Making The Best Poster Ever

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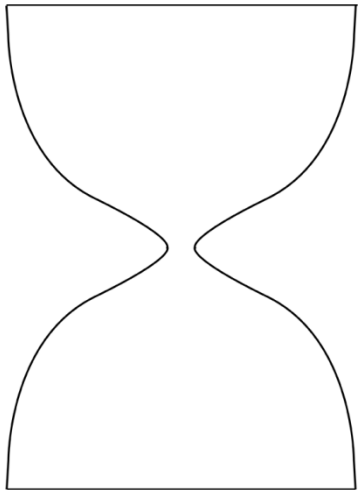
BE Writing Fellows
July 2013

Principles of poster-making

1. Why a poster?
2. Intriguing titles
3. The Hourglass Method
4. Oral presentation
5. Visual design

Our guiding image for crafting **concise, memorable** communication: the Hourglass.

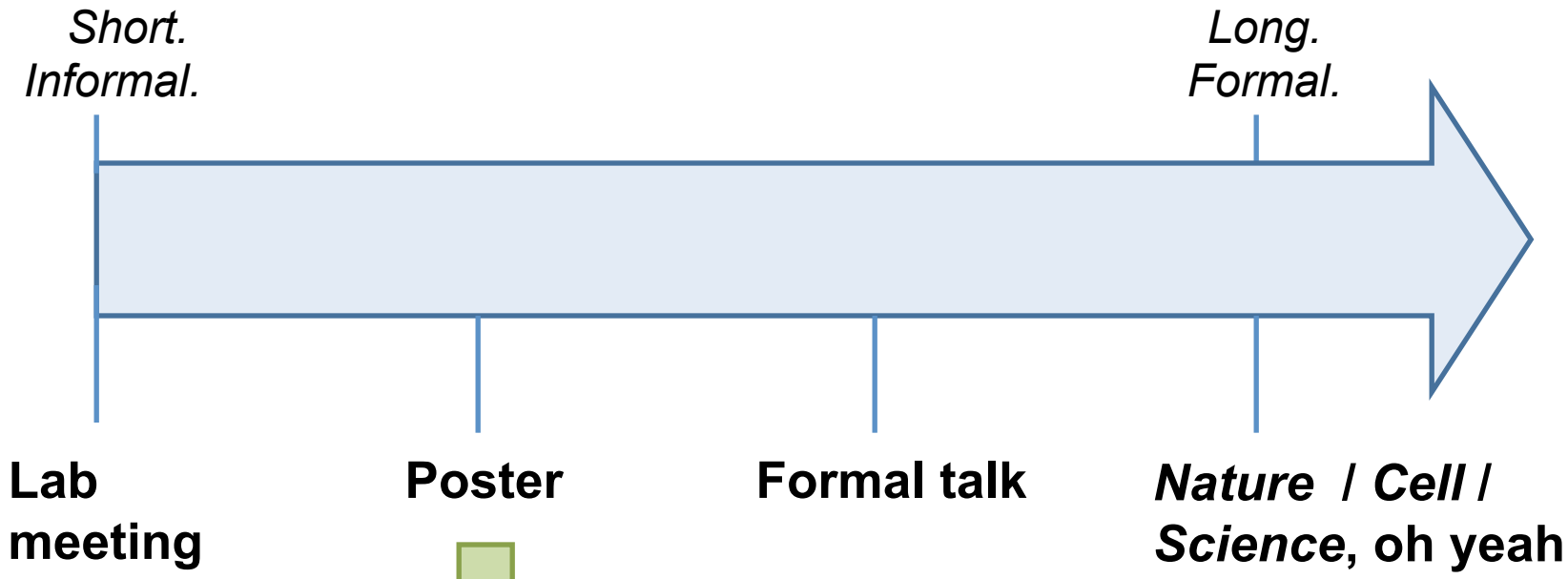


If you want to do science,
you have to communicate it.

Communicating to a wide audience with a poster is a valuable skill.

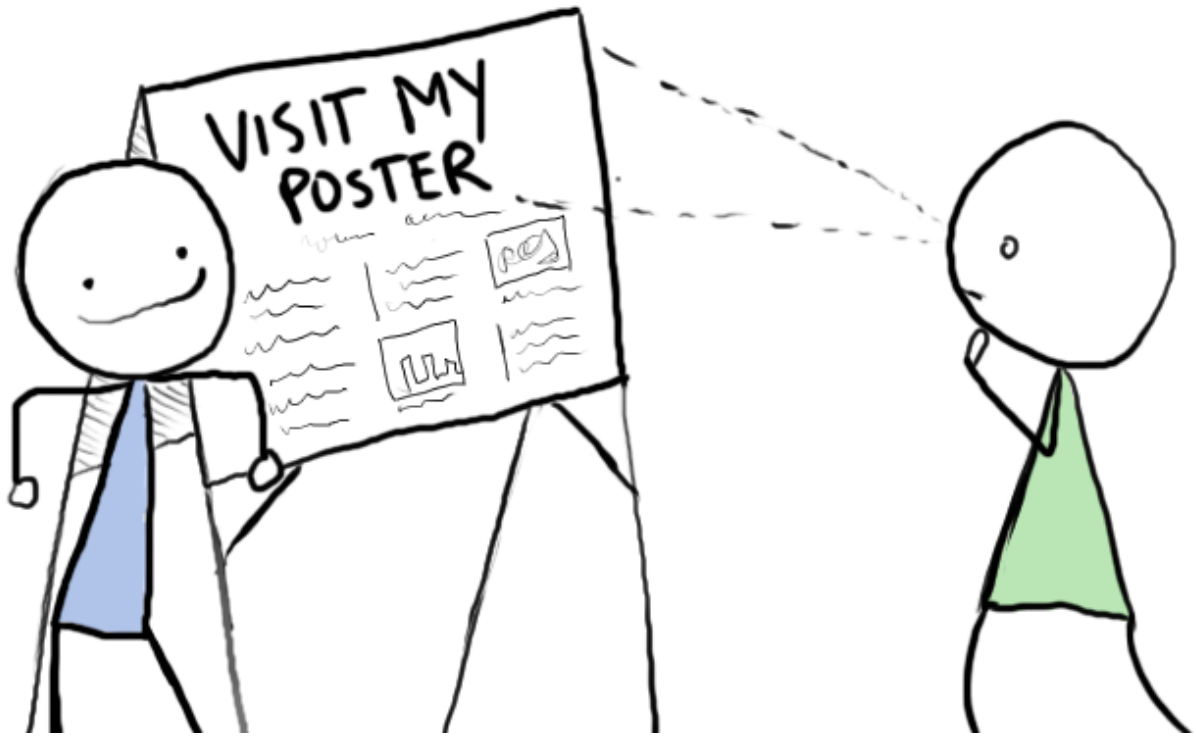
- **Get** ideas – seek advice.
- **Give** ideas – make an impact.
- MIT grad admissions.

