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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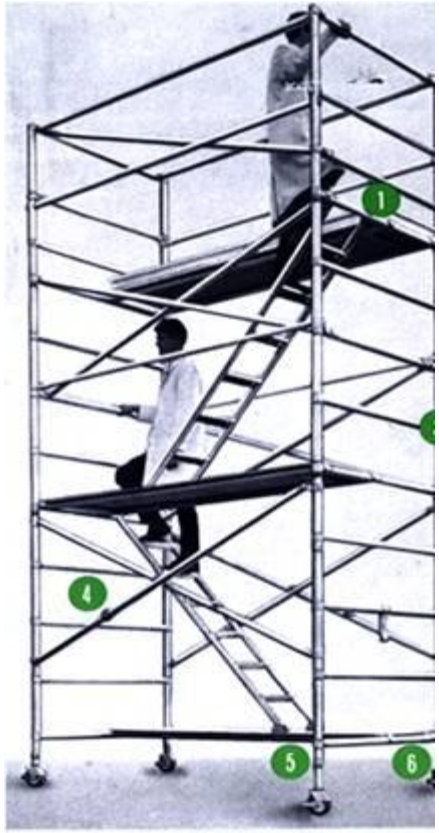
Presentation Structure

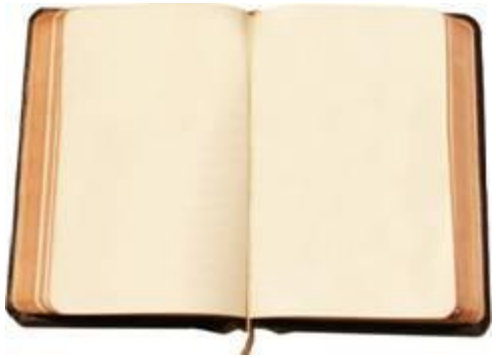
- Basic rule
  - Say what you are going to say
    - 1-3 main points in the introduction
  - Say it
    - Give the talk – main insights / method
  - Then say what you said
    - Summarize main points in the conclusion
  - Don’t try to build suspense and then unveil a surprise ending



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

http://battellemedia.com/images/book_open.jpg

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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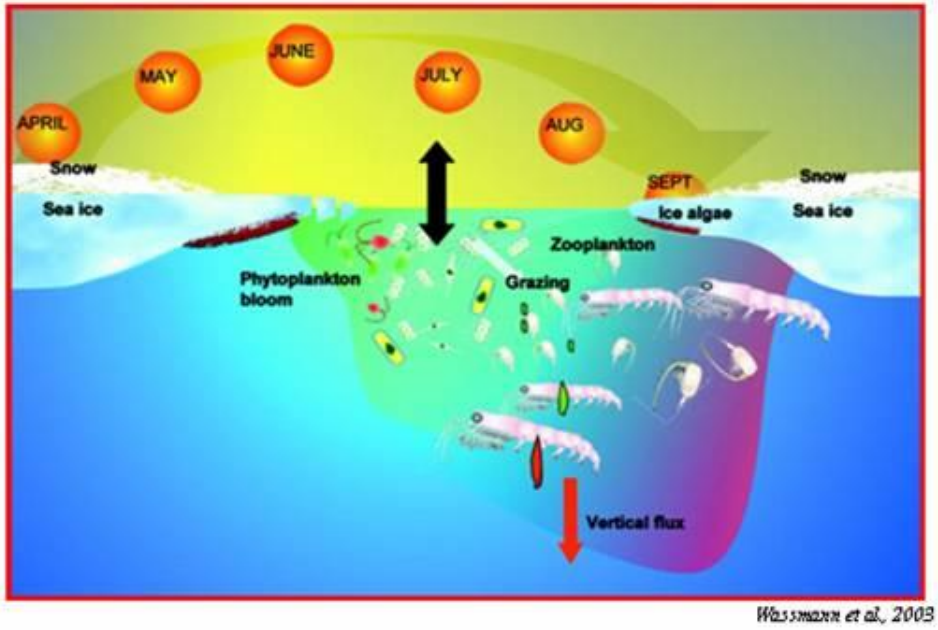
Overview Figures...

