



Making Great Posters for Research Applications

September 2013

Ann Holstein, Kelvin Smith Library

NSF IGERT Integrating Research and Education in Advanced Networking (IREAN) Program Virginia Tech

COGNITIVE ENGINE

Intelligent engines & their core principles... System diagram of biologically-inspired cognitive radio (identified for patent)...

COGNITIVE RADIOS

Fixed radios are set by their operators... Adaptive radios can adjust themselves to accommodate... Cognitive radios can sense their environment and learn how to adjust...

EVOLUTIONARY COMPUTATION & CASE-BASED DECISION THEORY

Classic algorithms are well suited for... Case-based decision theory... Evolutionary computation...

GAME THEORY

Feedback systems improve optimization performance on flow with... Game theory...

MULTI-OBJECTIVE OPTIMIZATION

Discretized networks have increased... Multi-objective optimization...

INTELLIGENT ADAPTATION & OPTIMIZATION OF COMMUNICATION NETWORKS

Economic valuation methods... Interference Temperature (IT)...

COGNITIVE RADIO ECONOMICS

Economic valuation methods... Interference Temperature (IT)...

REGULATORY CONCERNS

Interference Temperature (IT)...

IREAN STUDENTS AND FACULTY

20 Graduate Students, 5 Associated Faculty, 19 Faculty

Contributing Students	Contributing Faculty
Thomas W. Rindas, David Haddock, Kerry Wood, Adam Ferguson, Josh Reed	Charles W. Bostian, Scott F. Miller, Luke A. Dabish, Sheryl B. Ball, David Gorenau, Alan S. Mackenzie

Investigating signaling and metabolism of PLC- and PLD-derived phosphatidic acid in the root apical meristem of *Arabidopsis thaliana*

Early Ann Young, Ulrike Cox-Bowens, Jan Derrera Infante, Departmento de Ingeniería Genética, Centro de Investigación y Estudios Avanzados del Instituto Politécnico Nacional, Irapuato, Guanajuato, México, IHIMI International Summer Research Fellow, 2005

Abstract

The present thesis reports the role of two distinct signaling pathways in the development of Arabidopsis thaliana root apical meristem architecture. The phospholipase PLC and PLD both contribute to phosphatidic acid (PA) and diacylglycerol (DAG) signaling. We used mutants in the PLC and PLD genes to study the role of these enzymes in root growth. We found that PLC and PLD are both required for proper meristem development. We showed that PLC and PLD are both required for proper meristem development. We showed that PLC and PLD are both required for proper meristem development. We showed that PLC and PLD are both required for proper meristem development.

Introduction

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Methods

Arabidopsis thaliana root apical meristem architecture was analyzed using confocal microscopy and quantitative PCR. Root growth was measured using a root elongation assay. Root apical meristem architecture was analyzed using confocal microscopy and quantitative PCR. Root growth was measured using a root elongation assay. Root apical meristem architecture was analyzed using confocal microscopy and quantitative PCR. Root growth was measured using a root elongation assay.

PLD Pathway

PLD converts membrane phospholipids into PA and DAG. PA and DAG are signaling molecules that regulate cell growth and differentiation. In Arabidopsis, PLD is involved in root growth and meristem development. We used mutants in the PLD gene to study the role of PLD in root growth. We found that PLD is required for proper meristem development. We showed that PLD is required for proper meristem development. We showed that PLD is required for proper meristem development.

Results

PLD mutants show a root growth defect. PLD mutants show a root growth defect. PLD mutants show a root growth defect. PLD mutants show a root growth defect. PLD mutants show a root growth defect. PLD mutants show a root growth defect. PLD mutants show a root growth defect. PLD mutants show a root growth defect. PLD mutants show a root growth defect. PLD mutants show a root growth defect.

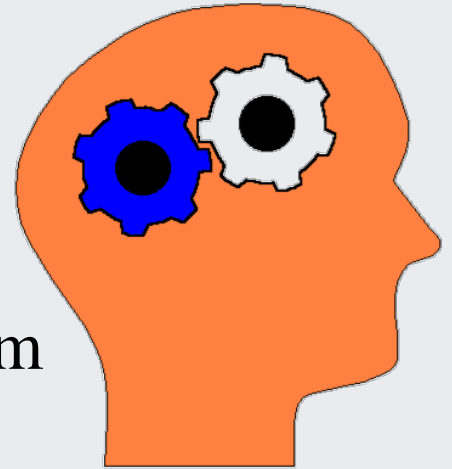
Future Directions

Further studies on the role of PLD in root growth. Further studies on the role of PLD in root growth. Further studies on the role of PLD in root growth. Further studies on the role of PLD in root growth. Further studies on the role of PLD in root growth. Further studies on the role of PLD in root growth. Further studies on the role of PLD in root growth. Further studies on the role of PLD in root growth. Further studies on the role of PLD in root growth. Further studies on the role of PLD in root growth.

Purpose

Purpose of a Poster

- To communicate information and ideas
- To outline a piece of work in a form that is easily assimilated
- To stimulate interest and discussion



A Great Poster Is...

Readable

- Easy flow of ideas from one item to the next
- Avoid grammatical errors, complex or passive sentence structure, and misspellings which make a poster "hard to read"



A Great Poster Is...

