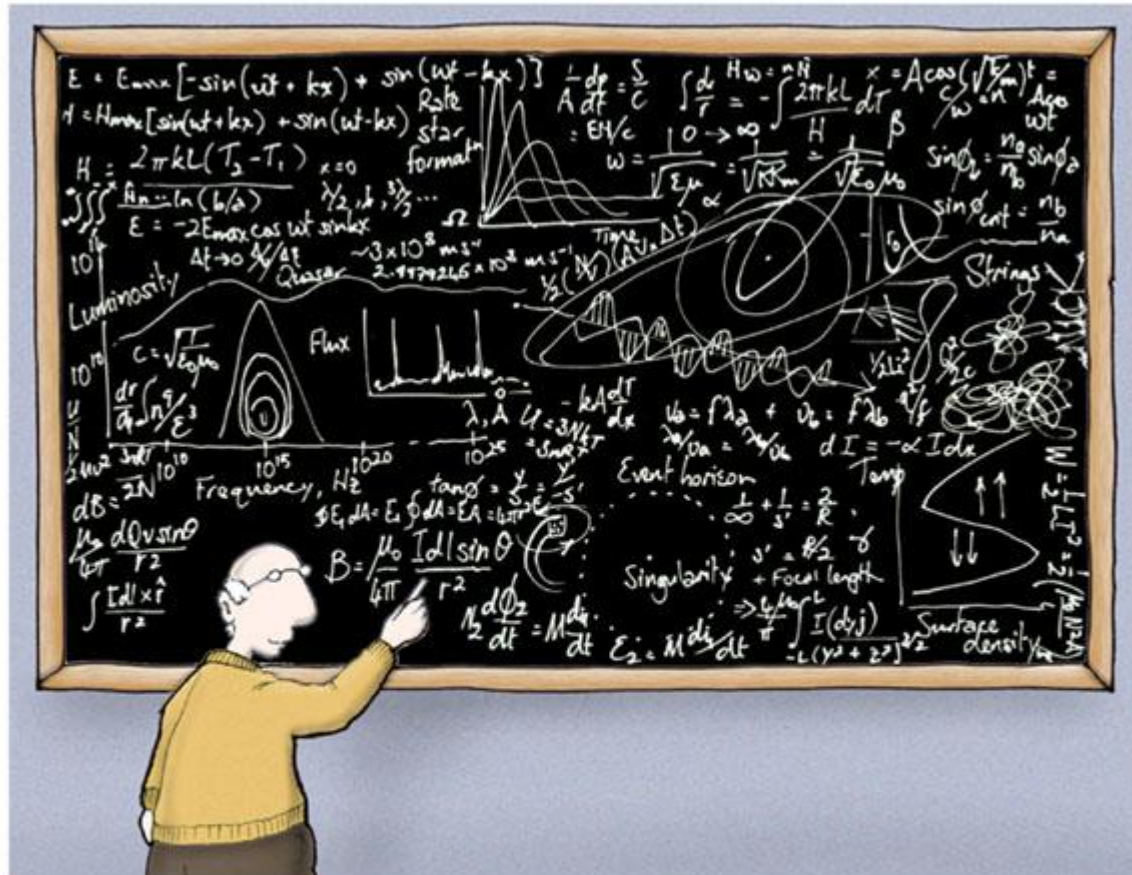


Persuasive Communication in Science



Astrophysics made simple

Why Have A Course on Science Communications?

Whatever else you might do in your career, you will almost certainly be writing/presenting extensively!

Typical writing projects you'll likely have in your careers

- journal articles
- research proposals
- technical reports
- recommendation and nomination letters
- referee reports and personnel evaluations
- seminar talks and lecture notes
- prelims, theses, etc., etc.

To be clear and persuasive, most of your writing will have to be aimed at an audience unfamiliar with the research or projects you describe

Why is Persuasive Communication Important in Science?

Communicating your scientific results is not just about having good data or completing a significant calculation (although these are critical also!): you must also have a **compelling story** to tell and present your results and support your conclusions both **logically** and **clearly**!