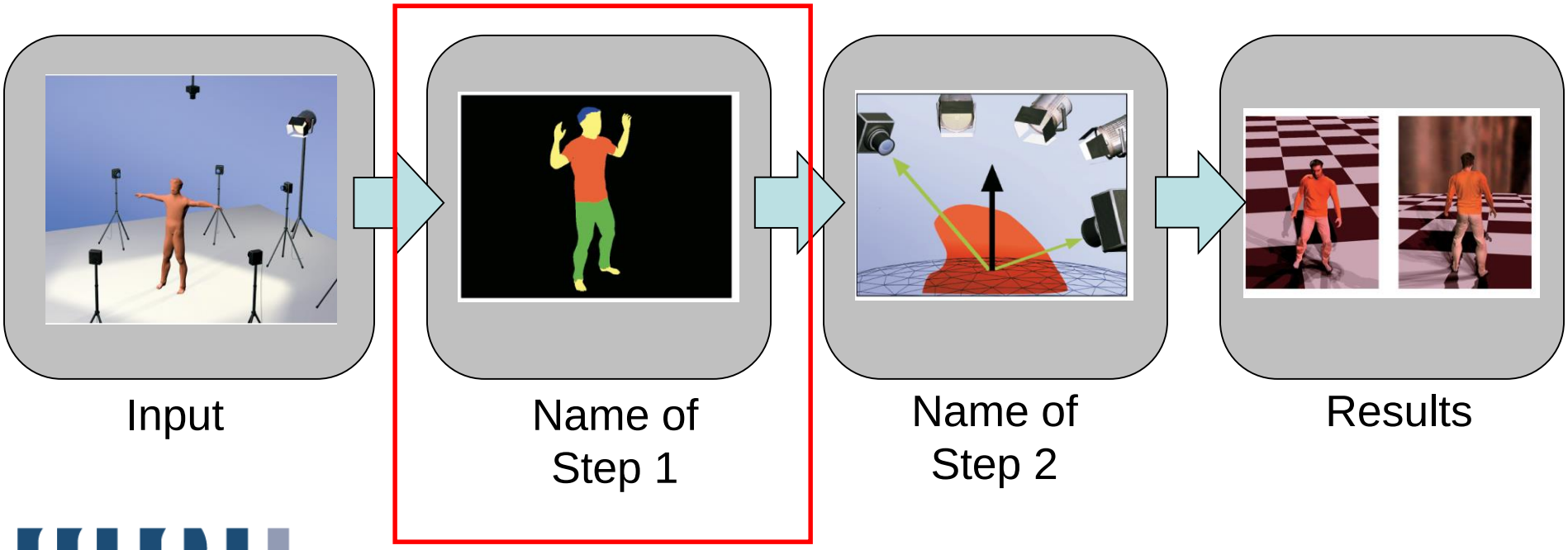


Wassmann et al., 2003

- 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



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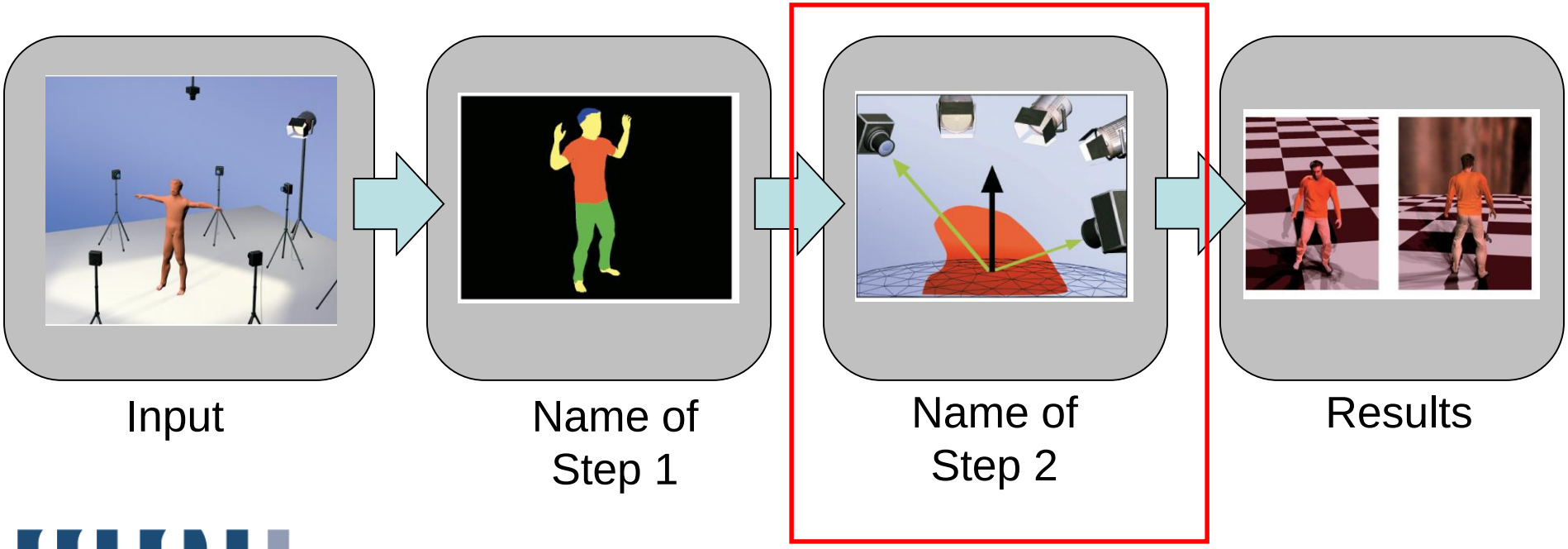

