The art of presentations
How to interest, educate, and inspire an audience in under an hour

M. Scott Shell
What is your central goal as a presenter?

To get a good grade, or good feedback?

To tell people what you did?

To appear professional and practiced?

To interest and educate your audience on your work.
Your role as a speaker

- Excite the audience for what you are talking about
- Educate the audience by organizing existing information into a cohesive picture
- Provide a critical eye for the information you are presenting
- Inspire additional interest, inquiries in your work
Understand how your audience learns

Learning
- eyes – 83%
- ears – 11%
- other – 6%

Learning retention
- read – 10%
- hear – 20%
- see – 30%
- see and hear – 50%
- say as read aloud – 70%
- say as perform – 90%

Be simple, clear, concise
Tell ‘em X 3
Public speaking is a common fear

Top fears

- Public speaking – 41%
- Height – 32%
- Insects and bugs – 22%
- Financial problems – 22%
- Water – 21%
- Sickness – 19%
- Death – 19%

1977 Book of Lists
Everybody gets nervous

The causes
- fear of the unknown
- fear of failure, appearing incompetent / unintelligent

How to prevent
- preparation
- practice
- familiarity with the presentation room
- focus on educating, not being evaluated

Presenting is like any other skill you learn with practice. The more you present, the easier and more automatic it becomes.
Know your audience!

- What is their background?
- Do they all have the same background?
- What is their knowledge of your subject material?
- What is their interest in your topic?

*Say why they care, not what you did.*
Organize your talk into a clear narrative

- Introduction
- Point A
- Point B
- Point C
- Summary / conclusion

Identify two or three main points, and any secondary information necessary for each.
Tell a story...

There’s a mystery here...

Bad guys and good guys

You saved the day

Surprise ending
General principles of good slides

- One idea per slide
- Consistency in content and design
- Streamline and simplify. Use whitespace. Eliminate!
- Avoid jargon, abbreviations, anything unexplained.
- Titles should be informative. Use statements.
- < 1 slide/minute. Assume 40 slides per hour.
The Visual Display of Quantitative Information

EDWARD R. TUFTE
Maximize the information to ink ratio

- **Avoid wordy text**
  use informative pictures, graphs, diagrams

- **Avoid uninformative extras**
  minimize animations, clip-art and obtrusive decorative elements

- **All information should be legible**
  the pertinent information should never be too small to read or interpret by the audience
Nanoscale systems in science and technology

• Nanotechnology
  – carbon nanotubes, can be made of varied size
  – nanowires
  – synthesis challenges

• Materials
  – self-assembled systems: micelles, nanotubes, vesicles
  – important in drug delivery, fine-tuning nanostructure

• Biology and biotechnology
  – DNA structure critical to managing genetic information
  – proteins form “nanomachines” in cells
Nanoscale systems in science and technology

nanotechnology

biology

materials

Micelle

Liposome

Phospholipid bilayer
chartjunk

info-to-ink ratio is high
\[ Q(N,V,T) = \frac{1}{\Lambda^{3N}} \sum_{\Phi} \sum_{X} \Omega_{sp}(\Phi, X)e^{-\beta\Phi} \left\langle \int_{\text{basin}} e^{-\beta U(r^N)} d\mathbf{r}^N \right\rangle_{\Phi,X} \]

PEL separation of canonical part. fn.

\[ A / N = \phi^* - k_B T \theta(\phi^*, x^*) + a_{\text{vib}}(\phi^*, T, x^*) \]

\( \phi^*(T), x^*(T) \) minimize \( A / N \)

Gaussian distrib.; harm. approx.

\[ a_{\text{vib}}(T, \phi) \approx 3kT \ln \left( \frac{T_E}{T} \right) - x \ln \text{erfi} \frac{\sqrt{\alpha_U l^2}}{kT} \]

\[ \theta(\phi, x) \approx \theta_\infty(x) \left[ 1 - \left( \frac{\phi - \phi_\infty(x)}{\Delta} \right)^2 \right] \]

\[ \theta_\infty(x) \approx \sigma_\infty - 3 \left[ x \ln \left( \frac{x}{\xi} \right) + (\xi - x) \ln \left( 1 - \frac{x}{\xi} \right) \right] \]

\[ \phi_\infty(x) = \phi_0 + \delta \cdot x \]
harmonic approximation, Gaussian distribution of saddles

potential energy

particle coordinates

$d\phi; dx$
Script text is distracting.

Informal fonts undermine your credibility.

Small fonts are hard to read from the back of the room.

Avoid too many font size and style changes.

Use color to highlight points, but don’t overdo it.

ALL CAPS IS ALWAYS A BAD IDEA.
Seemingly minor mistakes can become fatal flaws

- **Instant audience confusion**
  - too much information on one slide
  - dark or image-based backgrounds
  - hard-to-read slides (avoid green-colored things)

- **Instant audience snooze-fest**
  - reading text on the slide
  - discussing minor details irrelevant to the main point
  - getting off topic

- **Instant audience revolt**
  - going over time
Simulations predict correct folding pathways

\[ P(\text{cont. } ij \text{ native}) \]

\[ \frac{1 - P(\text{cont. } ij \text{ native})}{\prod_{\text{all fragments } k \text{ with contact } ij} \exp[a + bf_{ij}^k]} \]
Conclusions

Folding mechanisms can speed conformational search and enable physics-based folding predictions in large polypeptides.