Posters are the high-throughput communication method.



- Wide audience
- High-throughput

Hook your audience from the start: make a catchy title.



Hooking your audience

Title Clinic

Good titles explain “so what?”

Inulin modulates conspecific antagonism towards vancomycin-resistant *B. subtilis* strain BF819 in the human gut microbiome

versus

A human gut commensal exhibits targeted antagonism towards an antibiotic-resistant clinical counterpart

Exercise: Fix this title.

Novel methods for early prediction of undesirable interference by microbial inhabitants of the human gut with metabolism of the cardiac drug digoxin give rise to strategies for alleviating drug inactivation

Cut through title clutter by identifying key terms.

Novel methods for early prediction of undesirable interference by microbial inhabitants of the human gut with metabolism of the cardiac drug digoxin give rise to strategies for alleviating drug inactivation

Directly connect your key terms to create an efficient title.

Key nouns

- Human gut microbes
- Drug

Key verbs

- Prediction (of interference)
- Interfering (microbes, with drug)
- Alleviating (interference)

Predicting + alleviating…

…drug interference…

…by human gut microbiome

Consider your audience

The Hourglass Method

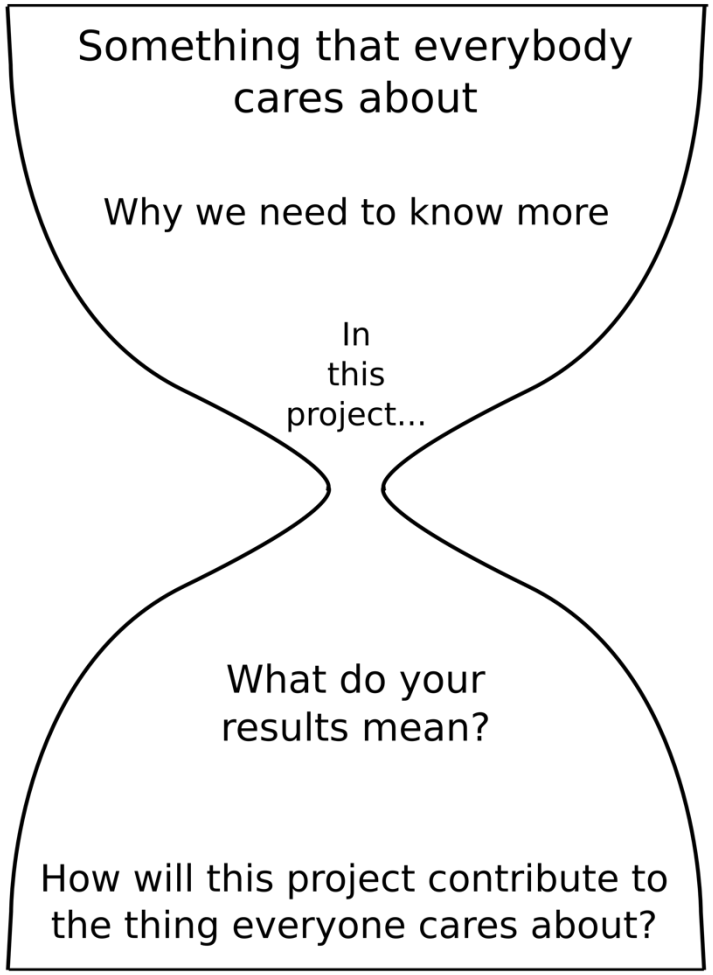
Your audience is diverse and hostile.

Sources:
andweshout.blogspot.com
livestrong.com

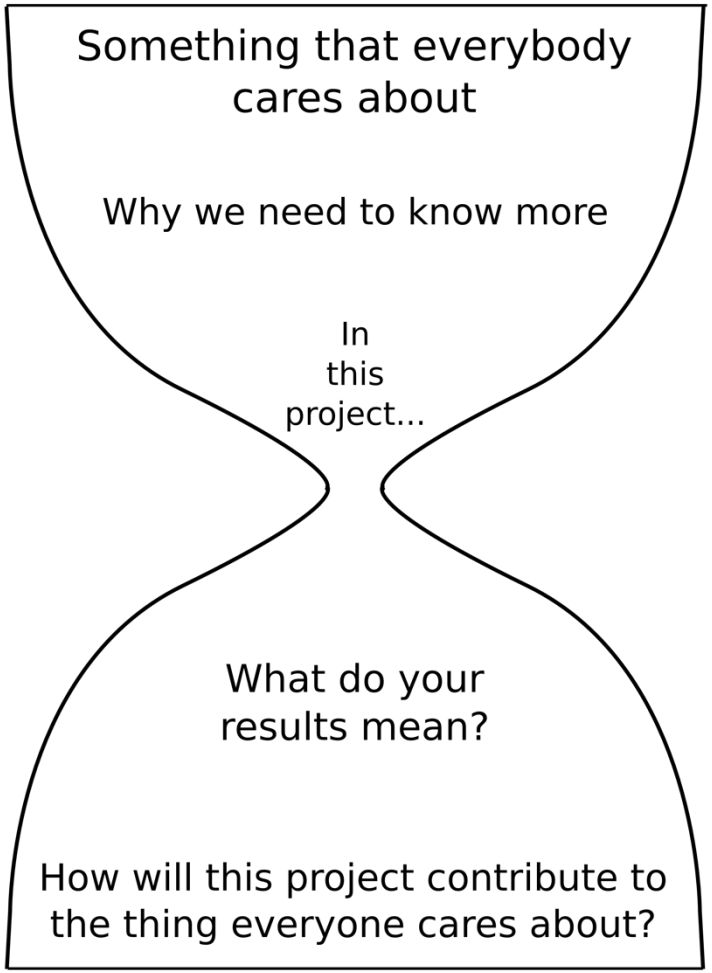
Exercise: Explain this research to a grad student in a different lab.