Paper is more than a record of things done

Writing process helps to:

- organize thoughts & data *while* research is going on
- conduct experiments & calculations
- plan research in progress



Whitesides' Group: Writing a paper
Adv. Mater. **16**, 1375 (2004)

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The more inexpert your audience, the more important it will be for you to write/present your results clearly and logically!

Persuasive scientific writing (as defined in this course) is:

- compelling (tell a story to keep your audience's attention)
- logically structured and supported with evidence (so your conclusions are defensible to a highly critical audience)
- clearly and succinctly expressed (so the reader can understand your arguments and ideas without getting lost)

Key Steps to Writing an Accessible Paper

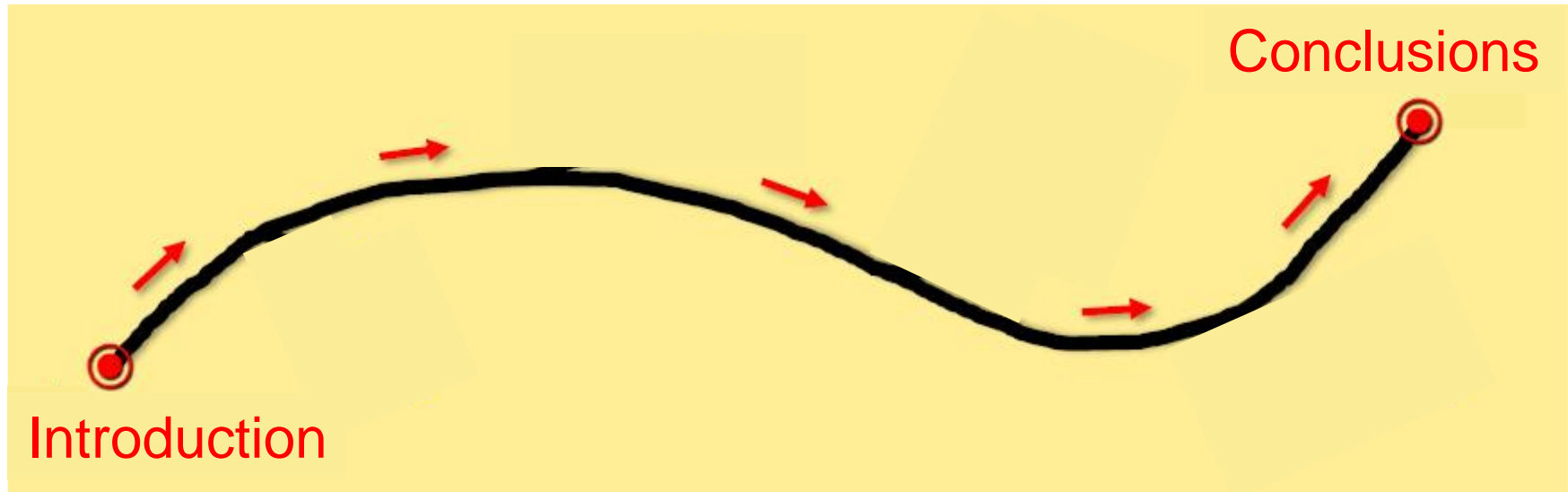
- (1). Identify and **write for** your audience (e.g., expert, general, etc.) – this will govern the level of the presentation, i.e., the words you use, the number of topics you cover, the figures and results you present
- (2). Tell a coherent and concise “story” that presents your motivation, results, and conclusions – **sketch out an abstract and introduction**
- (3). Sketch out a logical and concise outline for presenting the “story” of your scientific results – **create an outline and use a paragraph structure!**
- (4). Write simply and concisely, following the outline of your “story”, **avoiding disruptions** to the flow of your narrative

Accessible Papers Avoid Disruptions to the Narrative Flow

Logical Organization: An accessible scientific paper *clearly and logically connects* your introduction to your conclusions without disruptions to the narrative flow of your paper!

