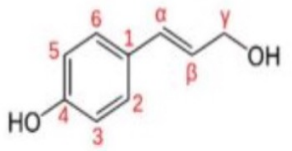




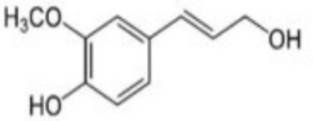


c. Cell wall 1. Chloroplast d. thylakoid membrane
e. Starch grain 2. Vacuole
f. Vacuole g. Tonoplast
h. Mitochondrion(mitochondria)
i. Peroxisome
j. Cytoplasm
k. Small membranous vesicles
l. Rough endoplasmic reticulum 3. Nucleus m. Nuclear pore
n. Nuclear envelope
o. Nucleolus
p. Ribosomes
q. Smooth endoplasmic reticulum
r. Golgi vesicles
s. Golgi body(Golgi apparatus)
t. Filamentous cytoskeleton

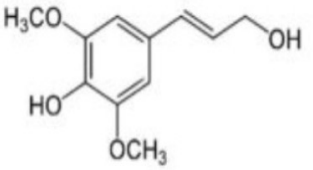
1



2



3



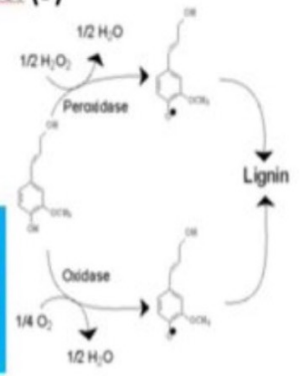
The three common monolignols: paracoumaryl alcohol (1), coniferyl alcohol (2) and sinapyl alcohol (3)

!!! Lignins are polymers made by cross-linking phenolic precursors

1813 Discovered by P. de Candolle
1930 Used as superplasticizers
1952 lignin is a network polymer
1976 The Chemical Reactivity

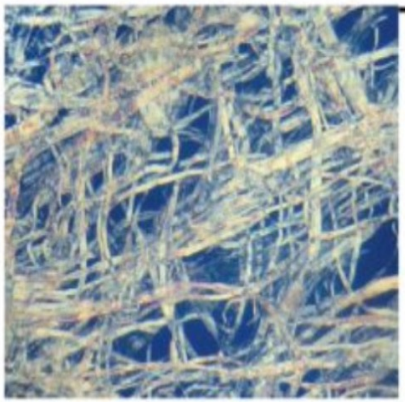
Lignin constitutes:

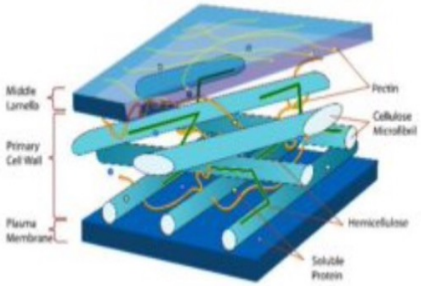
- **30%** of non-fossil organic carbon
- **20 to 35%** of the dry mass of wood.



polymerisation of coniferyl alcohol to lignin.

Wood pulp





Kraft recovery process

1. $Na_2SO_4 + 2\,C \rightarrow Na_2S + 2\,CO_2$
2. $Na_2CO_3 + Ca(OH)_2 \longleftrightarrow 2\,NaOH + CaCO_3$
3. $CaCO_3 \rightarrow CaO + CO_2$
4. $CaO + H_2O \rightarrow Ca(OH)_2$


Cluttered—not sure where to look
[iStock123186296]

Powerpoint Basics:

4. Style

Limit the numbers of items on a slide

Each slide should make just one or two points!