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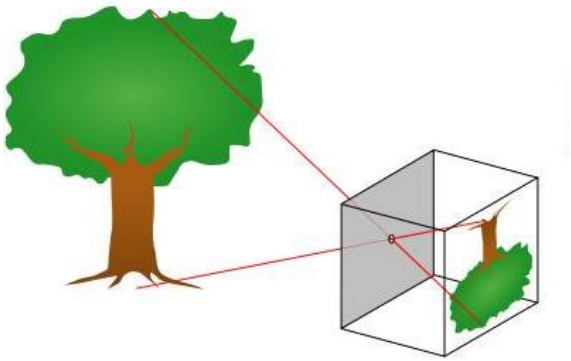
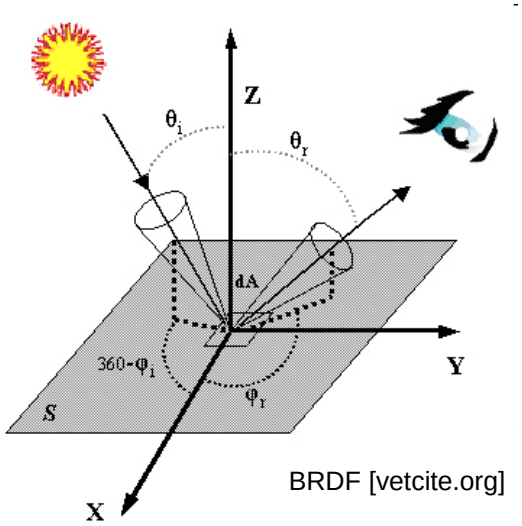
Figures to Explain Technical Concepts

- 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]

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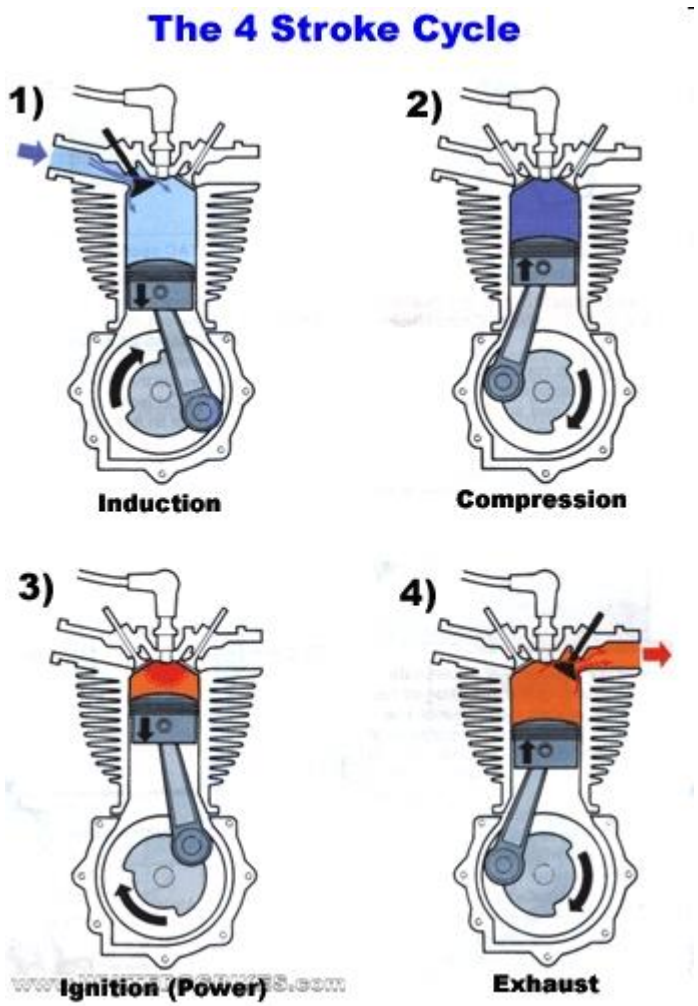
Figures to Explain Technical Concepts