Legible

- If a text is legible, it can be “deciphered”
- Common errors include:
 - Use of fonts that are too small to be read from 4-8 feet away, the typical distance for reading a poster
 - Poor text color selection

Size:	Arial:	Times New Roman:
1	Font	Font
2	Font	Font
3	Font	Font
4	Font	Font
5	Font	Font
6	Font	Font
7	Font	Font



A Great Poster Is...

Well Organized

- Spatial organization makes the difference between reaching 95% rather than just 5% of your audience
- Time spent hunting for the next idea or piece of data is time taken away from thinking about the science



A Great Poster Is...

and Succinct

- Studies show that you have only 10 seconds to grab and retain your audience's attention
- Make the punchline (title) prominent
- Keep the amount of text used throughout your poster to a minimum
- Do not attempt to include all the details!

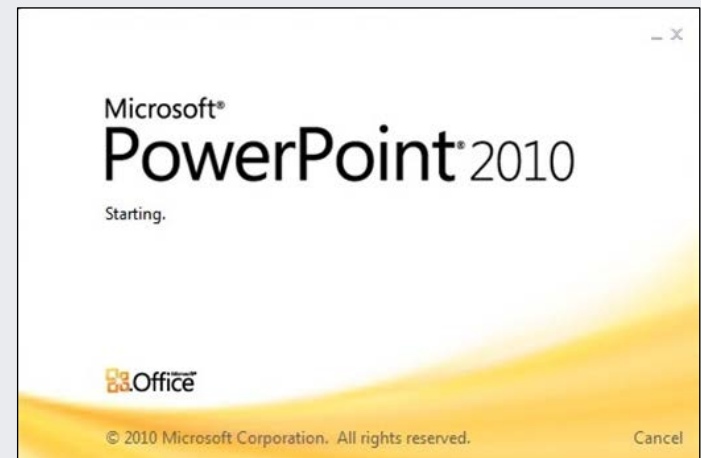
Making a Poster – 2 easy steps!

Designing the Poster Elements

- Most posters are made using some kind of computer software
- We recommend using Microsoft PowerPoint

Printing the Poster

- You can print your poster at KSL, we have a large format printer in the Freedman Center
- Library staff will be available to assist you



Time and Money

Time

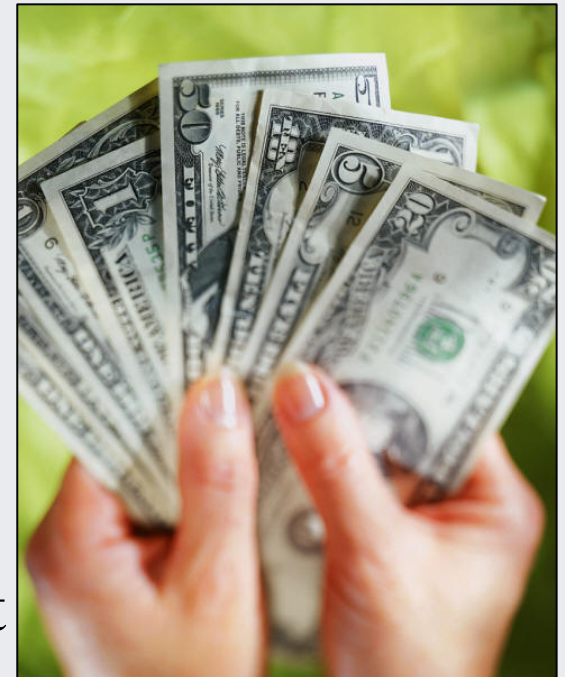
- It takes time to make a great poster
- Allow yourself 2 - 3 days to design and create your poster
- Last bits of data you rush around to get at the last moment will go completely unnoticed if your poster is messy and disorganized



Time and Money

Costs

- Poster printing costs at the Kelvin Smith Library (KSL) for gloss or semi-gloss poster paper
 - < 42” in length = \$25
 - 43-48” in length = \$35
 - 49-56” in length = \$45
 - 57-68” in length = \$60
- You may be charged \$70 or more if you print it elsewhere
- Check to see if your department is covering the printing cost



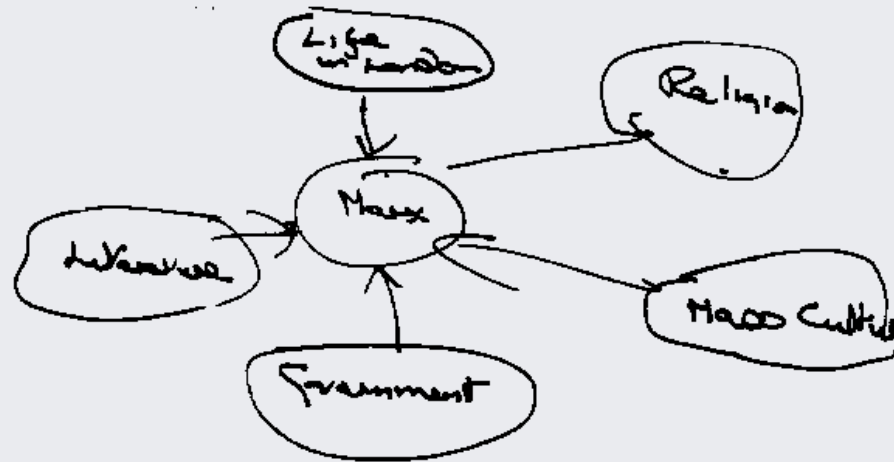
Getting Started



Getting Started

Decide what the Main Message is (*punchline*)

