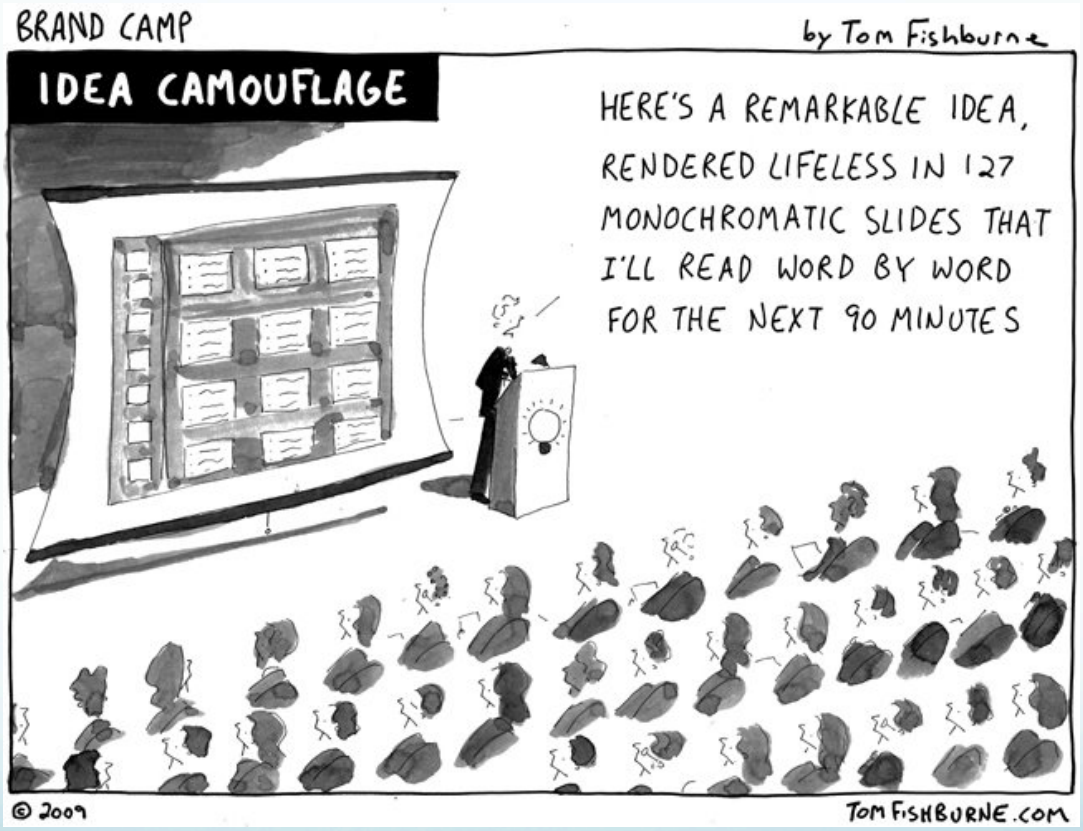
Some thoughts on giving Good Scientific Talks

Dr. Mike Strauss
OU REU 2017
with input from Dr. Eric Abraham and Dr. Ferah Munshi

How many talks have you heard that sound something like this?



What makes a good, interesting talk?

I. Why Bother Working at Speaking Well?

- Conferences, colloquium and you will have to:
  - This summer
  - Academic talks:
    - seminars
    - Job Interview Talks
  - Any professional occupation.
  - We aren't talking about teaching. That is a different skill entirely.
- It is important to know how to give a good talk.
  - May never be fun, but can decrease anxiety.
  - Satisfaction in competence.

Speaking well Matters!

- Get noticed, people remember you.
  - Postdocs, program officers, reviewers, students
- Same goes for business world.
  - Bosses will get *your* ideas
  - Impact on the job; influence others
- Job Talks
  - You will have to give talks when applying for post-doctoral and other jobs
  - As part of the interview to get a job as a professor, after over a decade of graduate school and post-doctoral research, a crucial interview component will be a presentation at a departmental colloquium.

With a *little* effort, you can give *great* talks … relatively.

- Many scientific talks are horrible
  - Many scientists put no effort into their presentations.
  - Most violate much of what will be discussed.
  - Most people don't *want* to work at it, even a little.
  - Most people fear public speaking.
- Shy people/introverts mistakenly believe they can't do this well, or is too much work
  - Introverts make great public speakers (with practice).
  - Extroverts do as well (practicing different things).

II. Some Basic Rules

- There is a bewilderingly large array of different kinds of talks one can give.
- Four rules you should ***never*** violate:

1. Audience Analysis: Know your audience
2. Storytelling: Know what you are trying to say and accomplish
3. Practice
4. Never, ***ever***, ***under any circumstances***, go overtime.

1. Audience Analysis

- What is their background?
- What is their interest?
- Why are they there?
- What level should you pitch the talk?
- Is there a mixture of the above? How is that relevant to your talk?
- Not necessarily any decisions, yet. But this guides the rest of your decisions.

2. Storytelling

Giving a good talk means telling a good story. Here are some ideas:

- For scientific talks start with context
  - What question are you trying to answer? What is the fundamental science?
- Support the importance of your research
  - Why is this question relevant? What has been done on this topic?
- Tell what you have contributed
  - How did you do your research? Why chose this method?
  - Summarize what you have learned and its value.

3. Practice

- *Every* talk should be practiced.
- Decreases fear.
- Polishes the presentation and transitions.
- Debugs slides, logical steps, colors, mechanics.
- Fixes time problems.

4. ***Never*** go overtime

- The "three rules" of public speaking
- Destroys good will, damages your likability
- Arrogant and insulting:
  - Are you are more important than audience?
  - Did you not practice? Audience not worth it?
  - Could you not be bothered to look up the specifications for the talk?
- I have *never* seen a scientific talk too short.

III. Planning the Talk: Details

- What are you trying to accomplish?
  - Communicate recent research results to the scientific community.
  - Advertise research, draw attention to it.
  - Get future papers published, grants funded.
  - Impress people by how smart/competent you are.
  - Get hired.
  - Get through requirement without looking stupid.

III. Planning the Talk (more)

- How much time do I have?
- Audience analysis?
- Main point of content.
  - What is the take-away message?
  - New method, new measurement, new calculation
  - Not the same as what you want to accomplish
  - Is there more than one main point? That should be clear in your presentation.

III. Planning the Talk (more)

- Narrative: You are telling a story. What is it?
  - Think of your talk as creative writing.
  - What type of narrative skeleton best fits your story?
    - Chronological, spatial, experimental, mystery
  - Who are the characters?
    - Good/bad guys (anthropomorphized equipment, bugs)?
  - Where is the drama? Conflict? Surprises?
  - This is not parody or farce, it should be implicit.
  - This is also very hard. Don't let initial difficulty or failures dissuade you from working on this.