- *4 stroke engine operation*
  - *The engine four main strokes to its cycle:*
  - The first stroke, called the **intake stroke**, the crankshaft pulls down the piston by rotating. The intake valve is open at this point in the cycle, and air will be pulled through the intake manifold into the motor. After this is complete the camshaft rotates to the low spot on the lobe. This allows the valve spring to close the intake valve.
  - The second stroke is called the **compression stroke**. This is because it compresses the fuel/air mixture. While this is happing the intake and exhaust valves are closed…

[www.enginebasics.com]

Figures to Explain Technical Concepts



[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 …

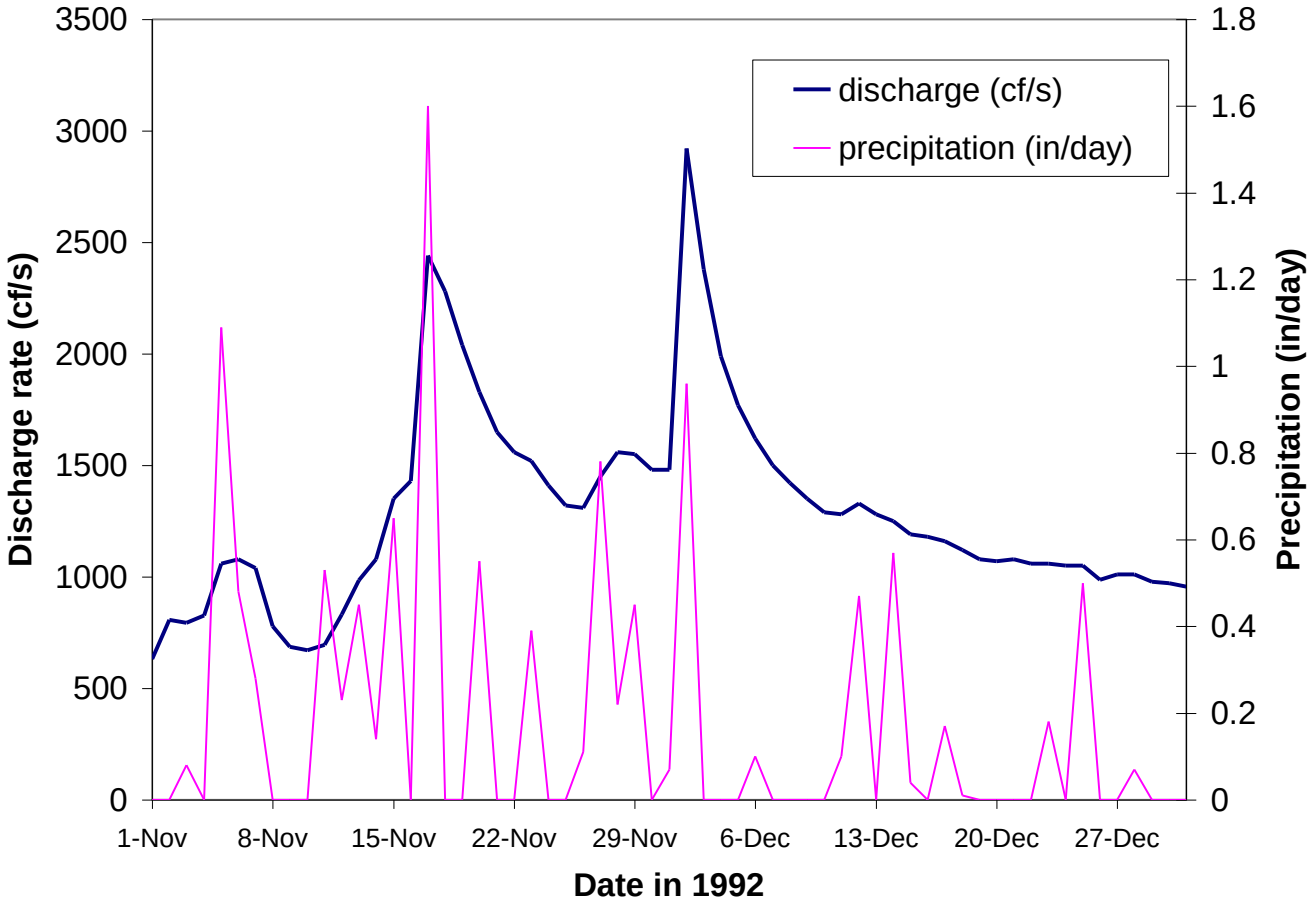
Esopus Creek

date	discharge (cf/s)	precipitation (in/day)
1-Nov	631	0
2-Nov	808	0
3-Nov	794	0.08
4-Nov	826	0
5-Nov	1060	1.09
6-Nov	1080	0.48
7-Nov	1040	0.28
8-Nov	779	0
9-Nov	686	0
10-Nov	670	0
11-Nov	696	0.53
12-Nov	831	0.23
13-Nov	985	0.45
14-Nov	1080	0.14
15-Nov	1350	0.65
16-Nov	1430	0
17-Nov	2440	1.6
18-Nov	2280	0
19-Nov	2040	0
20-Nov	1830	0.55
21-Nov	1650	0
22-Nov	1560	0
23-Nov	1520	0.39
24-Nov	1410	0
25-Nov	1320	0
26-Nov	1310	0.11
27-Nov	1450	0.78
28-Nov	1560	0.22
29-Nov	1550	0.45
30-Nov	1480	0

date	discharge (cf/s)	precipitation (in/day)
1-Dec	1480	0.07
2-Dec	2920	0.96
3-Dec	2380	0
4-Dec	1990	0
5-Dec	1770	0
6-Dec	1620	0.1
7-Dec	1500	0
8-Dec	1420	0
9-Dec	1350	0
10-Dec	1290	0
11-Dec	1280	0.1
12-Dec	1330	0.47
13-Dec	1280	0
14-Dec	1250	0.57
15-Dec	1190	0.04
16-Dec	1180	0
17-Dec	1160	0.17
18-Dec	1120	0.01
19-Dec	1080	0
20-Dec	1070	0
21-Dec	1080	0
22-Dec	1060	0
23-Dec	1060	0.18
24-Dec	1050	0
25-Dec	1050	0.5
26-Dec	986	0
27-Dec	1010	0