- Keep it short and sweet and make this your title!
- Your poster should cover the key points of your work



- Make your poster as self-explanatory as possible
- **Do not attempt to include all the details!**

Getting Started

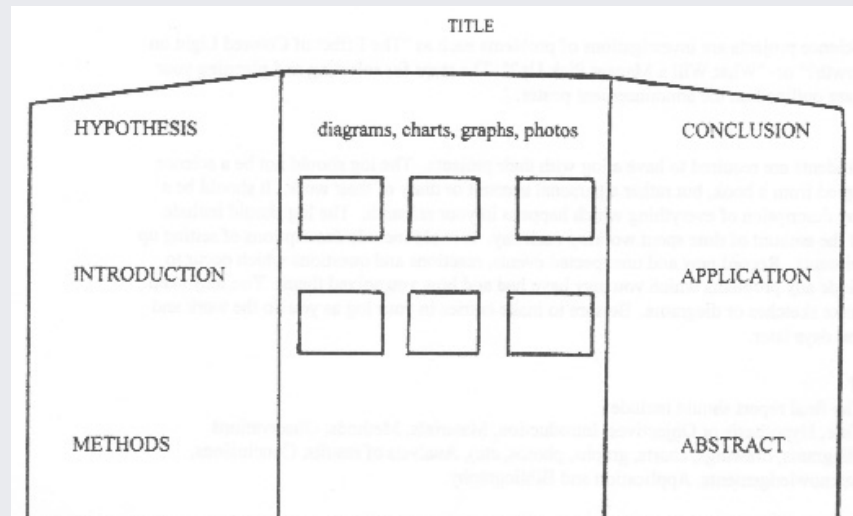
Capture your Audience

- Do not overwhelm the reader with text!
- Main points must come through clearly
- If a detailed explanation is required, prepare a handout of this information
- Include less text, and more graphs, charts and images

Getting Started

Lay out your Images Crudely

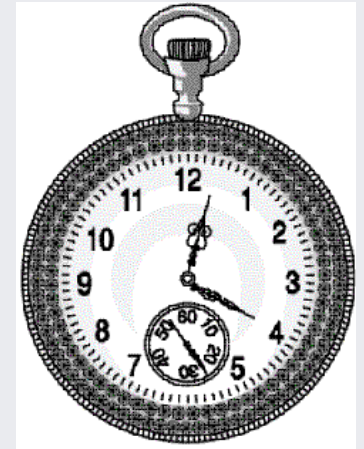
- Before spending time making the final elements of the poster, take pieces of paper that are about the right size and see if you can actually make it all fit physically



Getting Started

ELIMINATE all Extraneous Material

- The average poster gazer spends less than 10 minutes on your work
- You have 10 seconds to trap the viewer before they move on
- Only show data that adds to your central message
- When in doubt, edit out – crowded cluttered posters are difficult and tiring to read



Getting Started

What you DO Need

- Title
- Principal investigators name
- Other authors if applicable and affiliation of each
- Department and school name, addresses of school and other institutions

Additional Items

- Abstract, introduction, materials & methods, results, discussion, conclusion, future directions, references, acknowledgements, logos

Disruption of *NTPHAN* function in antisense transgenics produces ectopic leaf blades and hyperelongation of the leaf petiole in *Nicotiana sylvestris*.
 Neil A. McHale¹, Ross Koning², and Hsu-Liang Hsieh¹. 1. The Connecticut Agricultural Experiment Station, New Haven, CT 06504, and 2. Eastern Connecticut State University, Willimantic, CT 06226

1. INTRODUCTION
NTPHAN proteins are transmembrane proteins with DNA-binding domains structurally and functionally related to mammalian transcription factors. The *NTPHAN* domain consists of 2 or 3 imperfect repeats of 56 amino acids located at the N-terminus.

There are relatively few *NTPHAN* genes in animals, but plant *NTPHAN* genes are a very large gene family comprising a range of diverse functions.

Virtually all plant *NTPHAN* have the R2, R3 domain, indicating that this gene family emerged prior to vascular divergence within the Angiosperms. The gene family has expanded dramatically in a number of angiosperm species with particular expansion in the *PHARADISICA* clade.

PHARADISICA is a *NTPHAN* protein involved in leaf development and regulation of leaf function in the above ground portion. Loss of function mutations in *Arabidopsis thaliana* *NTPHAN* genes, but not in other species in the *PHARADISICA* clade, result in a leaf blade phenotype. To determine the genes with leaf blade function in *Nicotiana*, we cloned the orthologous *NTPHAN* and generated a series of antisense *NTPHAN* transgenics.