Finally: Creating the talk

You Have Completed:

1. Identified Your Goal.
2. Audience Analysis.
3. Main Content Points.
4. Narrative.

- Outline
  - Once you have a story, you can outline it
- Main Content Figures.
- How do you start? Engage the audience. Why is this important?
- Cool figures / Good jokes.
  - Sometimes should be used even if the talk is more concise/complete without them
- List Slides
  - Write on paper
  - What is valuable for *this audience* given the *amount of time* allotted?
- Create Talk

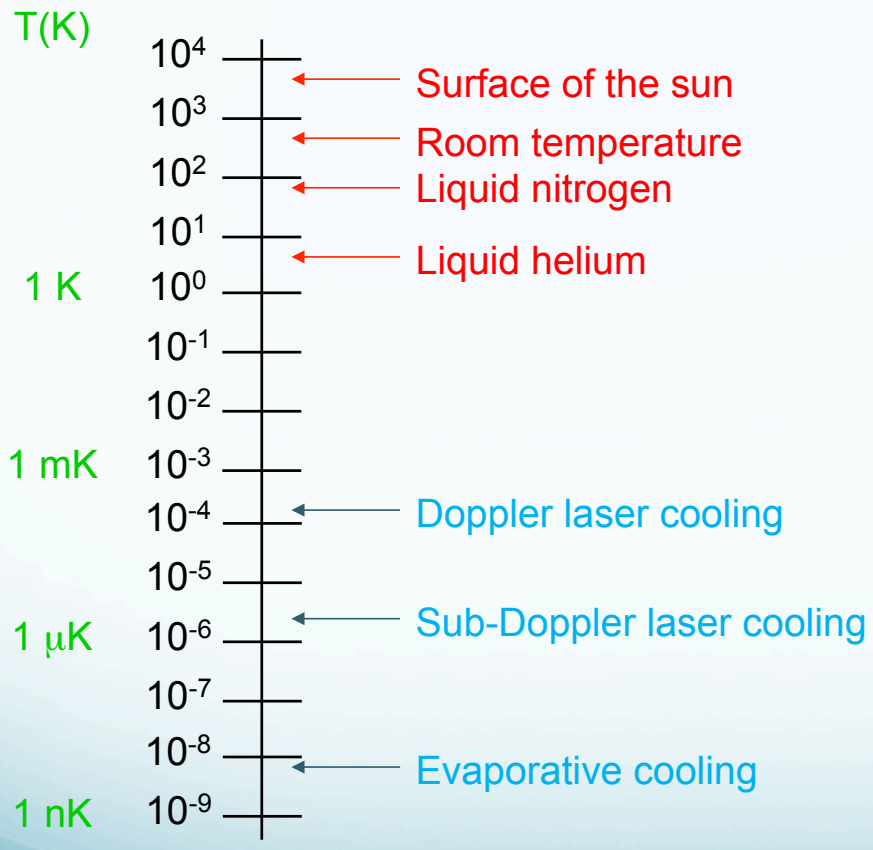
IV. Slide Tips

- Title: Yes
- Outline: Maybe
  - Can help guide audience.
  - Can calm nerves with easy first slide.
  - Wastes valuable time.
  - Narrative guides audience through talk.
  - Personal preference, but never for talk less than 15 minutes.

IV. Slide Tips

- Pictures over words!
  - (This talk does, unfortunately, have a lot of “words” but it is not a talk on research, data, results…)
- Bullets over sentences or paragraphs!
- No paragraphs. *Never read paragraphs!*
- Your text should not be exactly what you are going to say. It should be a reminder to you of what you are going to say. It is like an outline, emphasizing to your audience what the main point is, while reminding you of the topic so you can explain further in words. If you put all the words that you are going to say on the slide, it becomes a wall of text. You lose your focus on the audience as you stare at the screen. People will stop paying attention to what you are saying as you drone on and on and on.

How Low Can You Go?



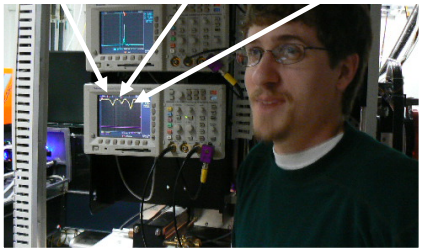
- Everything stays in the gas phase, must be very dilute.
- Temperature is related to the average speed of particles.
- Cooling is the same as slowing down.
- Cannot touch with any physical object.
- Typically 10^3 to 10^9 particles.

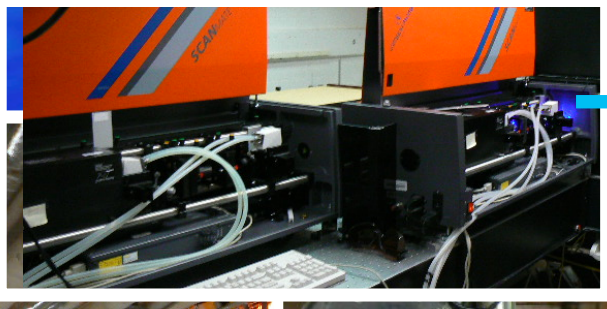
IV. Slide Tips

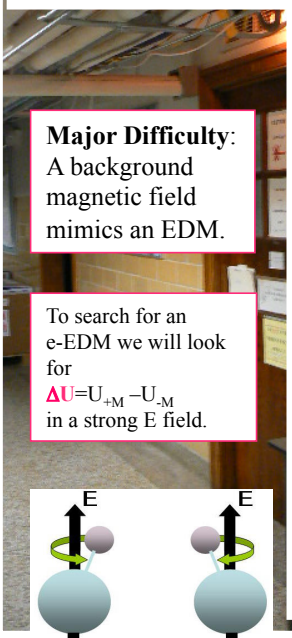
- Don’t be confusing. Avoid clutter. One thought per slide.
- Make text large enough to be seen. Can everything be read from the back of the room?