28-Dec	1010	0.07
29-Dec	977	0
30-Dec	972	0
31-Dec	957	0

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

Esopus Creek



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

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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

http://www.cs.aau.dk/~luca/SLIDES/howtotalk-ru.pdf

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

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

Equation Example

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

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

- 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

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

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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

Segmentation

Person A,
Person B

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

Color term

Smoothness

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General Rule - Presenting Methodology

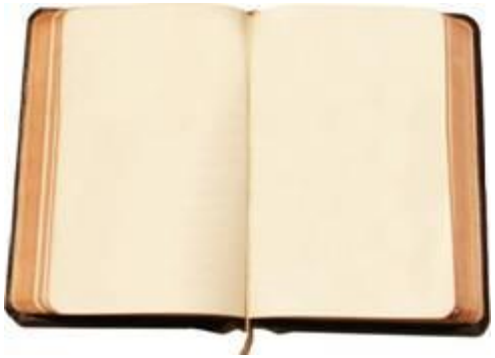
- A scientific talk is always about

‘How AND Why‘

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

http://battellemedia.com/images/book_open.jpg

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

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

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

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http://www.fw.msu.edu/orgs/gso/documents/GSOWorkshopDocsSp2006/PresentationTipsinPowerPoint.ppt#307,6,Powerpoint basics: 1. What font to use

Color

Dark letters against a light background work

Dark letters against a light background
are best for smaller rooms, especially when the
lights are on for teaching