- You did site-directed mutagenesis of inverse pericam (IPC)
- You designed your mutation to increase binding site cooperativity
- IPC is a calcium biosensor
- You used nickel-agarose resin for protein purification
- You increased binding affinity five-fold
- The mutant's binding affinity is relevant to cellular processes not previously studied

The Hourglass Method helps you explain “so what?”



Confused message



- You did site-directed mutagenesis of inverse pericam (IPC)
- You designed your mutation to increase binding site cooperativity
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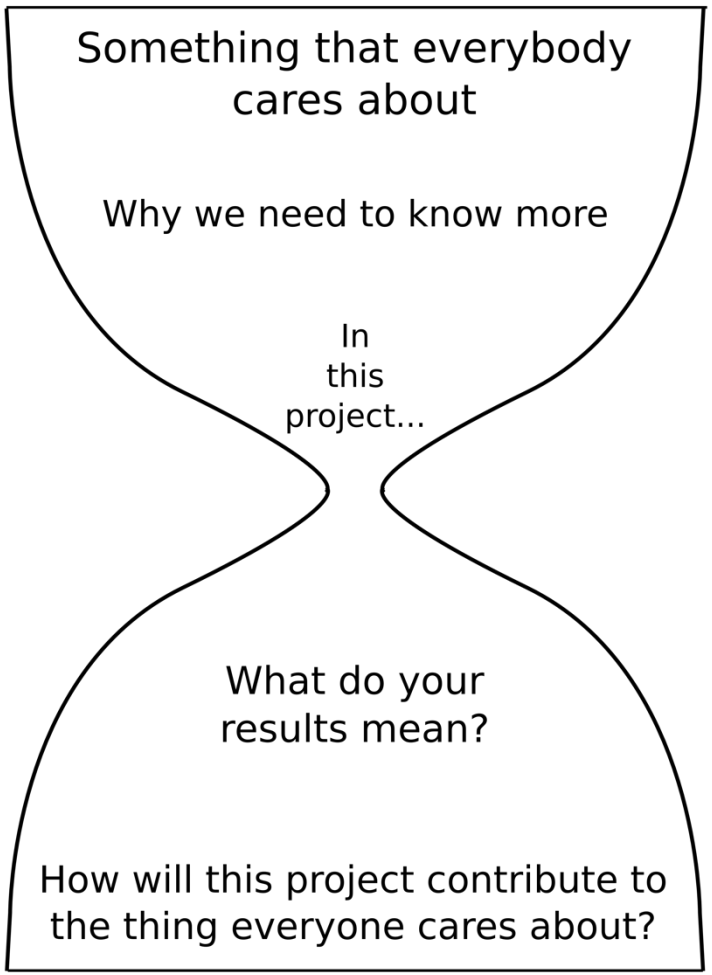
Clear message

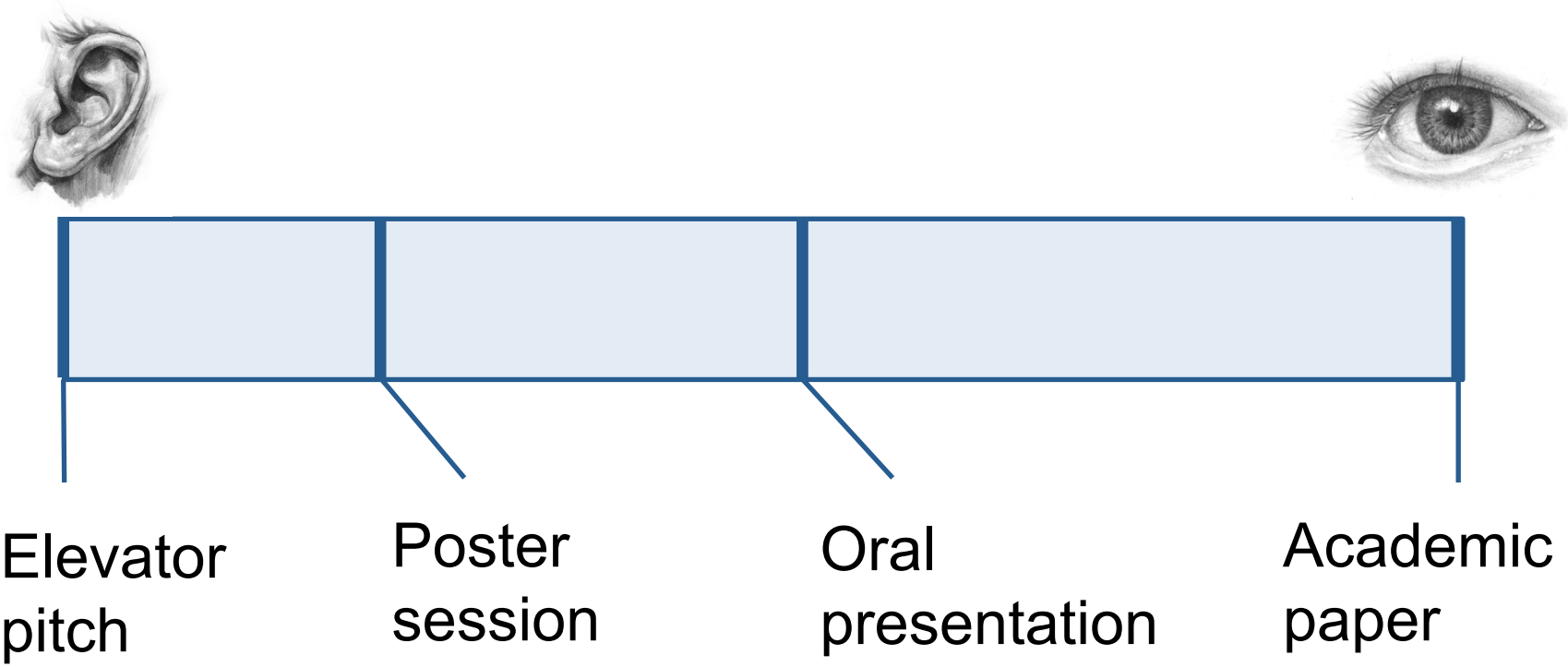


- Calcium is essential to cell signalling
- Existing calcium biosensors are not sensitive at some concentrations
- In this project, we used site-directed mutagenesis to increase a biosensor's binding affinity five-fold
- The mutant's binding affinity is relevant to new cellular processes
- This sensor will improve understanding of calcium signalling