$f_1 \approx c/436.8nm +$
$f_2 \approx c/476.7nm +$
$f_3 \approx c/532nm$

$^{206}Pb^{19}F$ $^{207}Pb^{19}F$ $^{208}Pb^{19}F$

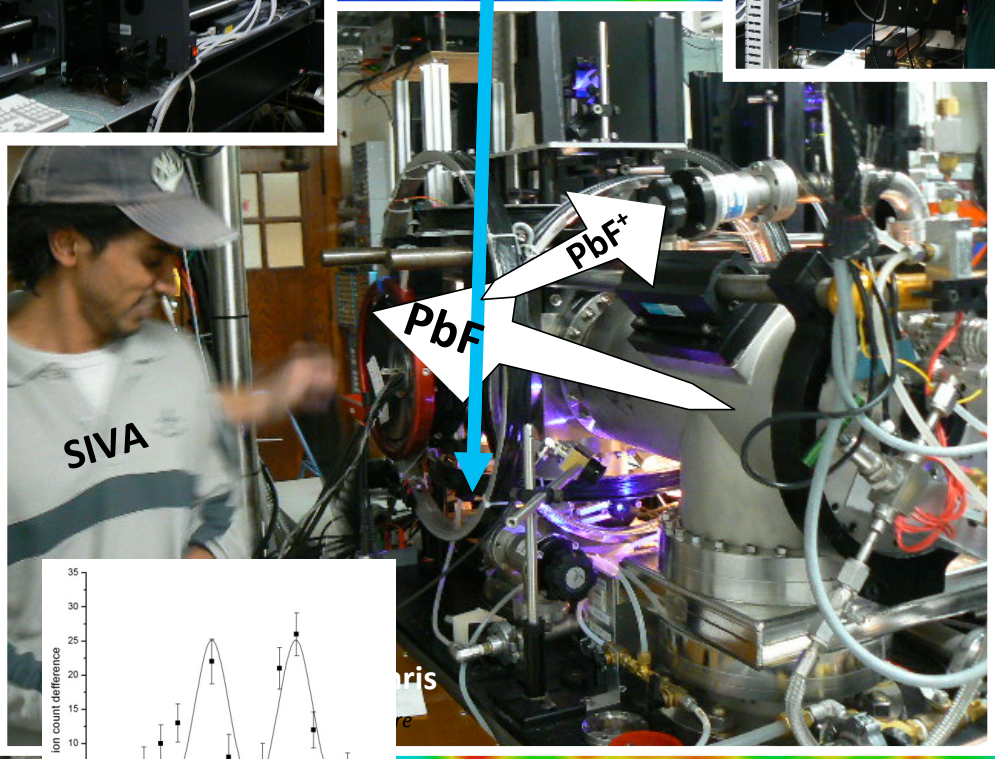






Major Difficulty: A background magnetic field mimics an EDM.

To search for an e-EDM we will look for $\Delta U = U_{+M} - U_{-M}$ in a strong E field.



$$U = \mu_B(g\,\vec{B}\cdot\vec{S} + g_{edm}\,\vec{E}\cdot\vec{S}) \quad \mu_B = 1.39962458\,\mathrm{Hz}/\mu\mathrm{G}$$

IV. Slide Tips

- No Acronyms or Jargon.
- The proliferation of BSOs in AGNs is an outstanding problem. Type Ia Sn are not a source of such QSOs. Furthermore, the lack of new TLAs may force us to consider ETLAs

IV. Slide Tips

- No equations!
- Really?
- Ok, not necessarily. But, you must explain every equation.
  - Every term could be explained.
  - Important terms could be explained (but then why the whole equation?)
  - Does the equation really add value to the talk? Is it the best way to present the point you are trying to make?
  - Will your audience care?

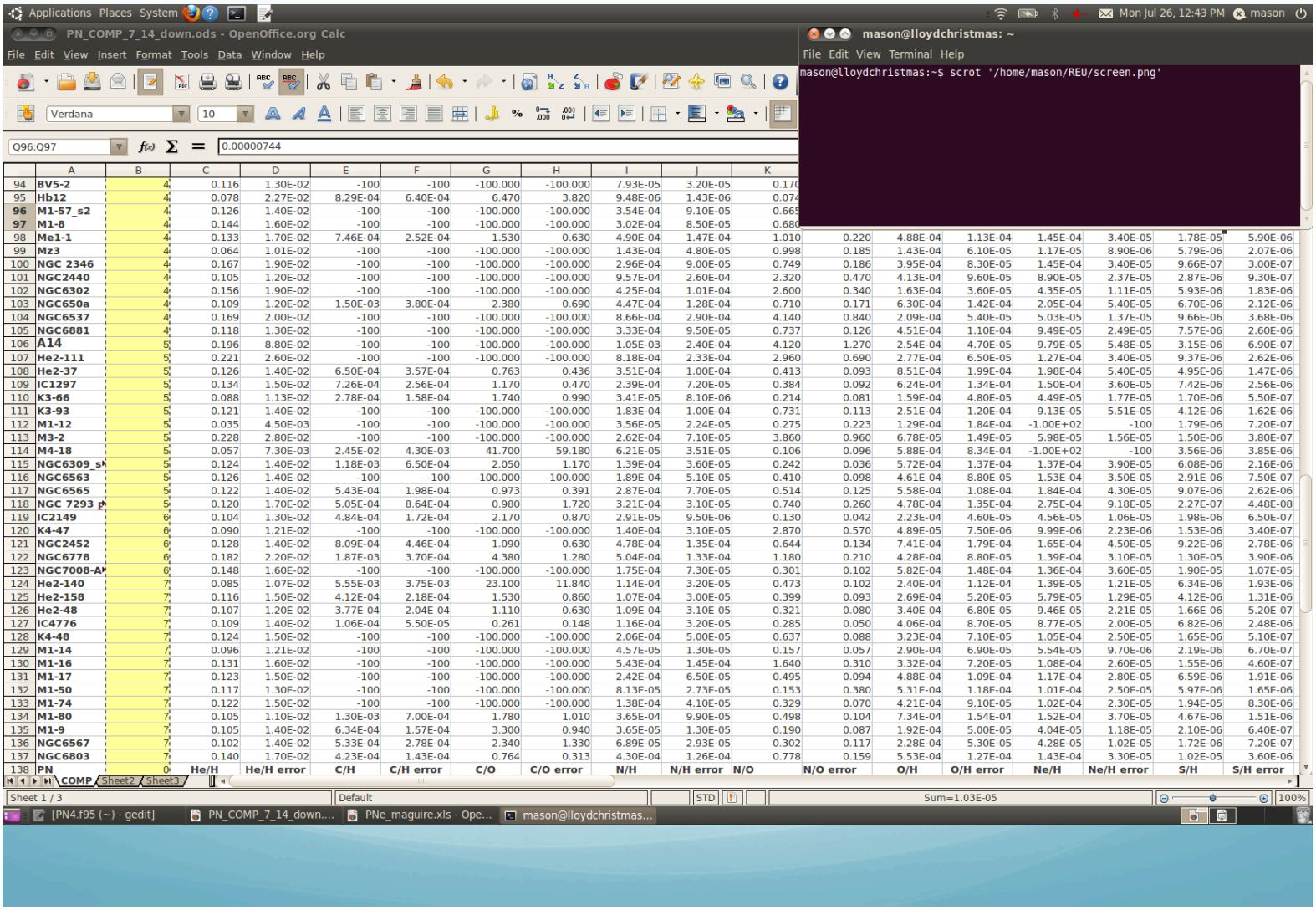
IV. Slide Tips

- No code, circuit diagrams, machine drawings.
  - Only exception might be in a very technical working meeting.
  - Will your audience care?

