How to Give a Good Scientific Talk

Christian Theobalt

Summer Term 2018
Outline

- Structuring your story
- Preparing your data/information
- Preparing and giving the presentation
- Concluding your presentation
- Questions and answers
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Presentation Structure

- **Basic rule**
  - Say what you are going to say
    - 1-3 main points in the introduction
  - Say it
    - Give the talk – main insights / method
  - Then say what you said
    - Summarize main points in the conclusion
  - Don’t try to build suspense and then unveil a surprise ending

http://www.safetyoffice.uwaterloo.ca/hspm/tools/images/scaffold_stair.png
Tell a Story

- Prepare your material so that it tells a story logically
- Typical structure of talk
  - Subject: title, authors, acknowledgements
  - Introduction / overview/ motivation
  - Method/approach
  - Results/information/analysis
  - Conclusion/summary

http://www.cgd.ucar.edu/cms/agu/scientific_talk.html
The Story

- Common mistake: too much material
- Remember: You will never be able to tell the full story
- You must select pieces that are most relevant
- A lot of this talk – guidelines on how to select
Audience

- Why and to whom are you giving this presentation?
- What do you want the audience to learn?
  - Think about this as you construct your talk
  - Edit your slides – delete what is unnecessary, distracting, confusing, off point
Audience

- Goal depends on audience → structure

University seminar
- Audience with broad technical background in the field
- ...lacking specific overview of state-of-the-art methods
- Message:
  - Importance of problem and its solution
  - Main ideas, insight, and novelty over related work
  - “Being a graduate student”: discussion, ideas for improvement
Is a Slide Needed or Not?

- Two important criteria
  - Is it important for the main points in the story I want to tell?
  - Will the audience understand and value this point?
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Overview

Figures...

- Create a summary figure with major findings, or an illustration of the processes or problem
  - Consider showing it at the beginning and the end
  - Consider showing it during the talk as a guide
- You can use web sources for figures (reference source !)
- Also good for motivation: why is a problem important?
Summary / Overview Figure

- Overview figure as guide – consistent terminology
- Tells the audience: where are we?
- Picks up people that “got lost”
- Optional: highlighting

Input → Name of Step 1 → Name of Step 2 → Results
Summary / Overview Figure

- Overview figure as guide – consistent terminology
- Tells the audience: where are we?
- Picks up people that “got lost”
- Optional: highlighting
Figures to Explain Technical Concepts

- Often easier to understand than text
- Often support your explanation better than text
  - Build figures up as you speak
  - Make sure you reserve enough time for them

Pinhole camera [Wikipedia]

BRDF [vetcite.org]
4 stroke engine operation

The engine four main strokes to its cycle:

- The first stroke, called the \textbf{intake stroke}, the crankshaft pulls down the \textit{piston} by rotating. The \textit{intake valve} is open at this point in the cycle, and air will be pulled through the \textit{intake manifold} into the motor. After this is complete the \textit{camshaft} rotates to the low spot on the lobe. This allows the \textit{valve spring} to close the intake valve.

- The second stroke is called the \textbf{compression stroke}. This is because it compresses the \textit{fuel/air mixture}. While this is happening the intake and exhaust valves are closed...

[www.enginebasics.com]
Figures to Explain Technical Concepts

The 4 Stroke Cycle

1) Induction
2) Compression
3) Ignition (Power)
4) Exhaust

[www.enginebasics.com]
Videos / Software often are the Results

- Often actual results in visual computing
  - Make sure *before the talk* that videos / software play with the presentation equipment (projector etc.)
  - Use common codecs
  - Stay in control
    - Explain the results - don’t play videos and be silent (unless there is a voice over in the video)
    - Speed of video should match your explanation
    - Sometimes better to cut videos into pieces (one per slide) rather than playing long video
  - Video files often are large – mind presentation size, don’t stretch performance of laptop
Results: Data Tables / Figures

- Tables are useful for a small amount of data
- Include units
- Indicate data source if they are not your own
- But tables are often used badly …
Discharge of the Esopus Creek (Coldbrook, NY) and precipitation at Slide Mountain, NY (source: USGS/NCDC)

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Discharge of the Esopus Creek (Coldbrook, NY) and precipitation at Slide Mountain, NY (source: USGS/NCDC)
Preparing Your Data, continued

- Figures
  - ‘1 figure ≈ 1000 words’
  - Figures should be readable, understandable, uncluttered
  - Keep figures simple, use color logically for clarification
    - **Red=bad, green=good**
    - Invisible color
    - **Meaning attached to colors** (color blindness is more common than you think)
  - Explain axes and variables
  - Include reference on figure