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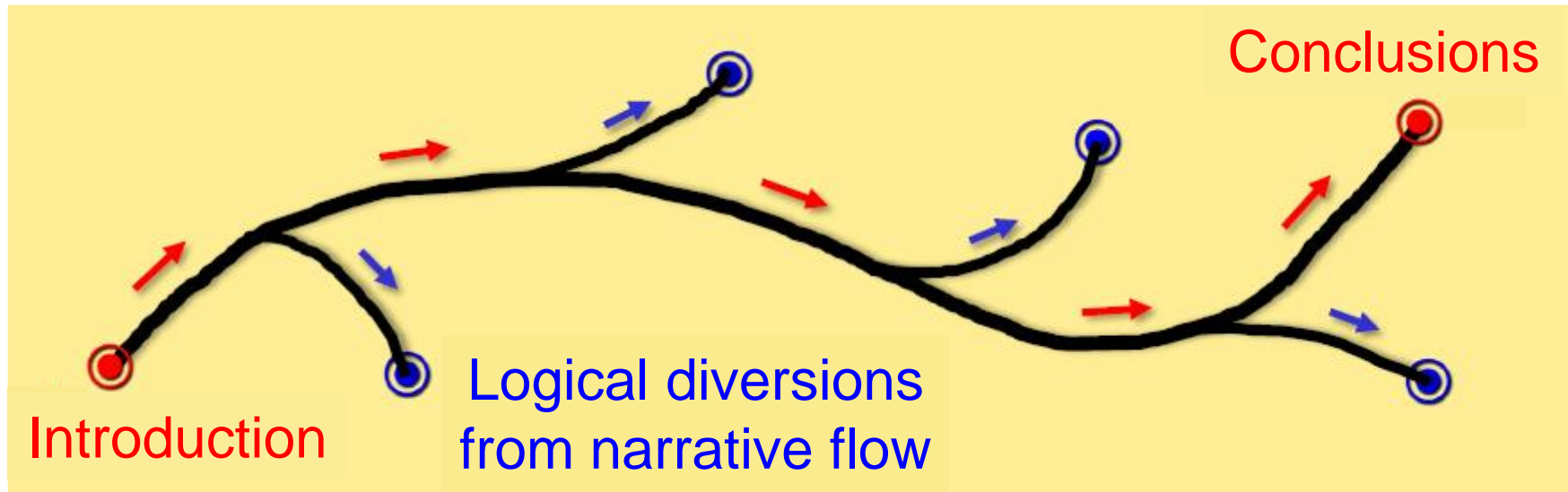
Editor Saad Hebboul:

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Avoiding Disruptions That Limit Accessible Writing: Create Logical Structure With Outlines

Make a habit of creating an outline and a clear paragraph structure for all your scientific papers and presentations!

“I emphasize the central place of an outline in writing papers, preparing seminars, and planning research. An outline is a written plan of the organization of a paper, including the data on which it rests. You should, in fact, think of an outline as a carefully organized and presented set of data, objectives, hypotheses, and conclusions, rather than an outline of text.”



Whitesides' Group: Writing a paper
Adv. Mater. **16**, 1375 (2004)

Building a Logical Structure: Topic Outlines

To create a logical structure in your scientific writing and presentations, create an outline!!

Example of basic (Level 1) structure of scientific **topic** outline:

I. Introduction (Get the reader's/viewers attention; states key idea(s) or thesis; provides essential background)

II. Procedures (Provides background on key experimental/theoretical methods)

III. Results (Presents key results that support ideas discussed in Introduction)

IV. Discussion (Interprets results; Discusses results in the context of prevailing models)

V. Summary and Conclusions (Reemphasizes key results and how they support thesis; Discusses new directions)

Building a Logical Structure: Topic Outlines

Example of a more detailed (Level 2) structure of scientific **topic** outline:

I. Introduction

- A. Attention-grabbing, “big picture” statement of issue
- B. Key previous results leading to state of the field
- C. Unaddressed problems
- D. Preview of key points of talk/paper

II. Procedures

- A. Experimental methods
- B. Theoretical methods
- C. Data processing
- D. Error analysis