Sample Input File

```
&parms
   vphot      =  7200.0
   vmax       =  40000.0
   tbb        =  6500
   ea         =  2900.0
   eb         =  8000.0
   nlam       =  1000
   flambda    =  .true.
   taumin     =  0.001
   grid       =  32
   zeta       = 1.0
   stspec     = 3100.0
   numref     = 11
   delta_v    = 300.0
   spectrum_file="sample.11"
   debug_out = .false.


   an    =      1,   2,  8,   11, 20,   22, 26, 28,  27, 12,   38,
   ai    =      0,   0,  0,    0,  1,    1,  1,  1,   1,  1,    1,
   tau1 =       7, 0.2,0.2, 0.03,  3,0.005,  2,0.3, 0.1,0.2,0.005,
   pwrlawin =  0,   0,  0,    0,  0,    0,  0,  0,   0,  0,    0,
   vmine=      0,   0,  0,    0,  0,    0,  0,  0,   0,  0,    0,
   vmaxe=     40,  40, 40,   40, 40,   40, 40, 40,  40, 40,   40,
   ve    =      2,   2,  2,    2,3.5,    3,  2,  2,   2,  2,    2,
   vmaxg =    10,  10,  7,    7,  7,    7,  7,  7,   7,  7,    7,
   sigma_v = 2.5, 2.3,2.3,  2.3,3.0,  2.3,2.3,2.3, 2.3,2.3,  2.3,
   temp =     10,  10,  8,   10, 10,   10, 10, 10,  11, 10,   10,
   dprof =   'g', 'g','e',  'e','e',  'e','e','e', 'e','e',  'e',
```