Predicted peptide structural ensembles are useful for engineering design.
Presentation etiquette

- Rehearse and gauge timing.
- Acknowledge your introducer: “thank you, Dr. X”
- Stand in a visible position. Don’t pace.
- Speak clearly. Avoid “um” and “uh”.
- Project.
- Make eye contact with the audience.
- Acknowledge the audience: “thank you for your attention”
Don’t be boring: vary your speed, intonation, and eye contact.

Use nonverbals appropriately.

Smile. Be positive and enthusiastic.

Tell a story.

Be confident. The audience is the student, you the expert.
What to do after the talk: answering questions

- Avoid over-answering.
- Be to-the-point. Seek clarifications if necessary.
- Never feign knowledge. Use “I’ll have to check on that…”
- Treat all questions and questioners with respect.
- Aggressive questioners: “Why don’t we talk afterwards…”
- Watch the time.
The ultimate key to giving good talks

Practice, practice, practice.
Would you do anything to improve these examples?
Content

• PART I
  ▫ What? Where? Who? When?
  ▫ Advantages
  ▫ How Does It Work?
  ▫ Applications

• PART II
  ▫ Why Is This Important?
  ▫ Comparisons
  ▫ Where Do Chemical Engineers Fit In?
  ▫ Future Developments, Challenges, and Goals
Which car causes more damage to the environment?

Prius

Range Rover
### Improved diagnosis and disease classification of leukemia and lymphoma

<table>
<thead>
<tr>
<th>100 years ago</th>
<th>Disease of the blood</th>
</tr>
</thead>
<tbody>
<tr>
<td>80 years ago</td>
<td>Leukemia or lymphoma</td>
</tr>
<tr>
<td>60 years ago</td>
<td>Chronic leukemia</td>
</tr>
<tr>
<td></td>
<td>Acute leukemia</td>
</tr>
<tr>
<td></td>
<td>Preleukemia</td>
</tr>
<tr>
<td></td>
<td>Indolent lymphoma</td>
</tr>
<tr>
<td></td>
<td>Aggressive lymphoma</td>
</tr>
</tbody>
</table>

#### Today

- **38 leukemia types identified:**
  - Acute myeloid leukemia (~12 types)
  - Acute lymphoblastic leukemia (2 types)
  - Acute promyelocytic leukemia (2 types)
  - Acute monocytic leukemia (2 types)
  - Acute erythroid leukemia (2 types)
  - Acute megakaryoblastic leukemia
  - Acute myelomonocytic leukemia (2 types)
  - Chronic myeloid leukemia
  - Chronic myeloproliferative disorders (5 types)
  - Myelodysplastic syndromes (6 types)
  - Mixed myeloproliferative/myelodysplastic syndromes (3 types)

- **51 lymphomas identified:**
  - Mature B-cell lymphomas (~14 types)
  - Mature T-cell lymphomas (15 types)
  - Plasma cell neoplasm (3 types)
  - Immature (precursor) lymphomas (2 types)
  - Hodgkin’s lymphoma (5 types)
  - Immunodeficiency-associated lymphomas (~5 types)
  - Other hematolymphoid neoplasms (~7 types)

5-Year survival: ~0%

70%
Packaging
@ 77 F, naphtha creates a readily ignitable vapor-air mixture
Tank head space contained this mixture during tank filling
Spark from tank level measuring float adequate to ignite
Prevention: add inert gas to head space (Nitrogen)
Timeline

Estimated release start time: 10:25
JT calls LT: 10:28
JT calls 911: 10:40
LT calls Thompson technical support: 10:31
Incident Commander arrives: 10:47
EMTs arrive in Gent ambulance: 10:48
Beckley, Princeton, and Beaver Fire Departments dispatched: 10:56
First report of explosion: 10:53

Key:
Junior Technician – JT (blue)
Lead Technician – LT (green)
Propagation of the Fire
Hazardous Material Incident Frequency

Propane Incidents

Incidents

Year

0 50 100 150 200 250 300 350


Propane Incidents

Hazardous Materials

Incidents

Year


Propane

Hazardous Materials
Hazardous Material Incident Frequency

Incidents

Year


all hazardous materials

propane
Next Generation Coal Plants

• 50% of US electricity comes from coal plants
• New plants plan to optimize what’s already familiar
• Reducing CO₂ waste
  – 3 ways to clean coal
    • Postcombustion,
    • Oxy-fuel combustion,
    • Precombustion
  – IGCC
• Trade off: cost vs. efficiency/environmental benefits

• What companies are beginning to act now
  – TECO
  – We Energies
  – AEP
  – FirstEnergy
  – BP and Rio Tinto
  – Southern

• Costs of CO₂ capture
  – EPRI says it will cut output by 10% and raise cost by 25% at a IGCC facility
  – MIT estimated costs would be between 30-40%
  – Much higher at conventional plants
Energy Supply

- Coal, petroleum, natural gas 80% global primary energy demand
- Biomass, nuclear, hydropower ~ 20%
How Fuel Cells Work

• Hydrogen enters on the anode side and is split through contact with the platinum catalyst

\[ 2H_2 \rightarrow 4H^+ + 4e^- \]

• The Proton Exchange Membrane (Polymer) only allows positively charged ions to pass

• The electrons are conducted through the anode to produce electric current

• Oxygen enters on the cathode side and reacts with the hydrogen from the anode to produce water

\[ O_2 + 4H^+ + 4e^- \rightarrow 2H_2O \]

Net reaction:
\[ 2H_2 + O_2 \rightarrow 2H_2O \]
Underground Storage

SOURCE: World Coal Institute