III. Results

- A. Key results 1
- B. Key results 2
- C. Key results 3

Provides more details of internal organization of each section

Building a Logical Structure: Topic Outlines

Example of a more detailed (Level 2) structure of scientific **topic** outline (cont.):

IV. Discussion

- A. Interpretation of results
- B. Comparison with key models/previous results
- C. Possible sources of errors

V. Summary and Conclusions

- A. Reemphasis of key results
- B. Summary of key conclusions
- C. Possible future directions
- D. Exciting closing statement

Provides more details of internal organization of each section

Building a Logical Structure: Topic Outlines

Example of an even more detailed (Level 3) structure of scientific **topic** outline:

I. Introduction

- A. Attention-grabbing, “big picture” statement of issue
 - i. Interesting diagram to show
 - ii. Interesting quote to give
- B. Key previous results leading to state of the field
 - i. Specific papers that will be referenced
 - ii. Previous ideas that will be emphasized
- C. Unaddressed problems
- D. Preview of key points of talk/paper

II. Procedures

- A. Experimental methods
 - i. Experimental diagram to show
 - ii. Procedural flow chart #1
- B. Theoretical methods
- C. Data processing
 - i. Flow chart describing data analysis
- D. Error analysis

Provides specific details figures, quotes, references, sentences, etc. to support section

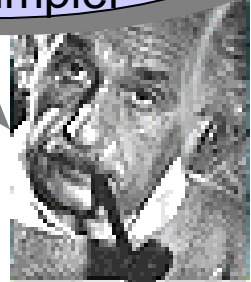
Building a Logical Structure: Topic Outlines

Make a habit of creating an outline for all your scientific papers and presentations!

Benefits of outlining:

- (1). Your papers and presentations will be logically organized from the beginning
- (2). Outlining forces you to identify the key points you want to make, and helps you avoid including extraneous information that will distract the reader from the logical flow of your argument: ***always write simply!***
- (3). Outlines allow you to break up large projects into more manageable chunks that you can tackle (e.g., **your thesis, a big review article, etc.**)
- (4). Outlines allow you to easily expand or contract material to different length presentations or papers

Everything should be made as simple as possible, but not simpler



Use a Sentence Outline to Create a Paragraph Structure

A “sentence outline” uses complete sentences to express key ideas and the logical progression of your paper that can be the topic sentences of your paragraphs

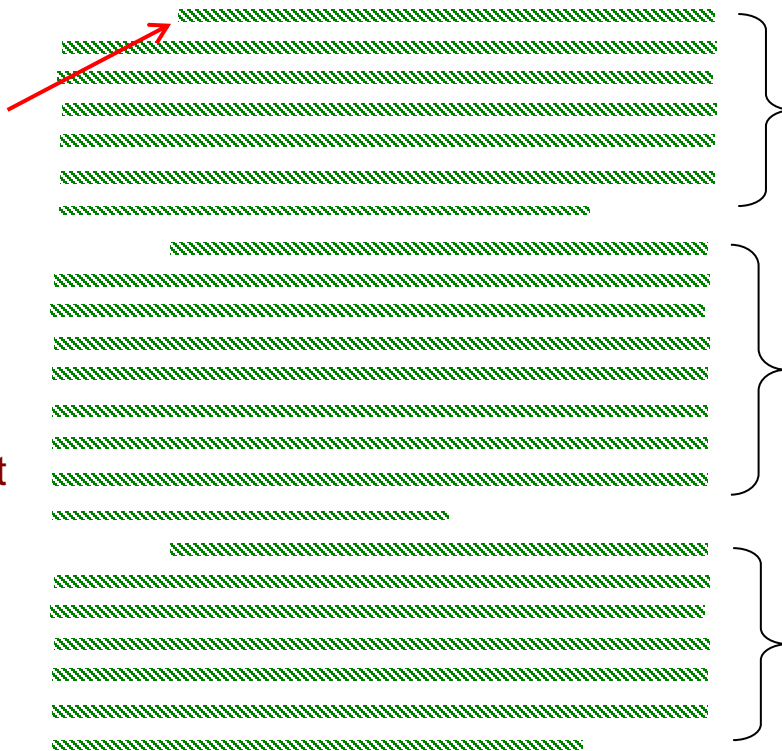
Basic rules of the sentence outline (e.g., see <https://www.examples.com/education/sentence-outline.html> for examples):