2. ANTISENSE PHENOTYPES
 1. Although *PHAN1* (*NTPHAN*) appeared to be essential for leaf development in *Arabidopsis*, this is not the case in *Nicotiana*. Antisense *NTPHAN* genes are highly abundant, but they did not affect developmentally at all stages of development.

2. Recently we have been observing that the main petiole phenotype in *NTPHAN* transgenics was in the above ground portion of the plant. This phenotype was observed in the stem, beginning in the region where basal cotyledons emerged and proceeded to the leaf development of basal cotyledons and eventually reaching that of the primary leaf.

3. In contrast, while transgenics have not produced a highly elevated level of cotyledon development, they did show a reduction in the number of cotyledons. The vascular cylinder in a stem is characterized by the presence of all vascular tissues, but the presence of all vascular tissues does not guarantee that all vascular tissues are present and functional.

4. In wild-type plants, cotyledon cells are progressively higher position in the stem are more vertically oriented and proliferate in the petiole. This pattern of cell division is essential for the normal development of the leaf blade.

5. THE ENIGMA CONNECTION
 Gene expression studies in mutants of *Arabidopsis* suggest that *PHAN* functions as a negative transcriptional regulator of *PHAN* genes. Since *PHAN* and its orthologous *NTPHAN* are expressed ectopically in developing leaves, the ectopic expression of transgenics might be down-regulating *PHAN* genes in the stem. The *NTPHAN* family (*Nicotiana glauca* homologues), with particular abundance in *NTPHAN* clade, are the members most similar to transgenics *NTPHAN* and *NTPHAN*, respectively.

6. CONCLUSION
NTPHAN is expressed at all stages of leaf development in *Nicotiana*, and genes are expressed in the stem. Loss of this function produces a stem phenotype of growth in leaf base which is similar to the stem phenotype of *PHAN* mutants. Although *PHAN* is expressed in the stem, the *NTPHAN* family (*Nicotiana glauca* homologues) is expressed in the stem. The *NTPHAN* family (*Nicotiana glauca* homologues), with particular abundance in *NTPHAN* clade, are the members most similar to transgenics *NTPHAN* and *NTPHAN*, respectively.

7. SEQUENCE HOMOLOGY
 The *NTPHAN* domain consists of 2 or 3 imperfect repeats of 56 amino acids located at the N-terminus. The *NTPHAN* domain is highly conserved among species in the *PHARADISICA* clade.

8. TRANSGENIC CONSTRUCTION
 The 5' UTR was cloned as a BamHI fragment in a vector construct in the 3' UTR promoter in pT19.

9. ADULT LEAF GROWTH
 The leaf blade phenotype in *NTPHAN* transgenics was observed in the stem, beginning in the region where basal cotyledons emerged and proceeded to the leaf development of basal cotyledons and eventually reaching that of the primary leaf.

10. GENE EXPRESSION
 An RT-PCR analysis was employed to examine patterns of gene expression. *NTPHAN* was highly expressed in leaves at all stages of development. *NTPHAN* was expressed constitutively in all wild-type samples, and control at a control level.

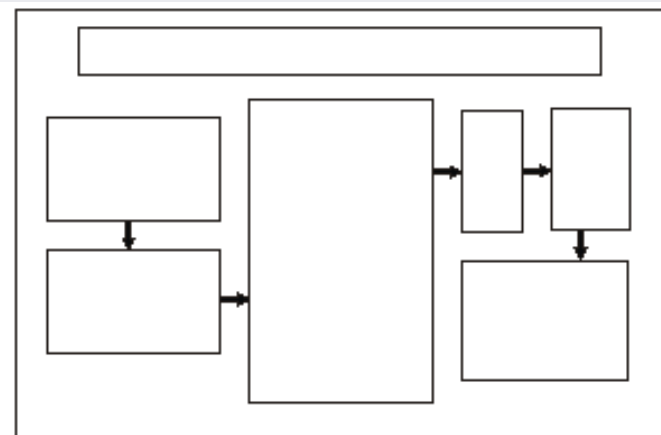
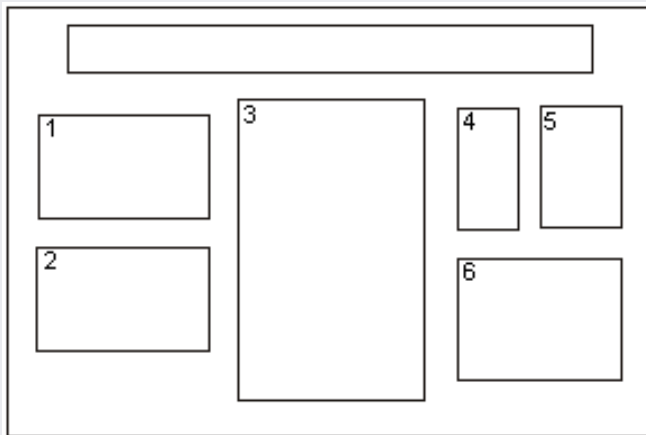
11. GENETIC ANALYSIS
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Poster Layout