Powerpoint Basics:

4. Style

Animations can be used to focus the viewer's attention

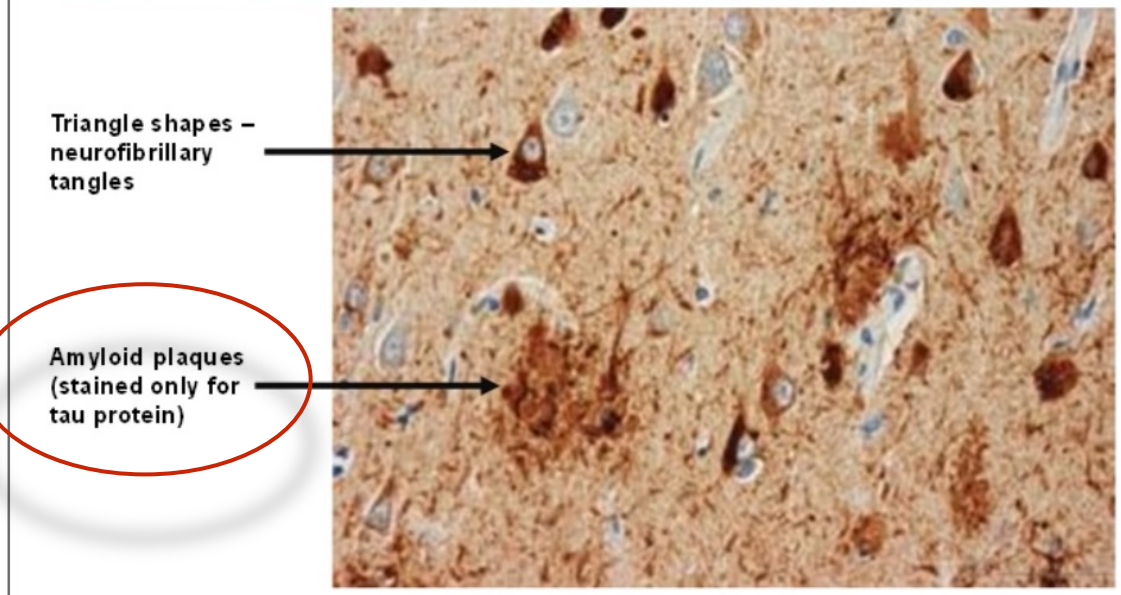
Limit however your use to no more than 3 or 4/slide.

Powerpoint Basics:

3. Layout

Annotate your images, grafts, and tables

Tissue from the hippocampal region of the brain stained brown to display the tau protein.



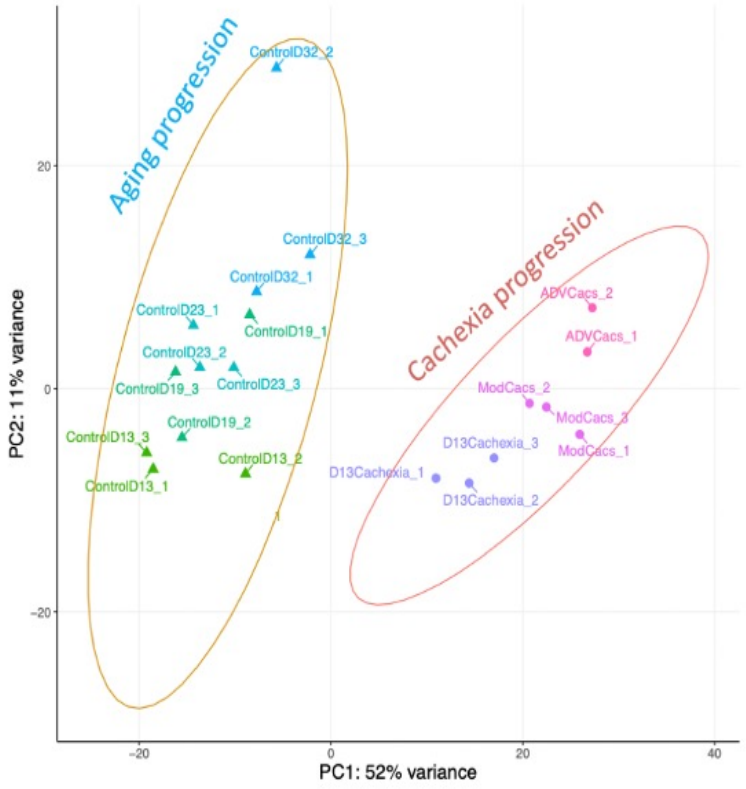
Source: "Gene Variation Linked To Earlier Onset Of Alzheimer's Symptoms" ScienceDaily (June 10, 2008), based on Kauwe JSK, Cruchaga C, Mayo K, Fenoglio C, Bertelsen S, Nowotny P, Galimberti D, Scarpini E, Morris JC, Fagan AM, Holtzman DM, Goate AM. "Variation in MAPT is associated with cerebrospinal fluid tau levels in the presence of amyloid-beta deposition." *Proceedings of the National Academy of Sciences*, vol. 105 (23). pp. 8050-8054. June 10, 2008