	A	B	C	D	E	F	G	H	I	J	K							
94	BV5-2	4	0.116	1.30E-02	-100	-100	-100.000	-100.000	7.93E-05	3.20E-05	0.170							
95	Hb12	4	0.078	2.27E-02	8.29E-04	6.40E-04	6.470	3.820	9.48E-06	1.43E-06	0.074							
96	M1-57_s2	4	0.126	1.40E-02	-100	-100	-100.000	-100.000	3.54E-04	9.10E-05	0.665							
97	M1-8	4	0.144	1.60E-02	-100	-100	-100.000	-100.000	3.02E-04	8.50E-05	0.680							
98	Me1-1	4	0.133	1.70E-02	7.46E-04	2.52E-04	1.530	0.630	4.90E-04	1.47E-04	1.010	0.220	4.88E-04	1.13E-04	1.45E-04	3.40E-05	1.78E-05	5.90E-06
99	Mz3	4	0.064	1.01E-02	-100	-100	-100.000	-100.000	1.43E-04	4.80E-05	0.998	0.185	1.43E-04	6.10E-05	1.17E-05	8.90E-06	5.79E-06	2.07E-06
100	NGC 2346	4	0.167	1.90E-02	-100	-100	-100.000	-100.000	2.96E-04	9.00E-05	0.749	0.186	3.95E-04	8.30E-05	1.45E-04	3.40E-05	9.66E-07	3.00E-07
101	NGC2440	4	0.105	1.20E-02	-100	-100	-100.000	-100.000	9.57E-04	2.60E-04	2.320	0.470	4.13E-04	9.60E-05	8.90E-05	2.37E-05	2.87E-06	9.30E-07
102	NGC6302	4	0.156	1.90E-02	-100	-100	-100.000	-100.000	4.25E-04	1.01E-04	2.600	0.340	1.63E-04	3.60E-05	4.35E-05	1.11E-05	5.93E-06	1.83E-06
103	NGC650a	4	0.109	1.20E-02	1.50E-03	3.80E-04	2.380	0.690	4.47E-04	1.28E-04	0.710	0.171	6.30E-04	1.42E-04	2.05E-04	5.40E-05	6.70E-06	2.12E-06
104	NGC6537	4	0.169	2.00E-02	-100	-100	-100.000	-100.000	8.66E-04	2.90E-04	4.140	0.840	2.09E-04	5.40E-05	5.03E-05	1.37E-05	9.66E-06	3.68E-06
105	NGC6881	4	0.118	1.30E-02	-100	-100	-100.000	-100.000	3.33E-04	9.50E-05	0.737	0.126	4.51E-04	1.10E-04	9.49E-05	2.49E-05	7.57E-06	2.60E-06
106	A14	5	0.196	8.80E-02	-100	-100	-100.000	-100.000	1.05E-03	2.40E-04	4.120	1.270	2.54E-04	4.70E-05	9.79E-05	5.48E-05	3.15E-06	6.90E-07
107	He2-111	5	0.221	2.60E-02	-100	-100	-100.000	-100.000	8.18E-04	2.33E-04	2.960	0.690	2.77E-04	6.50E-05	1.27E-04	3.40E-05	9.37E-06	2.62E-06
108	He2-37	5	0.126	1.40E-02	6.50E-04	3.57E-04	0.763	0.436	3.51E-04	1.00E-04	0.413	0.093	8.51E-04	1.99E-04	1.98E-04	5.40E-05	4.95E-06	1.47E-06
109	IC1297	5	0.134	1.50E-02	7.26E-04	2.56E-04	1.170	0.470	2.39E-04	7.20E-05	0.384	0.092	6.24E-04	1.34E-04	1.50E-04	3.60E-05	7.42E-06	2.56E-06
110	K3-66	5	0.088	1.13E-02	2.78E-04	1.58E-04	1.740	0.990	3.41E-05	8.10E-06	0.214	0.081	1.59E-04	4.80E-05	4.49E-05	1.77E-05	1.70E-06	5.50E-07
111	K3-93	5	0.121	1.40E-02	-100	-100	-100.000	-100.000	1.83E-04	1.00E-04	0.731	0.113	2.51E-04	1.20E-04	9.13E-05	5.51E-05	4.12E-06	1.62E-06
112	M1-12	5	0.035	4.50E-03	-100	-100	-100.000	-100.000	3.56E-05	2.24E-05	0.275	0.223	1.29E-04	1.84E-04	-1.00E+02	-100	1.79E-06	7.20E-07
113	M3-2	5	0.228	2.80E-02	-100	-100	-100.000	-100.000	2.62E-04	7.10E-05	3.860	0.960	6.78E-05	1.49E-05	5.98E-05	1.56E-05	1.50E-06	3.80E-07
114	M4-18	5	0.057	7.30E-03	2.45E-02	4.30E-03	41.700	59.180	6.21E-05	3.51E-05	0.106	0.096	5.88E-04	8.34E-04	-1.00E+02	-100	3.56E-06	3.85E-06
115	NGC6309_s	5	0.124	1.40E-02	1.18E-03	6.50E-04	2.050	1.170	1.39E-04	3.60E-05	0.242	0.036	5.72E-04	1.37E-04	1.37E-04	3.90E-05	6.08E-06	2.16E-06
116	NGC6563	5	0.126	1.40E-02	-100	-100	-100.000	-100.000	1.89E-04	5.10E-05	0.410	0.098	4.61E-04	8.80E-05	1.53E-04	3.50E-05	2.91E-06	7.50E-07
117	NGC6565	5	0.122	1.40E-02	5.43E-04	1.98E-04	0.973	0.391	2.87E-04	7.70E-05	0.514	0.125	5.58E-04	1.08E-04	1.84E-04	4.30E-05	9.07E-06	2.62E-06
118	NGC 7293 p	5	0.120	1.70E-02	5.05E-04	8.64E-04	0.980	1.720	3.21E-04	3.10E-05	0.740	0.260	4.78E-04	1.35E-04	2.75E-04	9.18E-05	2.27E-07	4.48E-08
119	IC2149	6	0.104	1.30E-02	4.84E-04	1.72E-04	2.170	0.870	2.91E-05	9.50E-06	0.130	0.042	2.23E-04	4.60E-05	4.56E-05	1.06E-05	1.98E-06	6.50E-07
120	K4-47	6	0.090	1.21E-02	-100	-100	-100.000	-100.000	1.40E-04	3.10E-05	2.870	0.570	4.89E-05	7.50E-06	9.99E-06	2.23E-06	1.53E-06	3.40E-07
121	NGC2452	6	0.128	1.40E-02	8.09E-04	4.46E-04	1.090	0.630	4.78E-04	1.35E-04	0.644	0.134	7.41E-04	1.79E-04	1.65E-04	4.50E-05	9.22E-06	2.78E-06
122	NGC6778	6	0.182	2.20E-02	1.87E-03	3.70E-04	4.380	1.280	5.04E-04	1.33E-04	1.180	0.210	4.28E-04	8.80E-05	1.39E-04	3.10E-05	1.30E-05	3.90E-06
123	NGC7008-A	6	0.148	1.60E-02	-100	-100	-100.000	-100.000	1.75E-04	7.30E-05	0.301	0.102	5.82E-04	1.48E-04	1.36E-04	3.60E-05	1.90E-05	1.07E-05
124	He2-140	7	0.085	1.07E-02	5.55E-03	3.75E-03	23.100	11.840	1.14E-04	3.20E-05	0.473	0.102	2.40E-04	1.12E-04	1.39E-05	1.21E-05	6.34E-06	1.93E-06
125	He2-158	7	0.116	1.50E-02	4.12E-04	2.18E-04	1.530	0.860	1.07E-04	3.00E-05	0.399	0.093	2.69E-04	5.20E-05	5.79E-05	1.29E-05	4.12E-06	1.31E-06
126	He2-48	7	0.107	1.20E-02	3.77E-04	2.04E-04	1.110	0.630	1.09E-04	3.10E-05	0.321	0.080	3.40E-04	6.80E-05	9.46E-05	2.21E-05	1.66E-06	5.20E-07
127	IC4776	7	0.109	1.40E-02	1.06E-04	5.50E-05	0.261	0.148	1.16E-04	3.20E-05	0.285	0.050	4.06E-04	8.70E-05	8.77E-05	2.00E-05	6.82E-06	2.48E-06
128	K4-48	7	0.124	1.50E-02	-100	-100	-100.000	-100.000	2.06E-04	5.00E-05	0.637	0.088	3.23E-04	7.10E-05	1.05E-04	2.50E-05	1.65E-06	5.10E-07
129	M1-14	7	0.096	1.21E-02	-100	-100	-100.000	-100.000	4.57E-05	1.30E-05	0.157	0.057	2.90E-04	6.90E-05	5.54E-05	9.70E-06	2.19E-06	6.70E-07
130	M1-16	7	0.131	1.60E-02	-100	-100	-100.000	-100.000	5.43E-04	1.45E-04	1.640	0.310	3.32E-04	7.20E-05	1.08E-04	2.60E-05	1.55E-06	4.60E-07
131	M1-17	7	0.123	1.50E-02	-100	-100	-100.000	-100.000	2.42E-04	6.50E-05	0.495	0.094	4.88E-04	1.09E-04	1.17E-04	2.80E-05	6.59E-06	1.91E-06
132	M1-50	7	0.117	1.30E-02	-100	-100	-100.000	-100.000	8.13E-05	2.73E-05	0.153	0.380	5.31E-04	1.18E-04	1.01E-04	2.50E-05	5.97E-06	1.65E-06
133	M1-74	7	0.122	1.50E-02	-100	-100	-100.000	-100.000	1.38E-04	4.10E-05	0.329	0.070	4.21E-04	9.10E-05	1.02E-04	2.30E-05	1.94E-05	8.30E-06
134	M1-80	7	0.105	1.10E-02	1.30E-03	7.00E-04	1.780	1.010	3.65E-04	9.90E-05	0.498	0.104	7.34E-04	1.54E-04	1.52E-04	3.70E-05	4.67E-06	1.51E-06
135	M1-9	7	0.105	1.40E-02	6.34E-04	1.57E-04	3.300	0.940	3.65E-05	1.30E-05	0.190	0.087	1.92E-04	5.00E-05	4.04E-05	1.18E-05	2.10E-06	6.40E-07
136	NGC6567	7	0.102	1.40E-02	5.33E-04	2.78E-04	2.340	1.330	6.89E-05	2.93E-05	0.302	0.117	2.28E-04	5.30E-05	4.28E-05	1.02E-05	1.72E-06	7.20E-07
137	NGC6803	7	0.140	1.70E-02	4.23E-04	1.43E-04	0.764	0.313	4.30E-04	1.26E-04	0.778	0.159	5.53E-04	1.27E-04	1.43E-04	3.30E-05	1.02E-05	3.60E-06
138	PN	0	He/H	He/H error	C/H	C/H error	C/O	C/O error	N/H	N/H error	N/O	N/O error	O/H	O/H error	Ne/H	Ne/H error	S/H	S/H error