1. Expand your outline “bullets” into complete sentences
2. Each sentence in the outline becomes the topic sentence that conveys the main idea of a paragraph (next slide)
3. Sentences should be as specific as possible (i.e., convey one idea)
4. The sentences should be organized to construct a clear logical argument supporting your conclusions, i.e., should follow your organized outline

Avoiding Disruptions in Clear, Logical Narrative Flow: Create a Clear Paragraph Structure

Every paragraph should contain roughly one idea + supporting evidence for that idea, if possible (see <http://people.physics.illinois.edu/Celia/Lectures/Paragraphs.pdf>)

The first sentence in each paragraph is usually the main idea, i.e., the “topic sentence”, while the body of the paragraph supports that idea, then transitions to the next paragraph.



paragraph 1

Idea 1, supporting examples/references, logical transition to next idea

paragraph 2

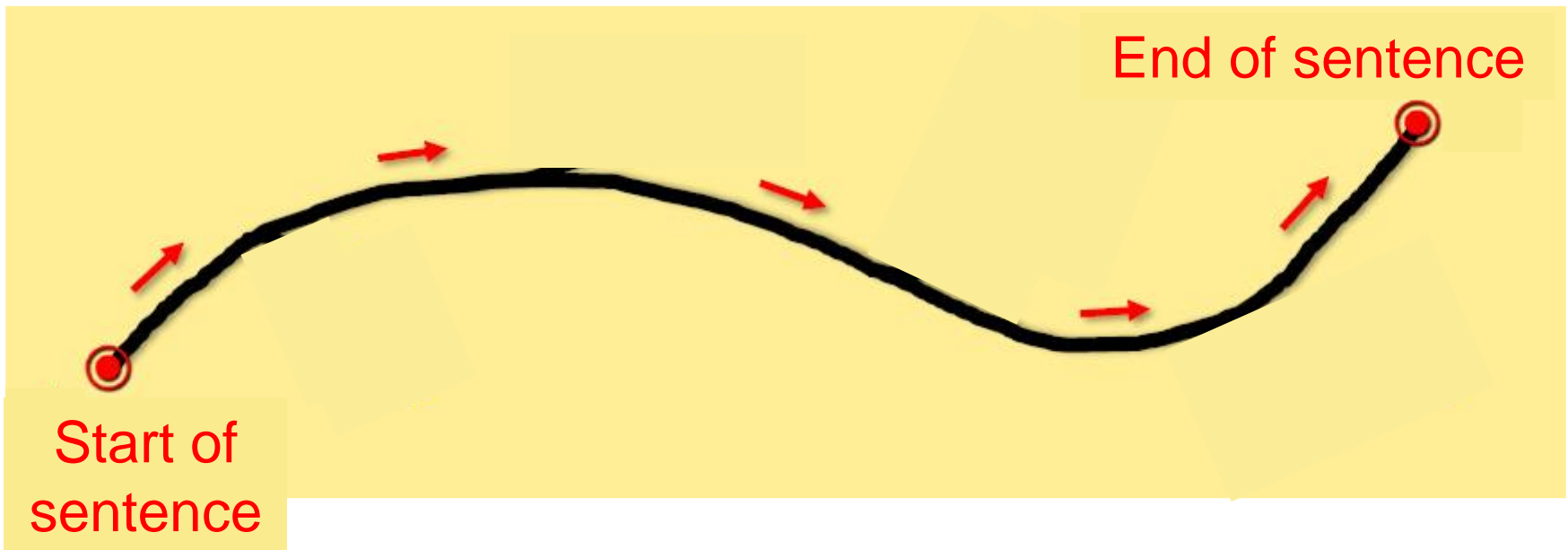
Idea 2, supporting examples/references, logical transition to next idea

etc., etc.

Upcoming: Avoiding Common Disruptions That Limit the Accessibility of Scientific Writing

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