Arranging Poster Elements and Text

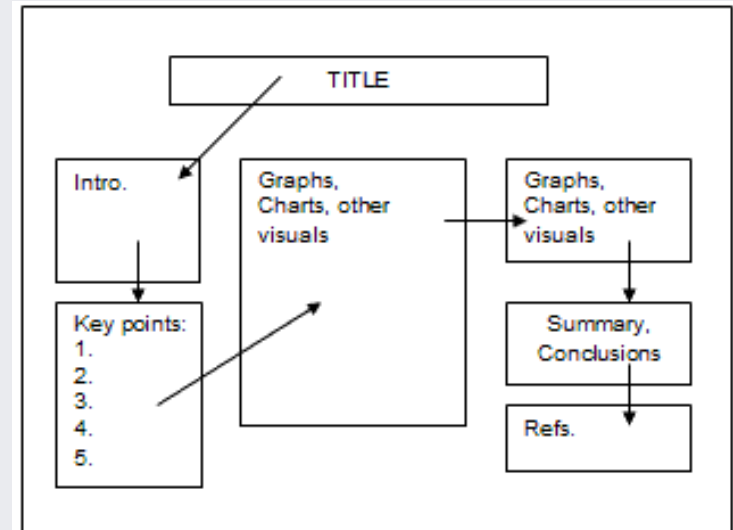
- People approach new information in a known spatial sequence: we track vertically from center to top to bottom, and horizontally from left to right



Poster Layout

Arranging Poster Elements and Text

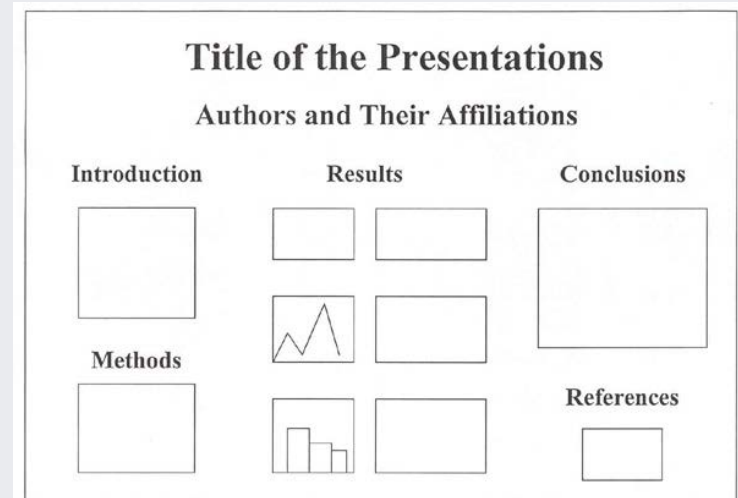
- Put the most important message in the center top position followed by the top left, and finish in the bottom right corner
- The poster title should be your punchline because, in that position, the title and your name will be seen in the first 11 seconds that a person looks at the poster



Poster Layout

Arranging Poster Elements and Text

- A poster layout in *columns* is most common.
- Arrange the contents into 3, 4, or 5 columns to facilitate the flow of traffic past the poster
- Organize the material into sections (Introduction, Methods, Data/Results, Conclusions, etc.)
- Use blank space to highlight or offset information



Poster Layout

Space is Important

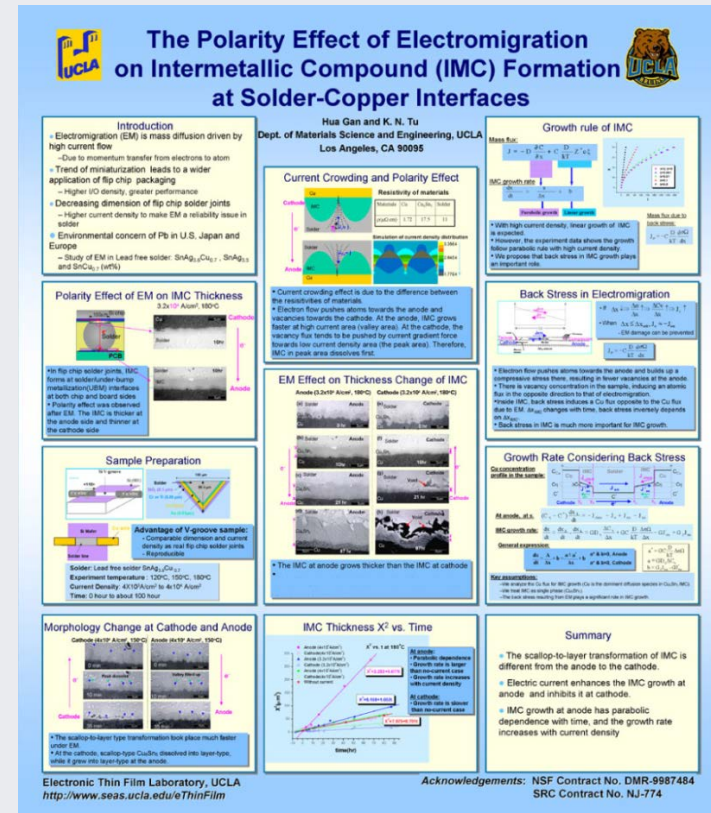
- Without space, your reader has no visual pauses to think
- Omit all extraneous text or visual distractions, including borders between related data and text, so the reader can assimilate your ideas easily
- Leave at least a 1/2 inch margin around all edges of your poster