Using Math

- People are used to study equations, not to see them for 2 minutes on a slide
- Equations should support your explanation, not harm it
- Common mistake: too many / too few equations
- Use them as little as possible…
- …and as much as needed
- Don’t use them to impress people or show how hard the problem you talk about is
- Use only important equations, take time, explain properly
Equation Example

- Properly explain each element

\[
\Psi(L) = \sum_{i \in I} \left( \phi(D|l_i) + \sum_{j \in N_i} (\phi(D|l_i, l_j) + \psi(l_i, l_j)) \right)
\]
Equation Example

- If you say: ‘to solve the problem we look for the minimum (or maximum) of the following energy function…’

\[
\Psi(L) = \sum_{i \in I} \left( \phi(D|l_i) + \sum_{j \in N_i} \left( \phi(D|l_i, l_j) + \psi(l_i, l_j) \right) \right)
\]

- and then you superficially explain each symbol → run risk to lose people’s attention quickly
Equation Example

- A slide overloaded with formalism often does not work well

\[
\Psi(L) = \sum_{i \in I} \left( \phi(D | l_i) + \sum_{j \in N_i} (\phi(D | l_i, l_j) + \psi(l_i, l_j)) \right)
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\]
Equation Example - Alternative

- Build equation up on slide, e.g., an error function and / or ...
- ... explain components on conceptual level
  - Why is that component part of the error function?
- Combine with figures
- Still explain most important mathematical insight
- Refer for details to paper – but know (!) the details, in case there is a question
Equation Example – Alternative Presentation

- Instead support by figures and explain main concepts

\[
\Psi(L) = \sum_{i \in I} \left( \phi(D|l_i) + \sum_{j \in N_i} (\phi(D|l_i, l_j) + \psi(l_i, l_j)) \right)
\]

Person A, Person B

Color term Smoothness
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General Rule - Presenting Methodology

- A scientific talk is always about
  
  ‘How AND Why’

- Explain what you do
- What is new and innovative
- AND motivate why this is the way to go
How and Why in the Story

- Subject: title, authors, acknowledgements

- Introduction / overview/ motivation
  - What you solve and why, briefly how - main contributions

- Method/approach

- Results/information/analysis
  - How and why

- Conclusion/summary
  - Repeat what you solved and how (contributions), so people remember
Preparing the Presentation

- Average not more than 1 slide per minute
- MS Powerpoint is now standard
  - If you use something else, be careful to check it in advance
- No sounds unless part of results!
  Some logical animations good
- Use 3-7 bullets per page
  - Avoid writing out, and especially reading, long and complete sentences
- Slide appearance (font, colors, upper / lower case writing) should be consistent
- Speelcheck 😊
What Font to Use

Type size should be 18 points or larger:

- 18 point
- 20 point
- 24 point
- 28 point
- 36 point

AVOID USING ALL CAPITAL LETTERS BECAUSE IT’S MUCH HARDER TO READ

* References can be in 12-14 point font
Dark letters against a light background work are best for smaller rooms, especially when the lights are on for teaching.
Light letters against a dark background also work.

Many experts feel that a dark blue or black background works best for talks in a large room.
Slide Aspect Ratio

• 16:9 more and more common

• Check projector capabilities or suggested format beforehand

https://www.massav.com/widescreen-displays-for-corporate-events/
Preparing Yourself...

- The way how you present yourself is as important as your slides
- Immerse yourself in what you are going to say
  - Web of Science/Google it: use the latest news
- Make sure you are familiar with the projection equipment, remote control and Powerpoint
  - Bring presentation on memory stick AND laptop with power supply AND an extension cord, test equipment in presentation room …
Rehearsing

- **Practice – actually stand up and say the words out loud**
  - You discover what you don’t understand
  - You develop a natural flow
  - You come up with better phrasings and ways to describe things
    - It is harder to explain things than you think, practicing helps you find the words
  - Stay within the time limit
  - Try speaking too loud to get a feeling where the upper limit is

- **Don’t over-rehearse or memorize the talk**
  - The first practice things will improve at least 10 fold -- the second will make things twice as good -- the third may add a bit of polish, but from there it can easily get worse

Giving the Presentation

- Nervousness is normal
- Starting out is the hardest part of the talk
  - To get going, memorize the first few lines
  - “Hello, I’m Christian Theobalt. The title and subject of my talk is “How to give a good talk”. In this presentation I want to give you a few hints and guidelines about how to prepare and give a scientific presentation”
Giving the Presentation

Experienced speakers:
- Speak freely and look directly at audience
- Key points and outline given by presenter

Inexperienced speakers:
- Put outline and key points of your presentation on your slides
- Helps you remember
- Key points are there for people who weren’t listening or who are visual learners
- Presenter mode: notes in presenter view, but don’t read them out loud, use own words (exception – language proficiency)!
Giving the Presentation