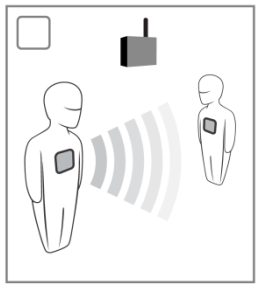
Deliver your message

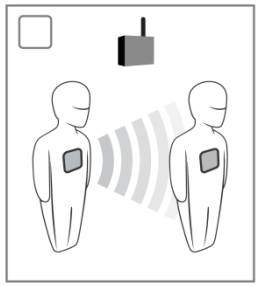
Posters are for speaking

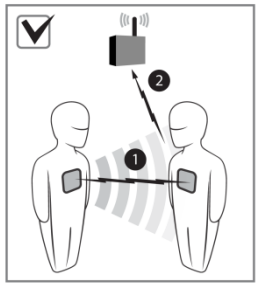
Your poster supports a spoken message.



Poster audiences have short attention spans.







Time talking	Probability listening
0 sec	100%
20 sec	50%
1 min	10%
2 min	5%
5 min	<1%

Cattuto C et al. (2010) PLoS ONE 5(7): e11596.

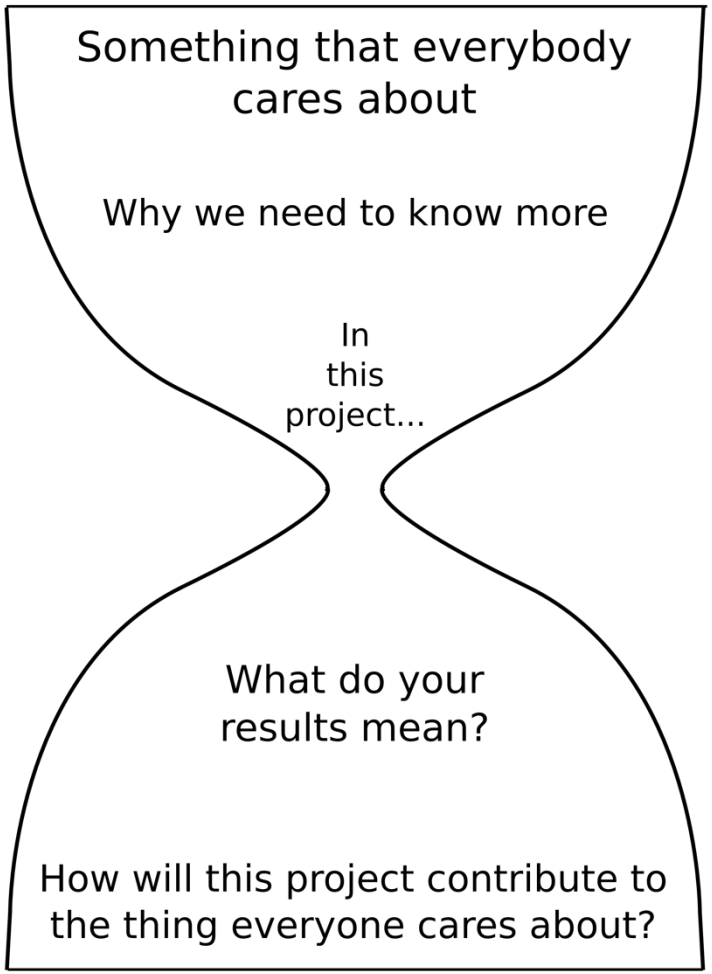
Fluid audiences require fluid presentations.

- *They see a shiny title: 0 seconds*
- Get 'em hooked: **20** seconds
- Reel 'em in: **2** minutes
- Live it up: **20** minutes

Exercise: A faculty member just asked you, “What are you working on?”

- In 20 seconds, they will be bored.
- This person is a scientist but not a specialist in your field.
- This person might have resources to help your project along.

The Hourglass Method makes clear elevator pitches.