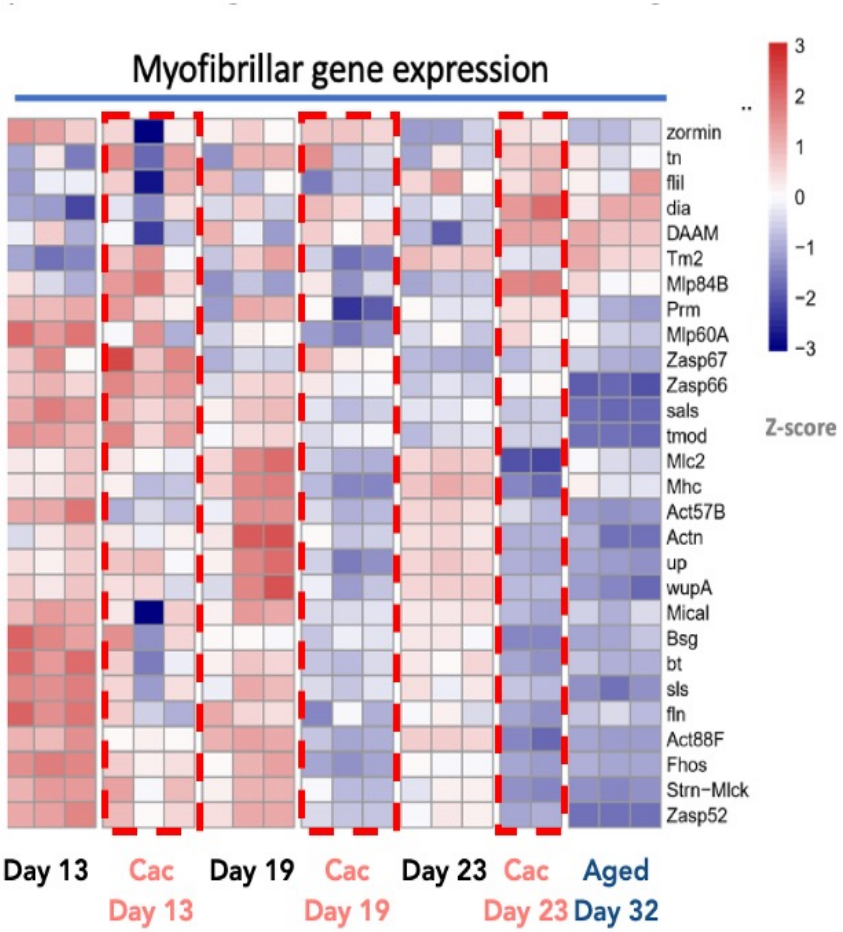
– 24 –

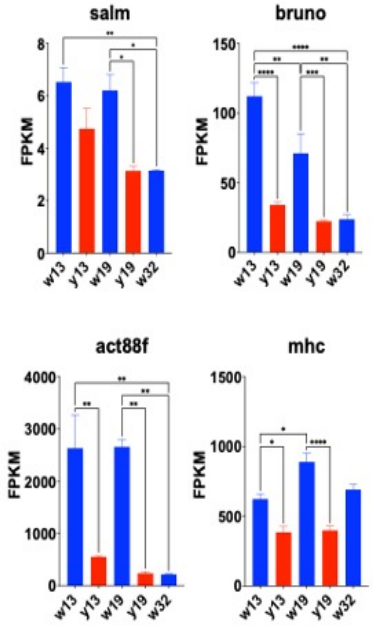
Example

Results

RNA-seq Shows Decreased Expression of Key Myofibril Related Genes

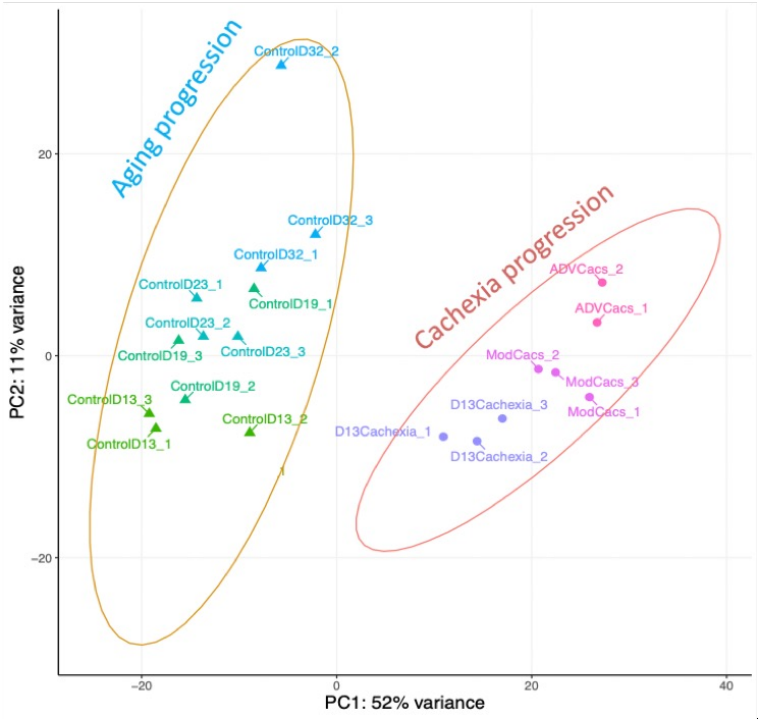


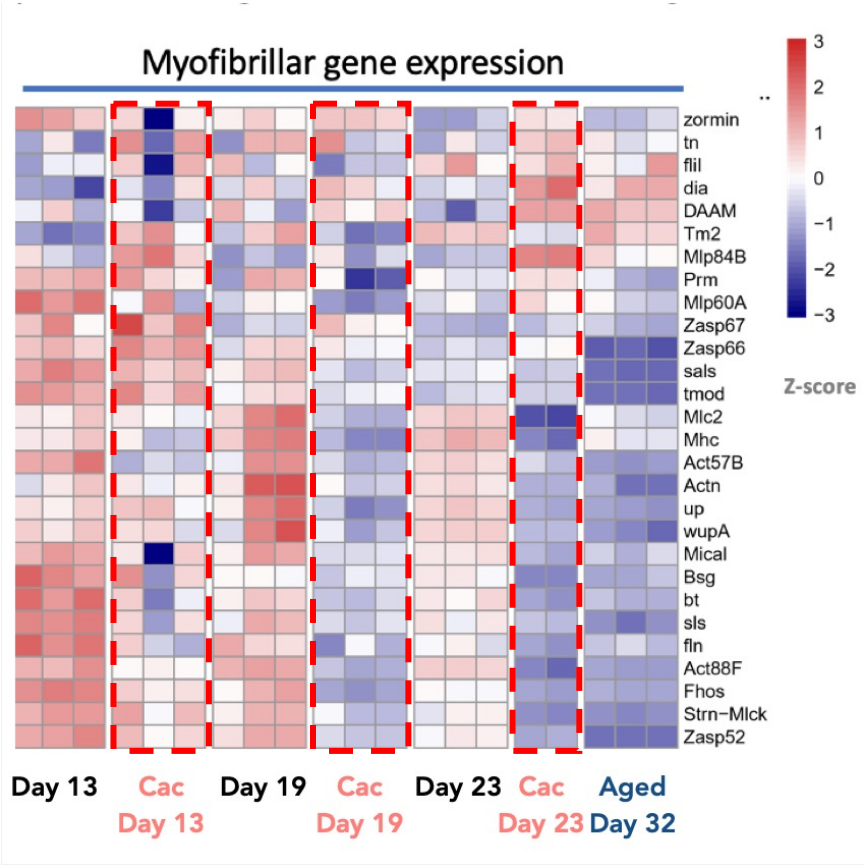


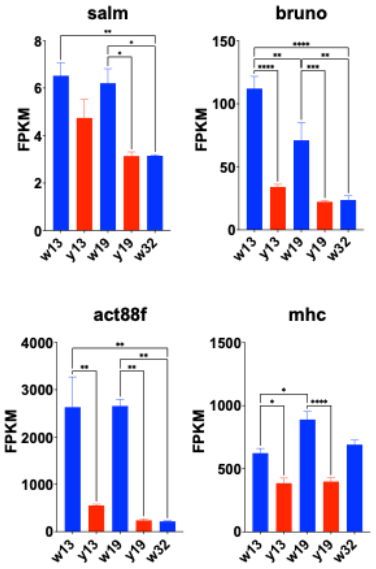


Normalized Gene Counts for Key Flight Muscle Genes

RNA-seq Shows Decreased Expression of Key Myofibril Related Genes







Normalized Gene Counts for Key Flight Muscle Genes

Powerpoint Basics:

4. Style

Do not include anything on a slide that is not explained

Include slides to explain new techniques that would not be known to the audience (with models)

Pauses are exceptionally powerful for focusing an audience as are blank slides.

Powerpoint Basics:

It takes a lot of time and forethought to use Powerpoint well

Use clear, simple graphics and clear simple text