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http://www.fw.msu.edu/orgs/gso/documents/GSOWorkshopDocsSp2006/PresentationTipsinPowerPoint.ppt#302,5,Powerpoint basics: 1. What font to use

Color

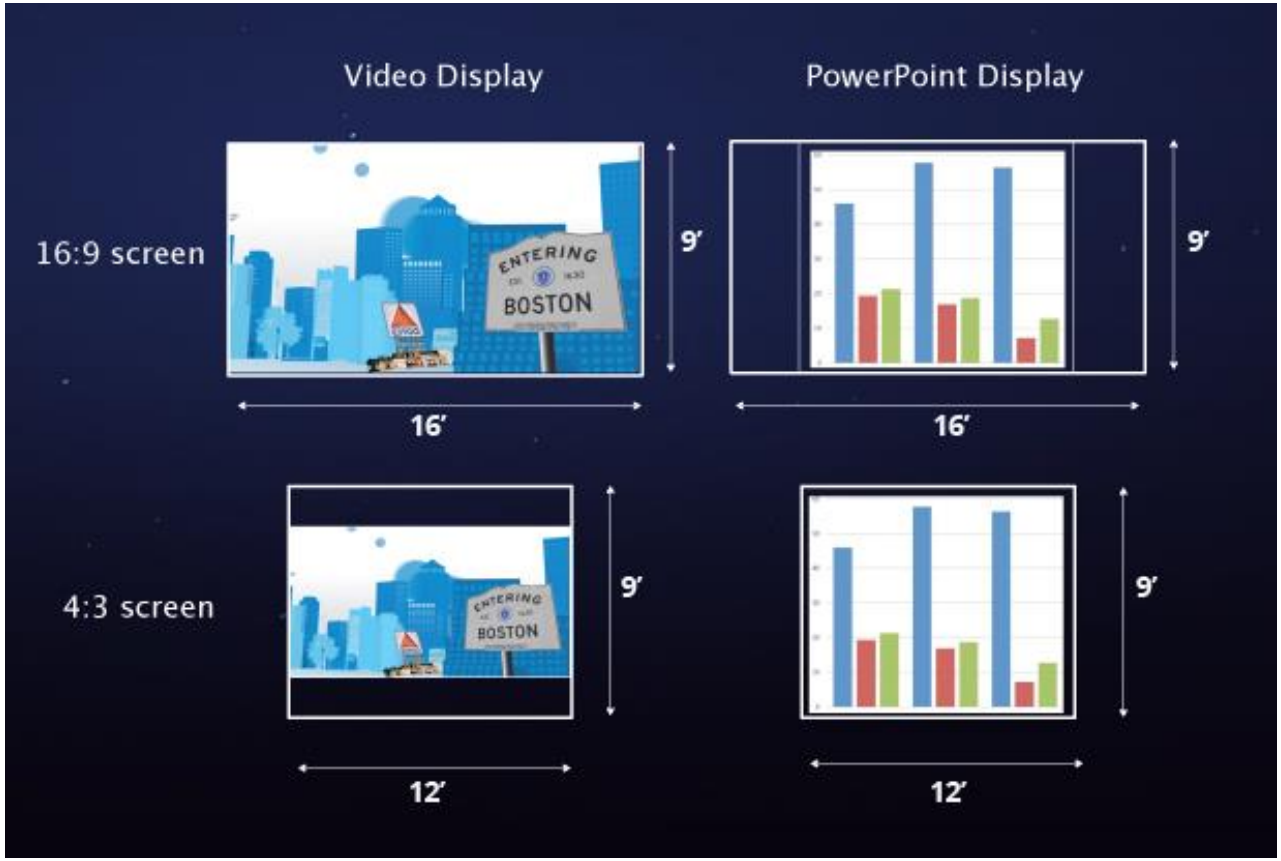
Light letters against a dark background also work

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

http://www.fw.msu.edu/orgs/gso/documents/GSOWorkshopDocsSp2006/PresentationTipsinPowerPoint.ppt#302,5,Powerpoint basics: 1. What font to use

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 …

www.terryfoxtheatre.com/theatre_specification...

www.thomas.edu/facilities/auditorium/index.htm

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

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http://www.fw.msu.edu/orgs/gso/documents/GSOWorkshopDocsSp2006/TipsforGivingaScientificPresentation.pdf