Poster Layout

Size is Important

- Size of poster elements or the fonts in each element can serve to emphasize the main points
- Making your subheadings in all capitals and two font sizes larger than the rest of the text on the same panel will draw the reader's eye first, and so be emphasized



Font Choice

Font

- Choose a basic font whose "e's" and "a's" stay open at all sizes and that is supported by your printer
 - **Arial, Bookman, Helvetica,** and Tahoma are good choices
- Avoid use of multiple fonts which can be distracting



Font Choice

Size

- Font sizes need to be big to be effective
- You should be able to easily read it from 4-6 feet away
- Test this by viewing a portion of your poster on your computer
 - Zoom in to 100%
 - Step back from your monitor to see if you can still read it

Size:	Arial:	Times New Roman:
1	Font	Font
2	Font	Font
3	Font	Font
4	Font	Font
5	Font	Font
6	Font	Font
7	Font	Font

Font Choice

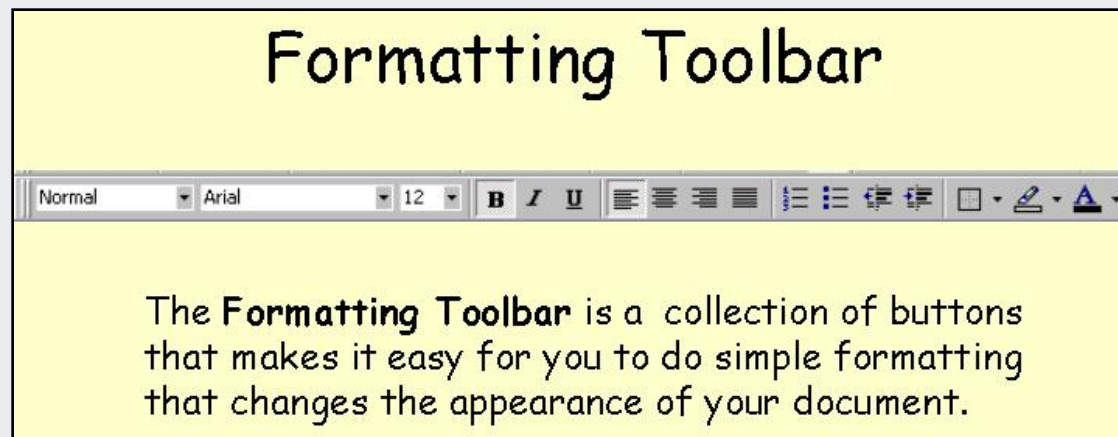
Size

- Recommended **Minimum** Font Sizes
 - Title: 60 point bold
 - Researchers and affiliations: 48 point
 - Section headings: color of your choice, 30 point bold
 - Text: black, 24 point
 - Figure, graph and table captions: black, 20 point
 - References and acknowledgements: black, 20 point
 - Photo/image credit: black, 14 point

Formatting

Format

- DO NOT use single spacing!
- Indents set text apart and are great for short lists
- Justify text
- Use short sentences, simple words and bullets to illustrate discrete points



Images, Graphs, and Tables

Images

- The same or more space on the poster should be taken up by images or graphs than by text
- A good rule of thumb is 30% text, 40% graphics 30% empty space

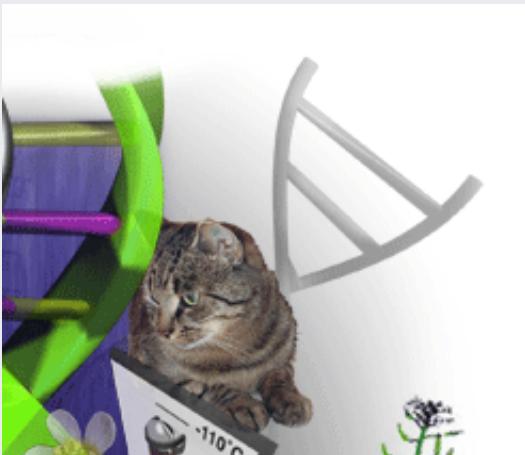


Figure 1. Feline DNA

- Use of color in your graphics will enhance your poster
- Don't forget to include explanatory captions on your poster

Images, Graphs, and Tables

Images

- Photos and drawings should be of sufficient size to be visible from a distance
- 4" x 5" photos are a good size
- Drawings are best if at least 8" x 10"
- Place related materials (e.g. photo with accompanying text) close together, then offset it by surrounding it with blank space