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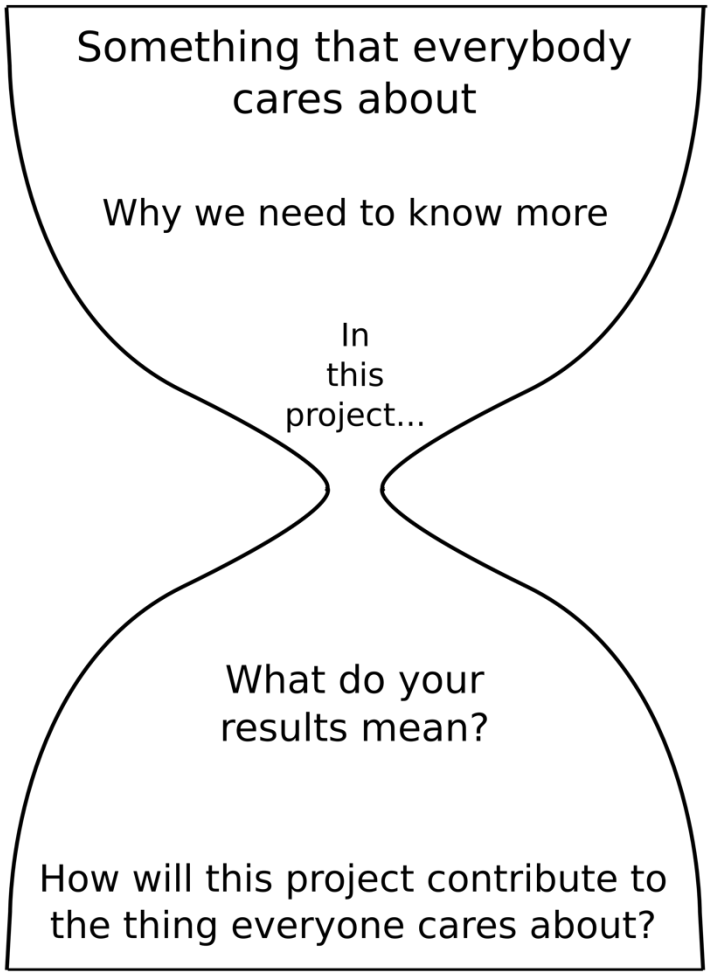
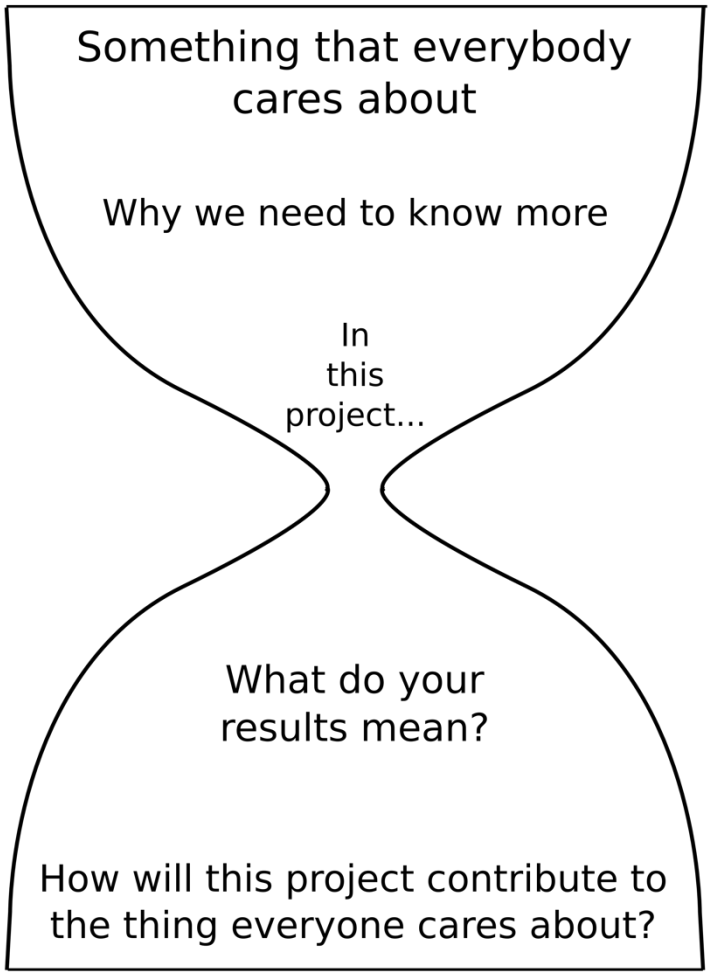


- Bacteria helped clean up the Deepwater Horizon spill much faster than expected.
- Only a handful of oil-degrading species have been isolated in the lab.
- In this project, we aim to identify oil-degrading species and oil-degrading pathways with culture-independent techniques.
- These results could provide a baseline measurement and improve biodegradation in environments,
- Improving the speed and decreasing the cost of spill cleanups.

Exercise: Elevator pitch, round 2



- In 20 seconds, they will be bored.
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Visual Design

Put your message first

Visual Design: a case study

Functional-Gene Microarray Characterization of Phytoplankton Community Composition in the Sargasso Sea

Diana M. Chien
Department of Ecology and Evolutionary Biology, Princeton University
Adviser: Bess Ward (Department of Geosciences, Princeton University)

Introduction

Marine phytoplankton community composition is a major determinant of the efficiency of the biological carbon pump, by which atmospheric carbon dioxide is fixed via photosynthesis in surface waters, and eventually transported to and sequestered in deep waters. Within a phytoplankton community, different cell types vary greatly in size, and respond differently to environmental variables such as nutrient flux and temperature. These factors directly influence the pathways and rates of carbon drawdown from surface waters.

Understanding the composition of global phytoplankton populations is consequently crucial to predicting the effects of climate change on ocean carbon sequestration. However, current methodologies for assessment of phytoplankton populations have many limitations in resolution and scale. Microarray analysis offers a relatively high-resolution, high-throughput method for assessing composition of natural assemblages. Here, a microarray, the Ward lab's "phytoarray," was used to characterize Sargasso Sea phytoplankton communities on the basis of genes encoding key enzymes involved in nitrate assimilation and carbon fixation: nitrate reductase (*NR*) and RuBisCo large subunit (*rbc*L).

Methods

- **Design of phytoarray BC_011:**
  - Archetypal oligonucleotide probes representing major phytoplankton groups, mostly eukaryotic and many uncharacterized
  - 62 chromophyte nitrate reductase (*NR*) archetypes
  - 78 chromophyte RuBisCo large subunit (*rbc*L) archetypes
- **Sample collection and preparation:**
  - Depth profiles (0 – 120m) collected from the Sargasso Sea, March 17-20, 2009
  - Two sampled locations: Bermuda Atlantic Time-Series Study (BATS) and Spatial Station 2 (SS2)
  - Water samples filtered and community DNA extracted, digested, amplified, and labeled with fluorophore Cy3
  - Samples hybridized to array
- **Hybridization analysis:**
  - Arrays scanned and fluorescence data quantified and filtered
  - Ratio of CY3 to background fluorescence calculated for significant probes
  - Ratios normalized across arrays by converting probe signal intensities to percentage of total signal intensity for each gene, yielding relative fluorescence ratio (RFR)

Results

- **Environmental conditions:**
  - Highly oligotrophic
  - Isothermal mixed layer
  - Little variation among sites in biomass, temperature, nitrate concentrations

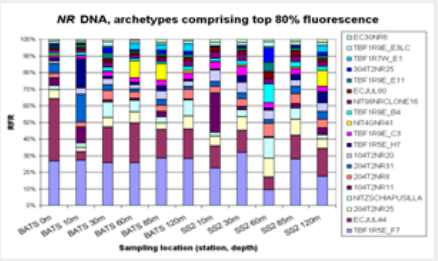


Fig. 1: Relative signal strength for the 19 *NR* archetypes (out of 62 total) contributing the top 80% to total fluorescence of *NR*, across all sites sampled.

- **Matches for most dominant *NR* archetypes:** A distant diatom, an uncultured eukaryote, and a distant prymnesiophyte
- **All top 80% *NR* archetypes:** 11 diatoms, 7 unidentified eukaryotes, 1 raphidophyte, 1 distant haptophyte

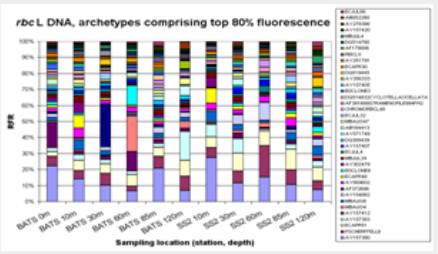


Fig. 2: Relative signal strength for the 38 *rbc*L archetypes (out of 78 total) contributing the top 80% to total fluorescence of *rbc*L, across all sites sampled.