Strip down slide content to the minimum essential data that you need to present.

Build content progressively.

Is this all you need to know to give a great talk?

Three Key Aspects of the Most Effective Presentations

The Story/Scientific Content

Slide preparation

Performance/delivery

Is this all you need to know to give a great talk?

MOST IMPORTANT:

Practice and delivery

Practice, Practice, Practice

Practice!!

Rehearse out loud dozens of times with a pointer

Get feedback from others

Repeat until you have perfected your story and delivery in the correct length of time.

Practice, Practice, Practice

Try to sound conversational!

Do not read a script.

Break up your practice sessions – maybe 3 X/day over 3 days. Cramming practice doesn't work.

Engage your audience
"The medium is the message"

Be enthusiastic and excited about your work

Be Dynamic and engaging

Go to seminars and critique the presentations.

What do you like about the presentation,
what don't you like?

Deliver to your Audience

Do not read your slides– slides are visual aids for your audience, not really for you.

Face and project to your audience, not to the screen.

Make eye contact with the audience

Do NOT Go Over Your Time

The audience turns off once you got past your time.

The audience might get agitated and resentful.

You often lose your time for questions.

Your audience may only remember that your talk was long not the content.


PRACTICE IS
EVERYTHING
RUBIO


Practice makes
perfect


practice makes perfect
success
attitude
skill
mindset
goal
determination
strategy
information
skillful
practice
leader
motivation
improving
learning
lead
knowledge
idea
development
rehearsing
dedication
plan
perfection
repeat
decision
training
proficiency
teaching
performance
activity
experience
education
action



Questions for 10 min talks?
Seminar?
Assigned papers?