Images, Graphs, and Tables

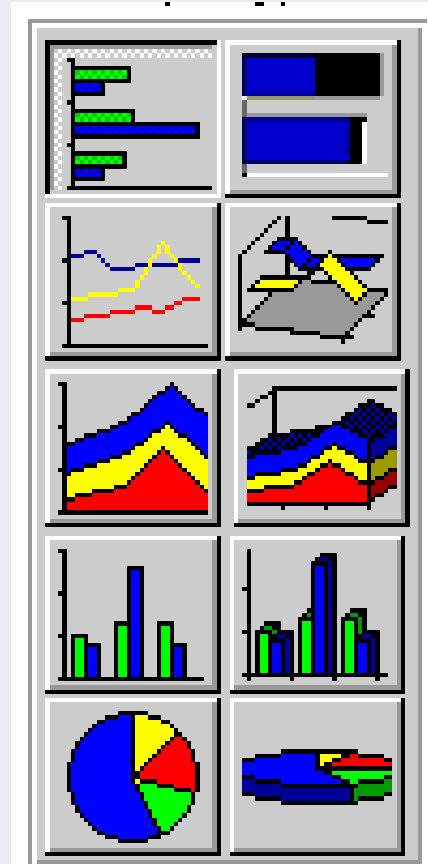
Images

- Your images should have a resolution of at least 300dpi (dots per inch) at the size they will be ultimately printed on your poster
- Save them as either JPEG (or JPG), or TIF files
- Avoid using BMP & GIF files
- In PowerPoint go to the **Insert**, then **Picture**, then find your image
- You can adjust both the size and position of your image in PowerPoint
- Use borders about 1/2 inches all around each figure

Images, Graphs, and Tables

Graphs

- When importing graphs from Excel or other software, copy the graph then go to the **Home** menu, **Paste Special**, as **Picture (Enhanced Metafile)**
- Avoid complex graphs and tables with excessive numbers
- Use colors to distinguish different data groups in graphs
- Avoid using patterns



Images, Graphs, and Tables

Tables

- If you do use a table on your poster, it should be very compact
- Use a table only if it would support your story more efficiently than a graph

Table 4: Installed R_{peak}

TOP500 Statistics — Installed R_{peak} [Gflop/s]					
	USA/Canada	Europe	Japan	others	Total
SGI	18895	6885.8	625.6	277.2	26683
IBM	9563.8	3756.3	258.1	57.0	13635
Sun	2628.1	787.1	234.4	177.0	3826.6
Hewlett-Packard	1745.5	496.5		46.1	2288.0
Fujitsu	48.4	620.8	1370.6	28.6	2068.4
NEC	256.0	248.0	842.0	64.0	1410.0
Hitachi		77.0	3200.0		3277.0
others	4244.8	137.6	125.1		4507.5
Total	37381	13009	6655.7	649.8	57696

Mannheim/Tennessee June 10, 1999

Add Color

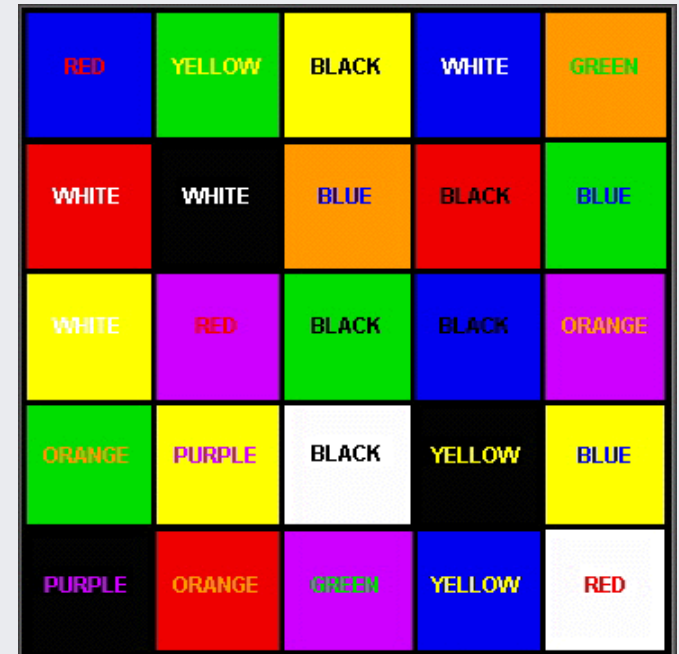
Color & Contrast

- Proper color contrast will reduce eye strain and make the poster more legible and interesting visually
- Be careful that the color does not outclass the visual impact of your data
 - Too much contrast is hard on the eyes and can distract the reader from your data
- Use color for highlighting and to make your poster more attractive

Add Color

Color & Contrast

- Do not go overboard with color
- Avoid patterns or motifs
- Dark background colors are ok, but KSL will charge an additional fee
 - \$5 42” or shorter
 - \$10 over 42” long



Add Color

Reproduction

- Images do not stay the same between one medium and the next and this is especially true for color quality
- The colors you see on your monitor are usually not *exactly* what comes out on the final, printed poster

Save your Poster

Saving

- Save the poster as a PowerPoint Presentation or .pdf only!
- Other save options (.gif, .jpg) will reduce the quality of your poster

Before You Print

Final Check

- Have some people look over your poster before you print
 - Research advisor
 - Peers
 - Friends & family
- If they are confused, it is far better to fix it now than to lose people at the poster session
- Pay particular attention to things that may not be necessary: eliminate everything that you can!