- **Matches for most dominant *rbc*L archetypes:** Coccolithophores *Coccolithus pelagicus* and *Pleurochrysis haptonemofera*, prymnesiophyte *Phaeocystic pouchetii*
- **All top 80% *rbc*L archetypes:** 13 prymnesiophytes, 10 diatoms, 4 dictyophytes, 4 pelagophytes, 3 dinoflagellates, 2 unidentified eukaryotes, 1 rhodophyte, 1 stramenopile

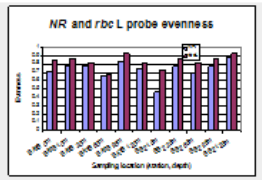
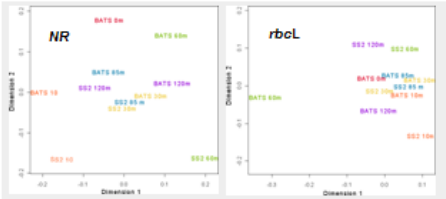


Fig. 3: Evenness of *NR* and *rbc*L probes at each site, calculated using the Shannon diversity index.

Archetype diversity:

- *rbc*L diversity and evenness are always greater than those of *NR*.
- At all sites, diversity and evenness for *rbc*L and *NR* are significantly correlated (Pearson's product-moment correlation, $P = 0.00249$).
- *NR* diversity and evenness weakly correlated with nitrate concentrations ($P = 0.0845$)



Figs. 4a and b: Sample ordination by dissimilarity of community composition, using non-metric multidimensional scaling (NMDS) plots

- Ordination did not follow environmental gradients.
- 30 m and 85 m samples from both stations more similar to each other
- 10 m and 120 m samples less similar
- 60 m samples extremely distant

Conclusion

- Great eukaryote diversity is observed despite highly oligotrophic and relatively invariant conditions in the sites sampled.
- *rbc*L provides higher species resolution than *NR*, but both appear to provide a robust picture of underlying diversity.
- Diversity and composition do not always clearly correlate with depth and other environmental variables.
- Some results confirmed the presently known picture of Sargasso diversity (i.e. relative dominance of prymnesiophytes, especially coccolithophores), while others appeared contradictory (i.e. relative insignificance of pelagophytes).
- The phytoarray provides a high-resolution snapshot of community diversity and composition, which can be improved by greater characterization of sequences (*NR* in particular) and the future addition of more archetypes.

Acknowledgements

I would like to thank Sarah Fawcett for providing nitrate concentration data.

Visual Hierarchies: Give more visual weight to more significant information.

UNIVERSITY OF KENTUCKY

Tension recovery kinetics in contracting myocardial preparations

Kenneth S. Campbell & Anastasia M. Holbrook
Department of Physiology, University of Kentucky, Lexington, KY 40536

Introduction

The rate at which cardiac muscle generates force is an important determinant of systolic function. Previous experiments have shown that this rate increases with the level of Ca^{2+} activation. We investigated the molecular mechanisms underlying the effect in isolated myocardial preparations by measuring the rate of tension recovery (k_{tr}) following brief shortening/re-stretch perturbations.

Methods

Mechanically digested rat myocardial preparations were chemically permeabilized with Triton X-100 and attached between a force transducer and a motor. Measurements were performed using SLControl software. Separate batches of solutions were used to investigate 1) the pH dependence (pH values of 6.75, 7.00 and 7.25) and 2) the phosphate (Pi) dependence (0.0, 2.5 and 5.0 mM added Pi) of the rate of tension recovery.

Statistical analysis was confined to tension recovery records with $P_{resid}/P_{ss} \leq 0.75$ and $r^2 \geq 0.98$ for a mono-exponential fit. This restricts the statistical analysis to unambiguous tension recovery records that are reasonably characterized by a single time constant.

Results

The rate of tension recovery measured in control experiments (pH 7.00, no added Pi) increased with the relative residual tension (P_{resid}/P_{ss}) measured immediately after re-stretch.

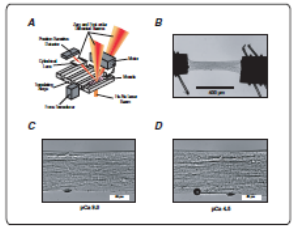
k_{tr} values measured in different trials were markedly dependent on the pH and the Pi content of the activating solution but remained correlated with P_{resid}/P_{ss}.

Conclusion

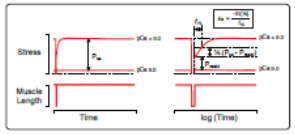
These new findings show that the rate of tension recovery in cardiac muscle depends on the mechanical state of the muscle immediately after the imposed perturbation.

If the P_{resid}/P_{ss} ratio is indicative of the proportion of cross-bridges attached between the myofilaments immediately after re-stretch, these results show that the rate of tension recovery may be determined primarily by cooperative mechanisms.

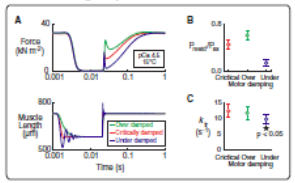
1 Methods and preparations



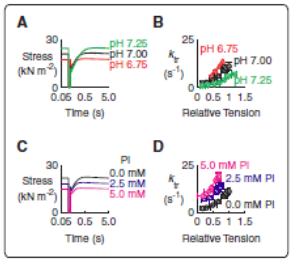
2 Contracting muscles redevelop steady-state tension following rapid shortening/re-stretch perturbations



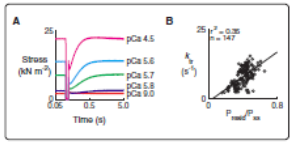
3 k_{tr}, the rate of tension recovery depends on the precise time-course of the length perturbation



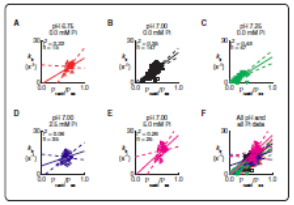
4 Experiments performed using critically damped motor motions showed that tension recovery kinetics were markedly dependent on the both the pH and the Pi content of the activating solution