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”*

http://soroptimistofgreaterdavis.org/documents/images/photos/speaker.gif

http://www.fw.msu.edu/orgs/gso/documents/GSOWorkshopDocsSp2006/TipsforGivingaScientificPresentation.pdf

Giving the Presentation

Experienced speakers:

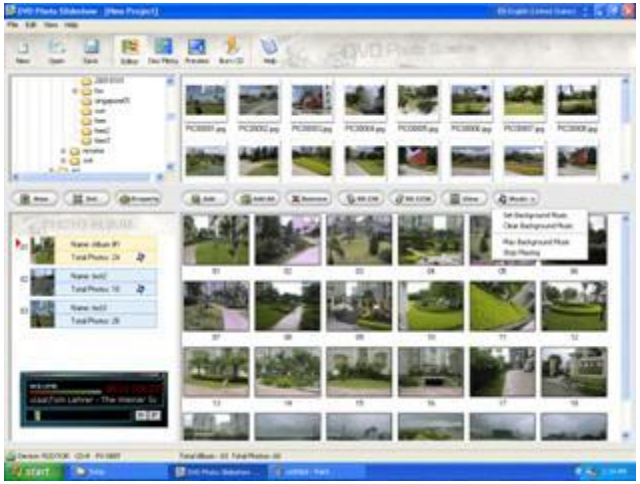
- Speak freely and look directly at audience
- Key points and outline given by presenter

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)!

http://www.metclubnyc.org/slide%20show.jpg

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

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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

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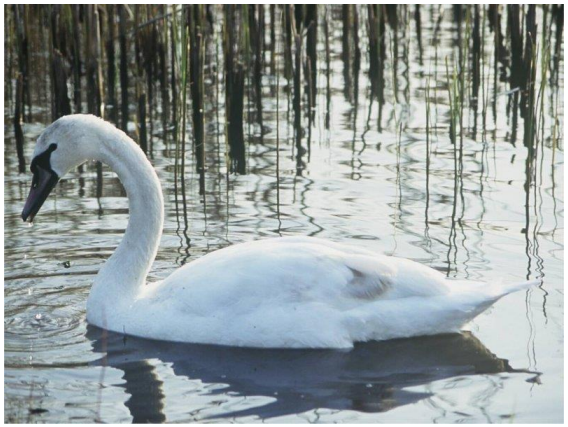
Concluding Your Content



- 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

http://www.cs.aau.dk/~luca/SLIDES/howtotalk-ru.pdf

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?"

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http://international.internet2.edu/images/CLARA-I2-MoU/i2-clara-applause.JPG

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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

http://www.erp.wisc.edu/profdev/Talkhandout05.doc
http://www.firekills.gov.uk/seniors/cool/howstart/images/howstart.gif

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

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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
    http://www.ldeo.columbia.edu/~martins/sen.../Scientific_talk.ppt

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

Resources

- Edward R. Tufte “Envisioning Information,” “The Visual Display of Quantitative Information,” “The Cognitive Style of PowerPoint: Pitching Out Corrupts Within”
- Luca Aceto,Aalborg University and Olivier Danvy, °Arhus, Denmark
  - http://www.cs.aau.dk/~luca/SLIDES/howtotalk-ru.pdf
- Michigan State University Graduate Student Organization
  - http://www.fw.msu.edu/orgs/gso/documents/GSOWorkshopDocsSp2006/TipsforGivingaScientificPresentation.pdf
  - 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
  - http://academic.evergreen.edu/H/heyingh/downloads/givingatalk.pdf
- Mark Schoeberl and Brian Toon
  - http://www.cgd.ucar.edu/cms/agu/scientific_talk.html
- UJohn Cairns, Jr., *BioScience Vol. 39 No. 9*
  - http://www.fw.msu.edu/orgs/gso/documents/GSOWorkshopDocsSp2006/CairnsSpeakingAtLength.pdf
- CD-Condensed Matter Journal Club
  - http://www.physics.ucdavis.edu/~kliu/Phy298/PresentationTips.pdf
- Meshnick SR, Eaton JW., City College, CUNY Medical School,
  - Prog Clin Biol Res. 1989;319:663-4. How to give a scientific talk., New York., PMID: 2622932 [PubMed - indexed for MEDLINE]
- How to give a job talk
  - http://www.psychologicalscience.org/observer/getArticle.cfm?id=2046
  - http://chronicle.com/jobs/2001/03/2001033002c.htm

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Thank you !

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