Before You Print

Test Print

- Print your poster on regular letter paper to proof read it
- Go to the **Print** option. In the pop-up window, select the **Scale to fit paper** box, and set the paper size to **letter (8.5x11in.)** and **landscape** mode
- Do NOT change any of the other settings!
- After printing, you can tell that the font sizes are right if you can still read the text

Printing

KSL

- If you decide to print your poster at KSL, you can either make an appointment or use the drop-off service (48-hr turnaround)
- Make your appointment early!
 - if you miss or are more than 10 minutes late you will be assessed a \$5 charge
 - you can reschedule, space permitting
 - Website:

<http://library.case.edu/ksl/services/libraryservices/poster/>

Printing

KSL

- For your printing session/drop-off, bring it with you on a USB drive, or you may retrieve it from your own e-mail
- Bring cash, check, or Case-cash to cover the cost of the print supplies for your poster *or* a University account number (SpeedType) if your department is paying for it

Printing

- Try to keep your poster file size under 10 MB. If you go over 10 MB you will increase your chances of running into errors printing or it will take a loooooong time to print.
- Image size is what will make a poster file too large to print. Too large files often are related to images that were imported at much too high resolution
- It will usually take between 10 and 20 minutes to print out your poster
 - Print time depends on poster dimensions, file size, and amount of elements on your poster

Printing

Student Activities & Leadership

- Plain paper color poster printing can also be done in **Student Activities and Leadership**.
- They require a one day notice. Information can be found online

<http://studentaffairs.case.edu/activities/services/poster.html>

Printing

Campus Printing Services

- High quality poster printing can also be done at **Campus Printing Services**.
- They require a two day notice. Information can be found online

<http://www.case.edu/finadmin/auxserv/printsrv/poster.html>

Poster Session

Brief Presentation

- You may wish to prepare a short presentation of about 3-5 minutes that you can periodically give to those assembled around your poster

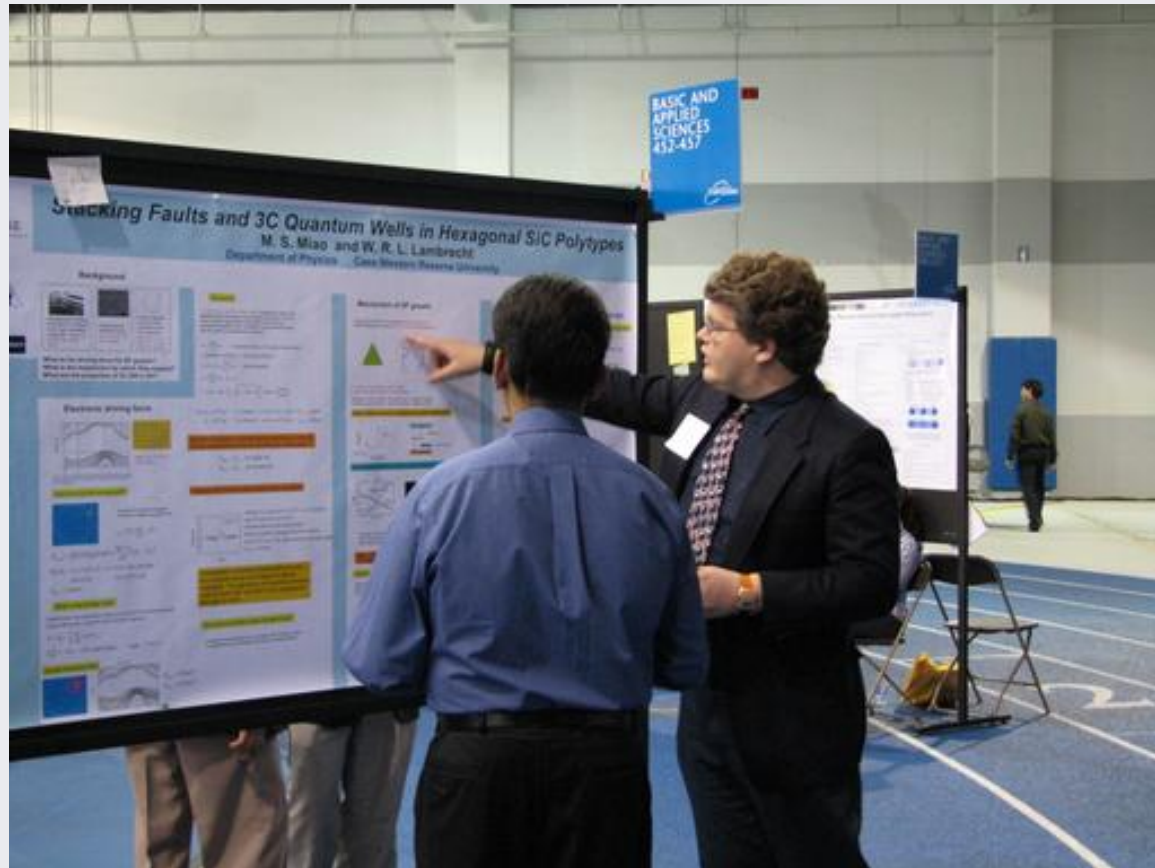


Poster Session

Have Fun!

- Good luck and have fun making your poster and showing it
- Displaying your finished work is a big accomplishment so take time to enjoy it and your interactions at the poster session
- Be on time and enthusiastic about showing your poster – this is your chance to advertise yourself and your work!

Poster Session



Thank You!