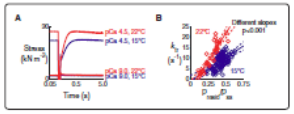
5 Analysis of control recordings (pH 7.00, no added Pi) from these experiments showed that k_{tr} correlated with the relative residual tension measured immediately after re-stretch (P_{resid}/P_{ss})



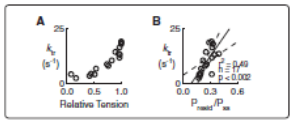
6 To our surprise, k_{tr} remained correlated with P_{resid}/P_{ss} in solutions with different pH values and different Pi contents



7 Raising the experimental temperature increased the slope of the k_{tr} - P_{resid}/P_{ss} relationship



8 k_{tr} also correlated with P_{resid}/P_{ss} in experiments performed using rat trabeculae



Recorded with SLControl
Supported by NIH AG20710
Supported by American Heart Association Scientist Development Grant 0630073N

Bullet points, not sentences.

BAD

Full sentences both waste your valuable real estate and make it difficult for your audience to pick out *the* most interesting information from a mass of potentially interesting words words words.

GOOD

Bullet points

- conserve space
- visually separate different ideas
- should condense your thoughts into concrete, active phrases

Bullet points, not sentences.

rescuing the BAD

Full sentences

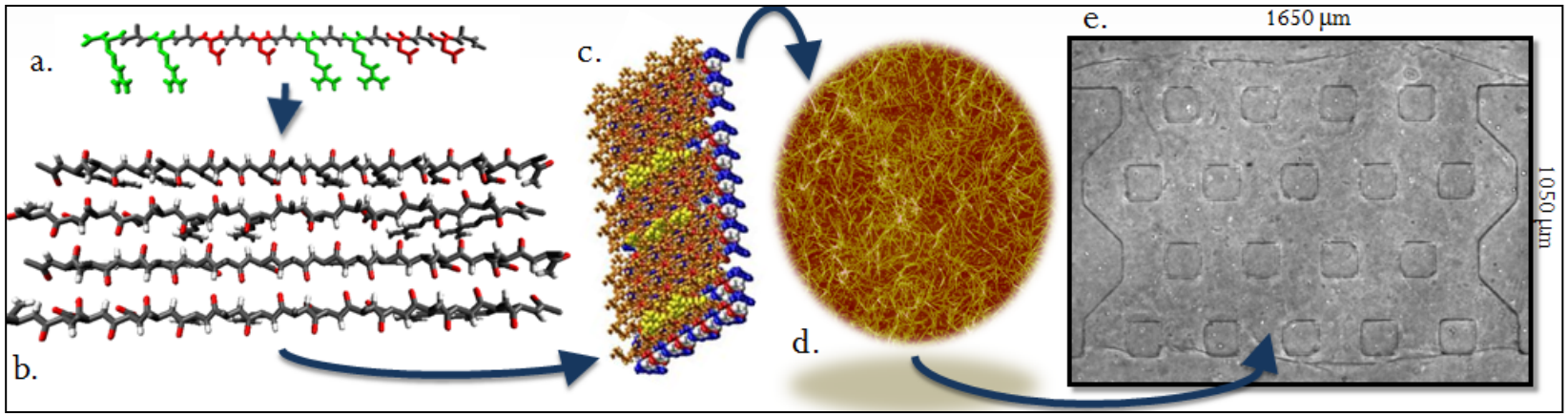
- clutter your space
- obscure your message

GOOD

Bullet points

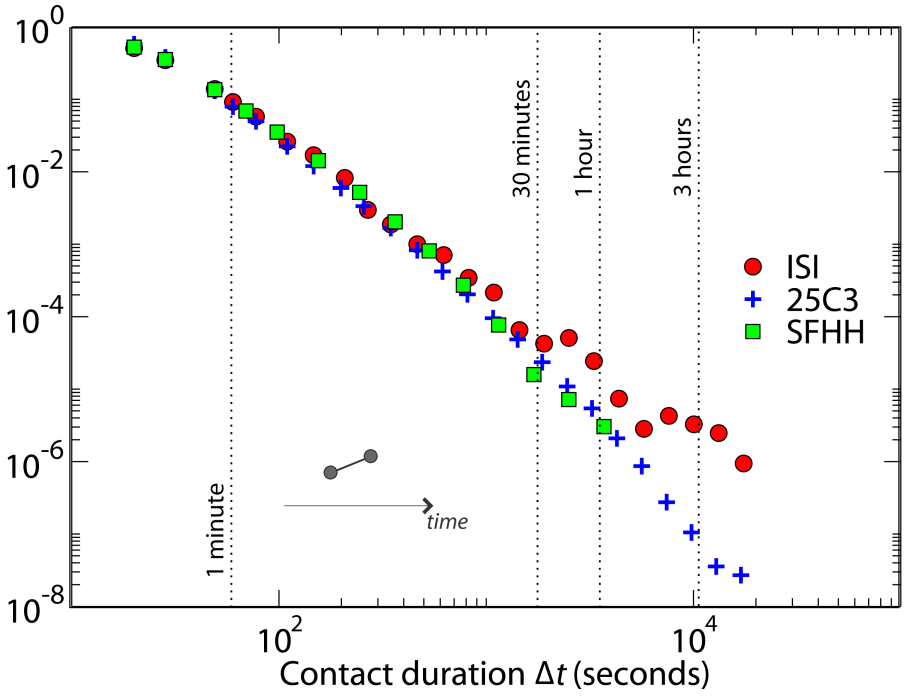
- conserve space
- visually separate different ideas
- should condense your thoughts into concrete, active phrases

Cartoons and flowcharts are worth a thousand words.



Courtesy John Casey

Only show as much data as you need to convey your message.