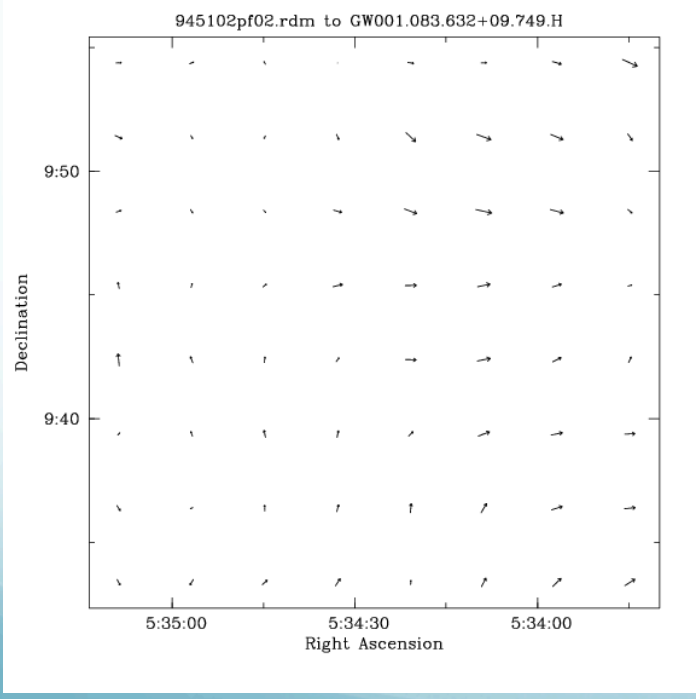
COMP Sheet2 Sheet3

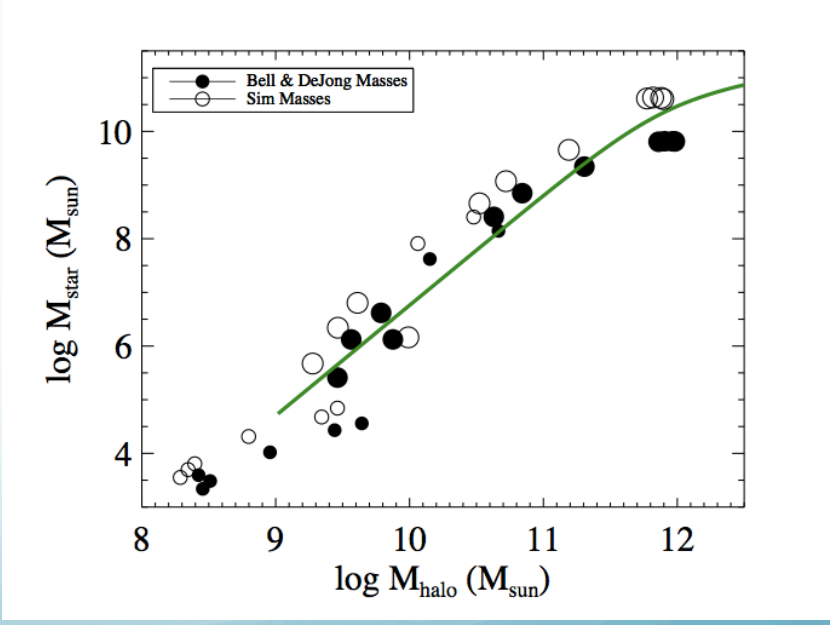
IV. Slide Tips

- Graphs: *legible!*
  - No clutter
  - Labels, axes
  - Symbols and lines large enough
  - Is anything too cluttered
  - Can everything be seen from the back of the room?
- Colors: Check colors.
- When planning, assume 30 to 120 seconds per slide.
- I prefer minimum, or no, text animation for scientific talks

Which is better?

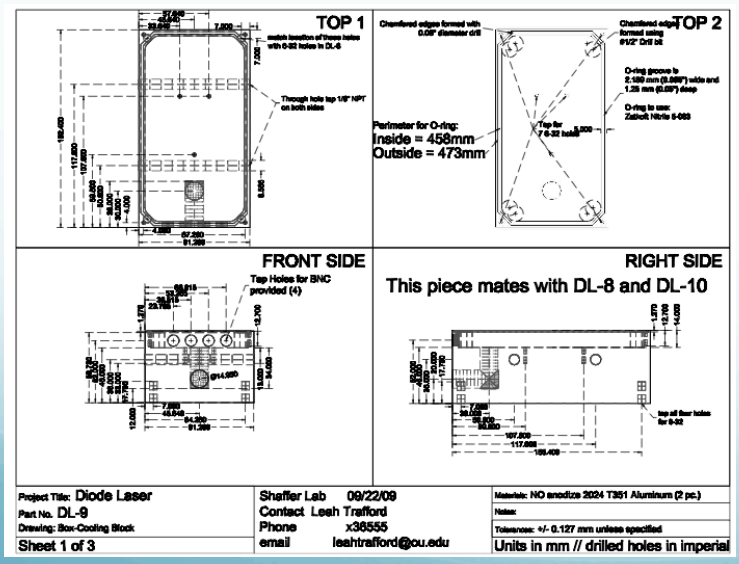
- Can you read axes? What does the plot mean? Is the title understandable? Can you see the data?