- Stand where the figures can be seen
- Look at people during presentation, be “open”
- Be enthusiastic
- Don’t worry about stopping to think
- Don’t rush
  - Figure out which slide is your half-way mark and use that to check your time

http://www.dvd-photo-slideshow.com/screenshot/01.gif
Giving the Presentation

- Imagine yourself seen from the perspective of the audience
  - Don’t continuously wander around the room
  - Don’t jiggle change in your pocket
  - Don’t overuse laser pointer
  - Don’t overdo the use of hand gestures
  - Raise the pitch of your voice at the end of sentences
  - Speak a little slower than in a normal conversation
    - Nervousness → you speak faster, force pauses
Outline

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Concluding Your Content

- Announce the ending so that people are prepared
  - For example, with a slide titled “Conclusions”
  - Or by saying, “In my final slide …” or “My final point is …”
- Have only a few concluding statements
- Come back to the big picture and summarize the significance of your work in that context
  - Main contributions
  - Extend logically beyond your limited study – but don’t overreach
- Open up new perspective (could be another slide)
  - Describe future work, raise questions, potential implications

Finishing Your Presentation

- Think carefully about your final words and how to finish your presentation strongly
  - Don’t just drift off … “I guess that’s all I have to say …”
  - You may want to actually memorize your ending lines, just as you do your starting points

- Ending your talk
  - Give credit, acknowledge help
  - Say “Thank You” … pause for applause … then
  - Say: “Any questions?”
Outline

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Questions and Answers

- Questions after your talk can be difficult but they definitely help you in improving your research / writing
  - Identifies parts the audience did not understand
  - Focuses and adds dimension to your analysis

- You can repeat the question
  - This gives you time to think
  - The rest of the audience may not have heard the question
  - Also if you heard the question incorrectly, it presents an opportunity for clarification
Questions and Answers, continued

- Keep your answers short and to the point – don’t respond with another lecture
- Don’t say that a question is bad, or that you addressed it already
  - Rephrase it into something that you want to talk about
- Never demean the question or questioner
  - They may have friends in the audience, and you never need more enemies
  - The research world is smaller than you think and you will continue to encounter people throughout your career

http://www.erp.wisc.edu/profdev/Talkhandout05.doc
http://www.cartoonstock.com/newscartoons/cartoonists/ato/lowres/aton893l.jpg
Difficult Questions

- Usually you have thought more about the material than anyone else -- this puts you in a stronger position than you may think

- Anticipate typical questions and prepare for them
  - Generalizability of your findings to other other conditions, other data?
  - Methodological bias? Limitations? Exceptions? Priorities?

- Still concerned about questions?
  - Make extra slides – perhaps on details of instrumentation or methodology

http://www.regislasvegas.org/images/class-pic-hand-raised.jpg
Seminar Specifics: Moderating the Discussion

- Different from Conference Talk
  - Much more time after talk – around 45 mins.
  - Conversation in group to identify strengths/weaknesses/open questions

- Prepare a set of points to discuss, such as:
  - weaknesses / limitations of methods (extra slide(s))
  - Comparisons between papers you read (extra slide(s))
  - Propose improvements / extensions
    - Ask other participants what they think and about their ideas
    - Build bridges to other talks in the seminar
    - Points you were unclear about while reading the papers

- Remember: the discussion is very valuable for the report
Conclusions

- Structure your content in a way that is comfortable for you and your audience
- Filter out core aspects and build convincing story
- Use figures / videos / maths appropriately
- Think ahead about where you might encounter difficulties and figure out ways to overcome them
  → “Live rehearsal” very important
Material Sources

- Many slides from:
  - *How to Give a Good Talk* by Stephanie Pfirman, Cornell University

- Also ideas from:
  - *How to give Scientific Presentations*, Tiffiani Williams, Texas A&M University
    [http://faculty.cs.tamu.edu/tlw](http://faculty.cs.tamu.edu/tlw)
Resources

- Luca Aceto, Aalborg University and Olivier Danvy, °Arhus, Denmark
- Michigan State University Graduate Student Organization
  - http://www.fw.msu.edu/orgs/gso/documents/GSOWorkshopDocsSp2006/PresentationTipsinPowerPoint.ppt#428.1
- Susan Herzog, Eastern Connecticut State University
  - http://www.easternct.edu/smithlibrary/library1/presentations.htm#ppt
- Heather Heying, Evergreen
- Mark Schoeberl and Brian Toon
  - http://www.cgd.ucar.edu/cms/agu/scientific_talk.html
- UJohn Cairns, Jr., *BioScience Vol. 39 No. 9*
- CD-Condensed Matter Journal Club
- Meshnick SR, Eaton JW., City College, CUNY Medical School,
- How to give a job talk
  - http://www.psychologicalscience.org/observer/getArticle.cfm?id=2046
Thank you!