Time talking	Probability listening
0 sec	100%
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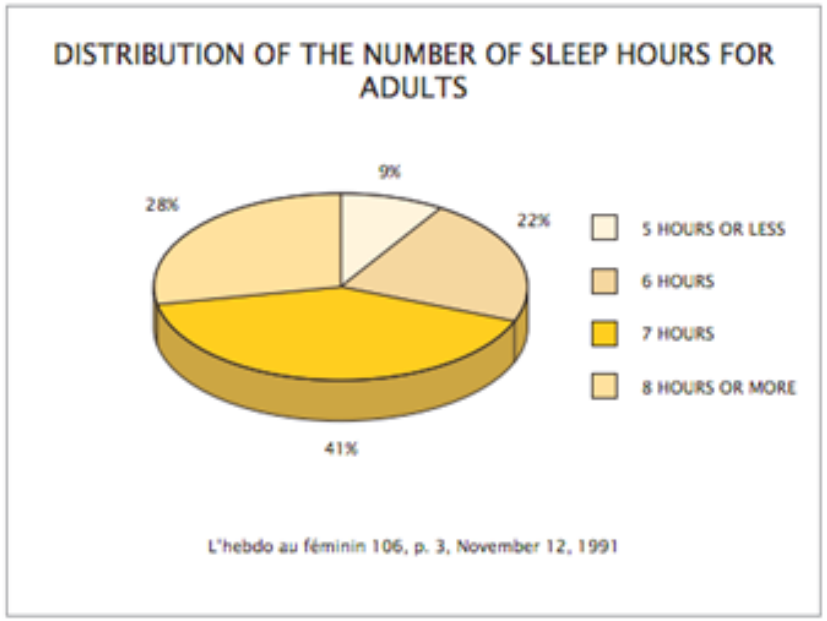
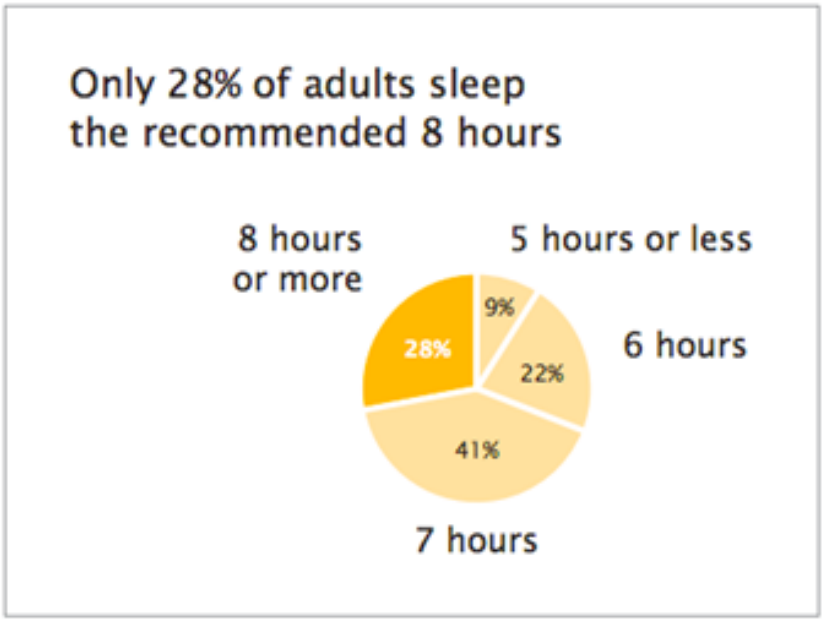
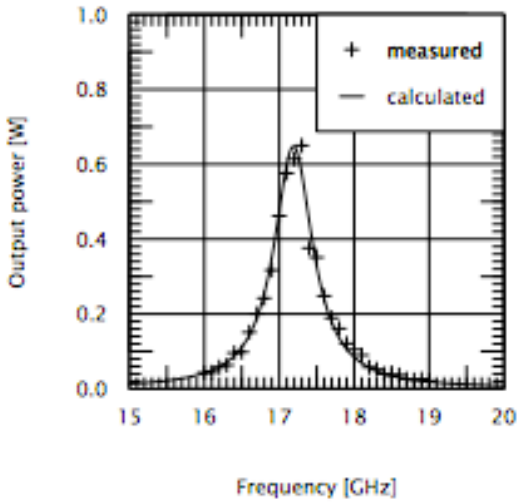
Make the figure tell your message.

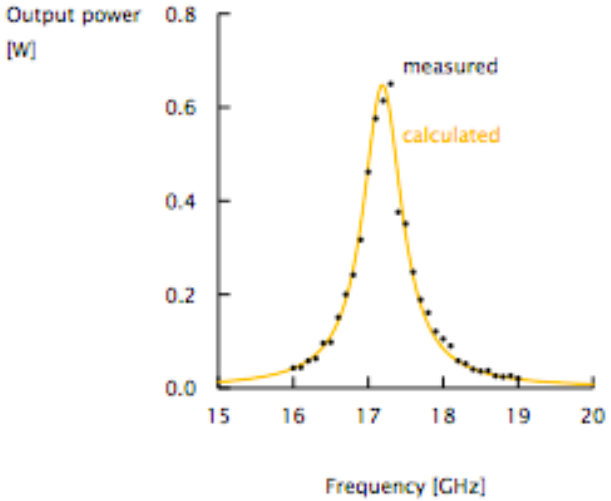


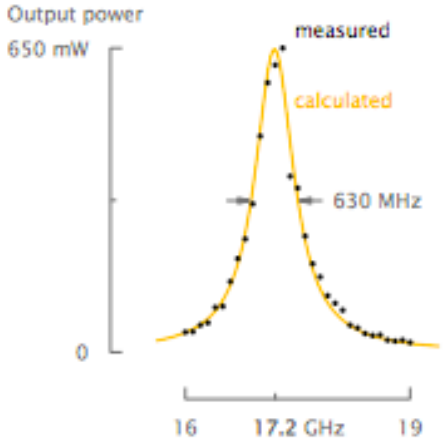


by Jean-Luc Doumont

Make the figure tell your message.

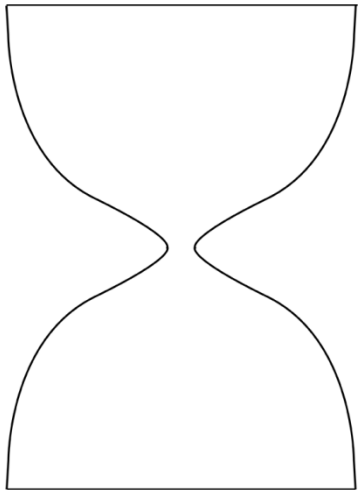






by Jean-Luc Doumont

Our guiding image for crafting **concise, memorable** communication: the Hourglass.



Questions?