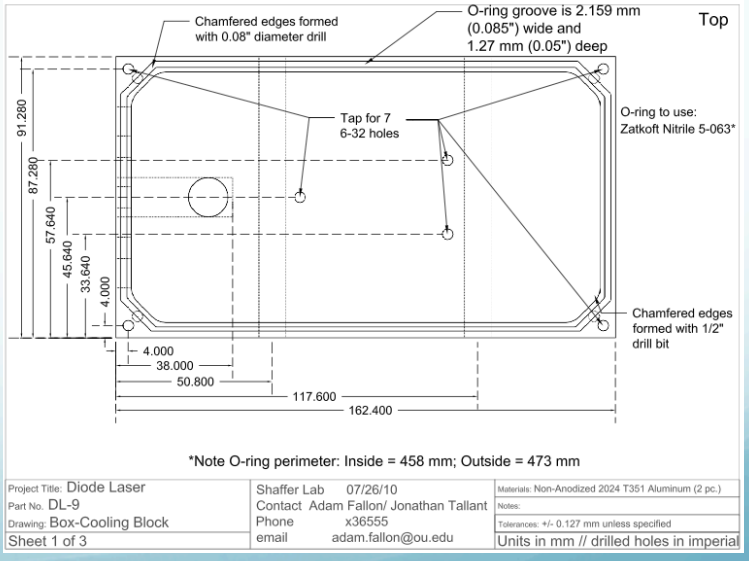


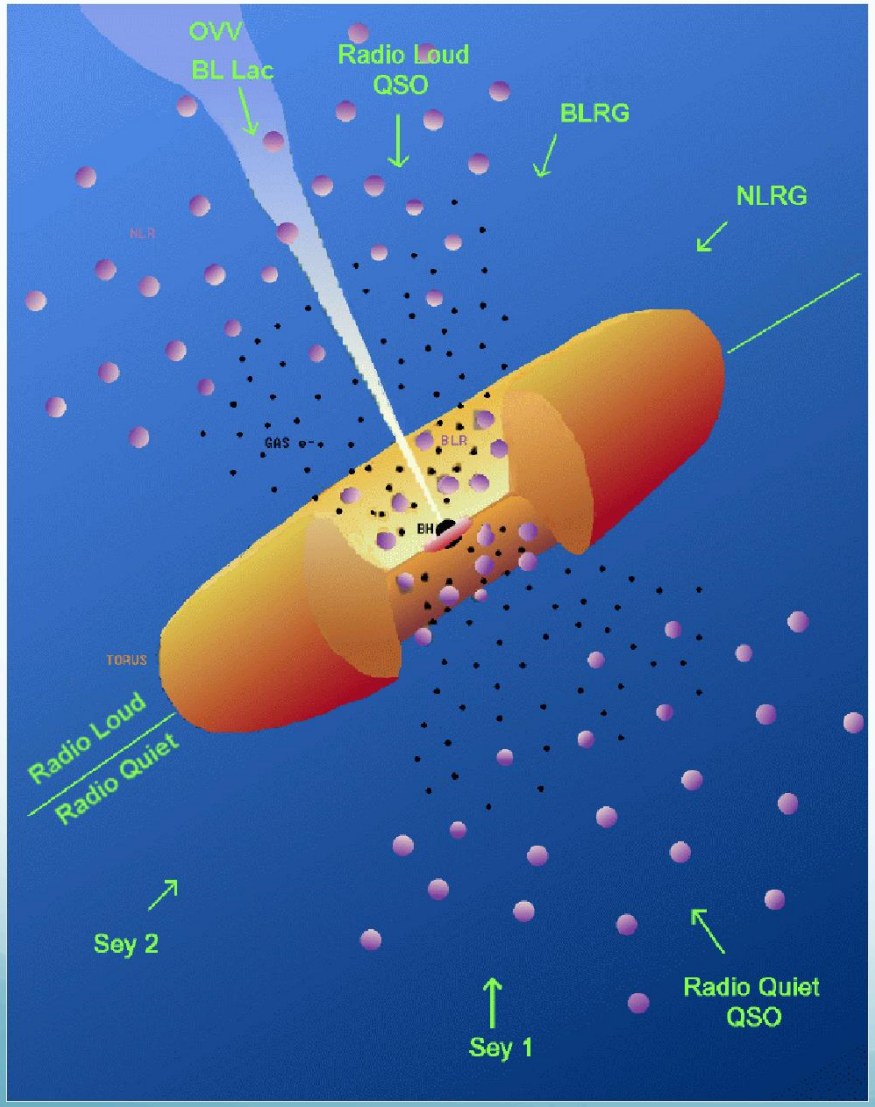


The First of My Obstacles

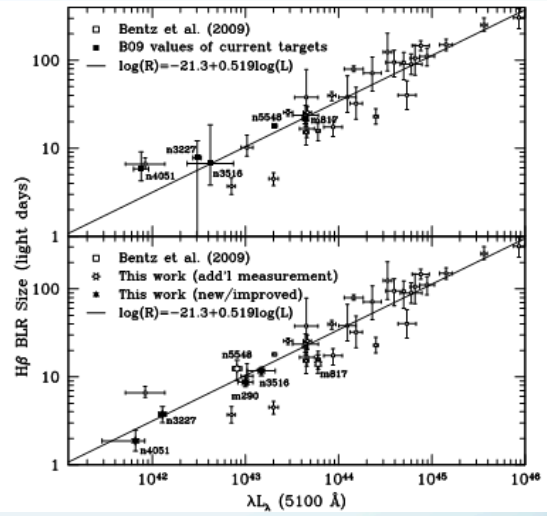
- I did not create every piece in AutoCAD
- I assumed those I did not adjust to be good enough for the machine shop
  - They had built a strikingly similar design before







Radius and Luminosity?

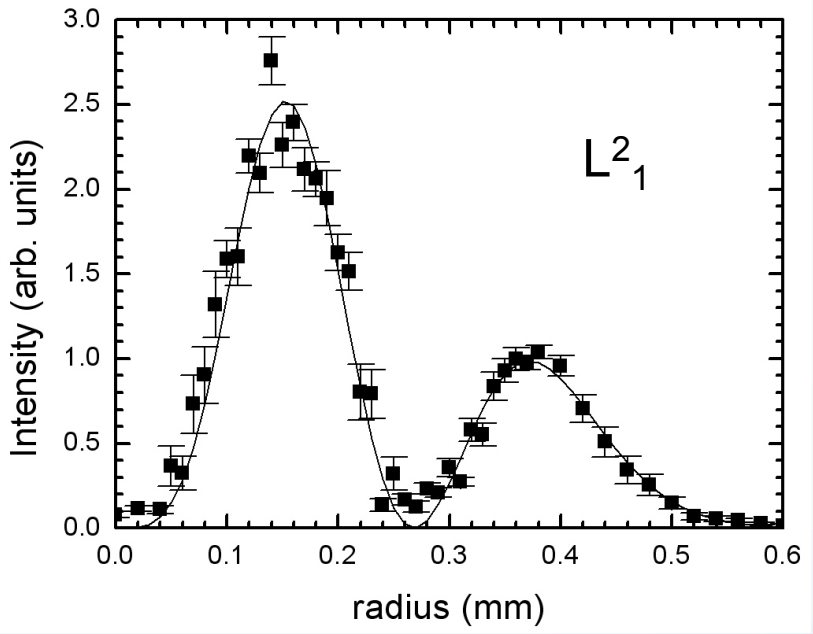


Denney et al

Detailed Beam Analysis

- Measured intensity profile..
- Rigorous fit to superposition of modes to determine mode quality.
- Fits consistent with 100% in mode of choice.

Also measured:
- Propagation characteristics
- Extinction ratios
- Conversion efficiencies
- Misalignment effects



(99.3 +- 0.9)% of intensity in L^2_1 mode.

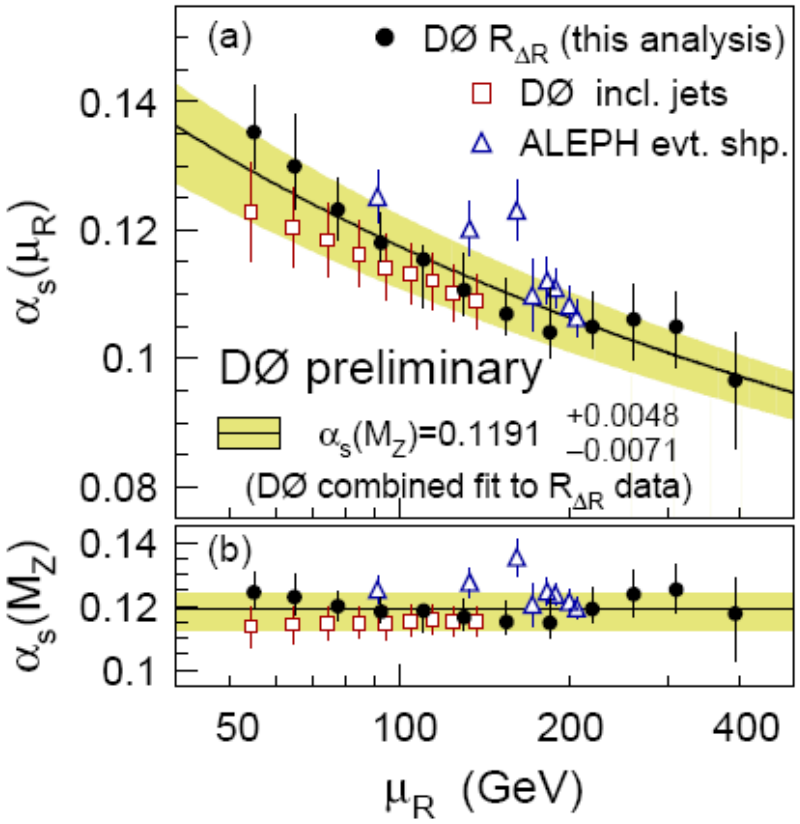
Sharon A. Kennedy, Matthew J. Szabo, Hilary Teslow, James Z. Porterfield, and E. R. I. Abraham, Physical Review A **66**, 043801 (2002).

$\alpha_s(p_T)$ results

- Use p_{Tnbr} > 50, 70, 90 GeV (138 data points total)
- At each p_T, combine all data points with different p_{Tnbr} and ΔR requirements
- Determine results for $\alpha_s(p_T)$ at 12 p_T values

→ $\alpha(p_T)$ results up to 400 GeV
→ $\alpha_s(p_T)$ decreases with p_T as predicted by the RGE

Results agree with results from
→ ALEPH event shape data
→ Previous DØ results from inclusive jets



$$\alpha_s(M_Z) = 0.1191^{+0.0048}_{-0.0071}$$

V. Speaking Tips: Do's

- Do speak to audience, not to computer or screen.
- Do have good legible graphics
- Do practice your talk.
- Do start strong.

V. Speaking Tips: Dont's

- Don't block projector.
- Don't put in too much information.
- Don't put in too many equations.
- Don't have too much information on any slide
- Don't cover segments: beware of appearing text.
- Don't go over the top. You are not in debate class, acting, or selling cars.
- Don't go overtime

Remember

- It is *your* talk. You are probably the expert in the room. It is your research. Be confident.
- You have practiced your talk so you know what you want to say, how you will make transitions, and how long your talk will take.

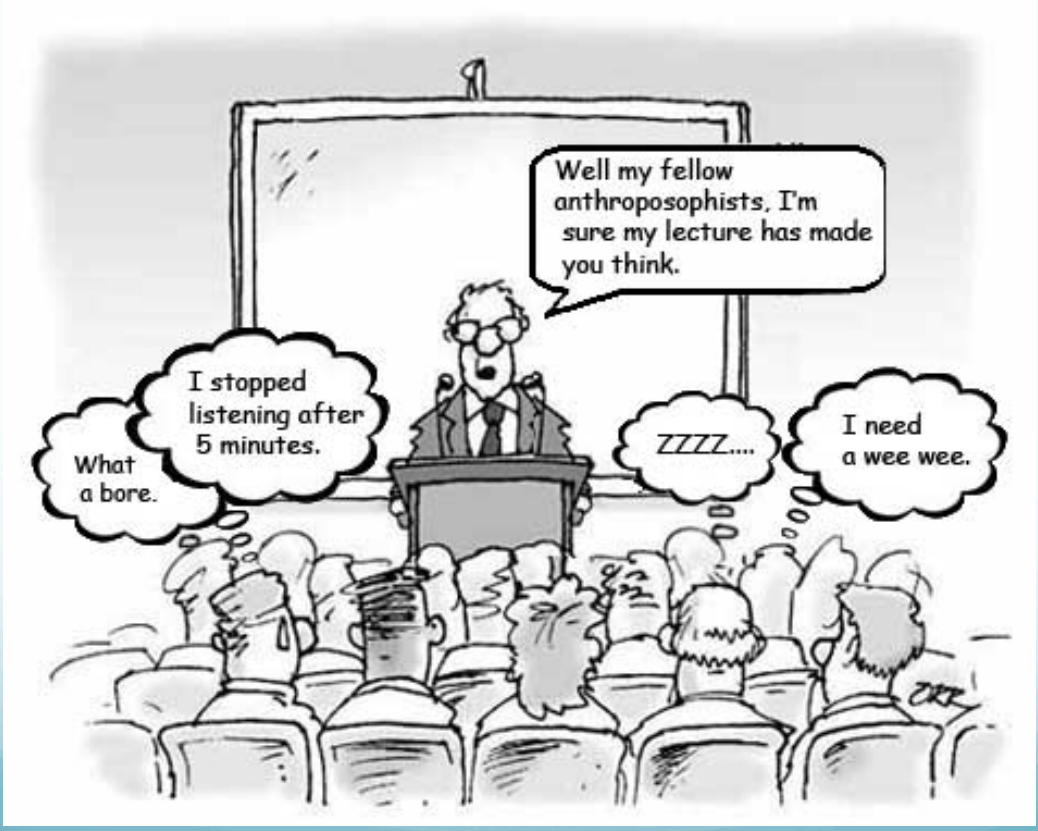
VI. Questions

- Sometimes questions are the most challenging part of the talk.
- Repeating the question may give you time to think.
- If you don't know the answer don't make something up. Don't panic. "I don't know but I'll look that up" is a perfectly reasonable answer.
- If the questioner is belligerent, take it off line.

VII. Miscellaneous

- Dress appropriately.
- Prepare for AV equipment.
- Be yourself. Don't try to mimic someone else.
- Keep humor at professional level. Careful going overboard with internet pictures.
- Oh, yeah, and remember to practice and don't go overtime.

Questions?


Well my fellow anthroposophists, I'm sure my lecture has made you think.
I stopped listening after 5 minutes.
What a bore.
ZZZZ....
I need a wee wee.