Ay31 - Class #2

How to Construct an Outline

Structure of Scientific Papers

The Astronomical Literature

Astronomical Databases

Assignments

- Due noon today: 1. Format 2. Topic 3. Mentor
- Received from: AR, MF, BC1, BC2, JM, AR, MW, AZ, LF, AH, EC, CD
- Responses sent by email
- Due next Friday (by email): Outline for your piece
- Signup for one-on-one meetings in week 4 — signup to be distributed by email

Working with Mentors

- Ask them for **references to review or introductory articles on your topic**. Read these papers and take notes to prepare for your outline.

- Work with them (or ask them) for **3 example pieces in the same format**. The examples should be on different topics from the one that you are writing.

An Outline — Assignment

- Purpose of an outline: to provide structure to help you move to a first draft. Most *efficient* way to write papers.
- Work with your mentor to find 3 examples of similar pieces. (You will probably find most of them.) Read/skim the examples and study the structure. Note for yourself (don't turn in): what are the common elements and structure?
- Choose a target journal or telescope. Look up the 'Instructions for Authors', 'Call for Proposals', etc. Read it thoroughly. Your outline should reflect the requirements for your piece. Include a link to the instructions in with your outline.
- Outline should contain:
  1. Provisional, descriptive title
  2. Description (few sentences) of primary audience and possible secondary audience.
  3. Structure of the piece — list the major sections and ideas for their contents, in skeletal form (details on next slide).
  4. Some details and sentences interspersed.
- See, e.g. Alley pp. 239-241 and
  'Writing a Paper' (course website, by G. Whitesides).

Structure of an Outline

(for a research paper)

- **Introduction**
  - Write first few sentences and possibly first paragraph. Should clearly state objectives and indicate importance.
  - Elements
    * Objectives of work
    * Justification for objectives. Why is the work important?
    * Background. Who else has done what?
    * Guidance to the reader. What should the reader watch for in the paper? What are the high points?
    * Summary/conclusion. What should the reader expect as a conclusion?

- **Analysis, Results, and Discussion**
  - Results and discussion are sometimes combined; look for examples
  - Organize subsections according to major topics (depends on research)
  - Make subsection headings as descriptive and specific as possible
  - Emphasize structure here (little text), but include subsection headings figures, tables, equations, diagrams.

- **Conclusions**
  - Summarize the conclusions with short phrases or sentences
  - Conclusion ≠ summary
  - Add new, higher level of analysis, and state significance of work.

Constraints

- Audience
  - who will read the document?
  - what do they know about the subject?
  - why will they read the document?
  - how will they read the document?

Break: with partners
discuss Audience for your piece

- Format
  - includes how type is arranged on page, pages are numbered, sources are referenced, length of document.
  - formats vary widely based on journal, proposal call, etc.
- Mechanics
  - rules of grammar and punctuation
  - important to get right to not distract from your piece
  - consult reference books and style guides
- Politics
  - stay honest, but know sensitivities of your audience
  - be astute in what you include and exclude, and how arguments are formed

Stylistic Tools

Style: The way you cast your thoughts into words and images.

<u>Elements of Style</u>

1. **Structure**
   - strategy of a scientific document
- defines sections and flow of ideas
- most important element of style
- templates are helpful, but don't be bound by them
      Questions if you want to break a style convention:
         <u>Is your style effective</u> and communication / persuasion?
         Is it distracting?

From Alley (Ch. 1)

Stylistic Tools

Elements of Style

2. **Language**
   - the way words are used
   - includes arrangement of words into phrases and sentences,
     the use of numbers, equations, abbreviations, examples/analogies
   - Precision: Say what you mean. Be clear. Be forthright.
   - Concise: Every word counts. Fluid writing is smooth writing —
     transitions from sentence to sentence, section to section, etc.

Six Goals of Language in Scientific Writing

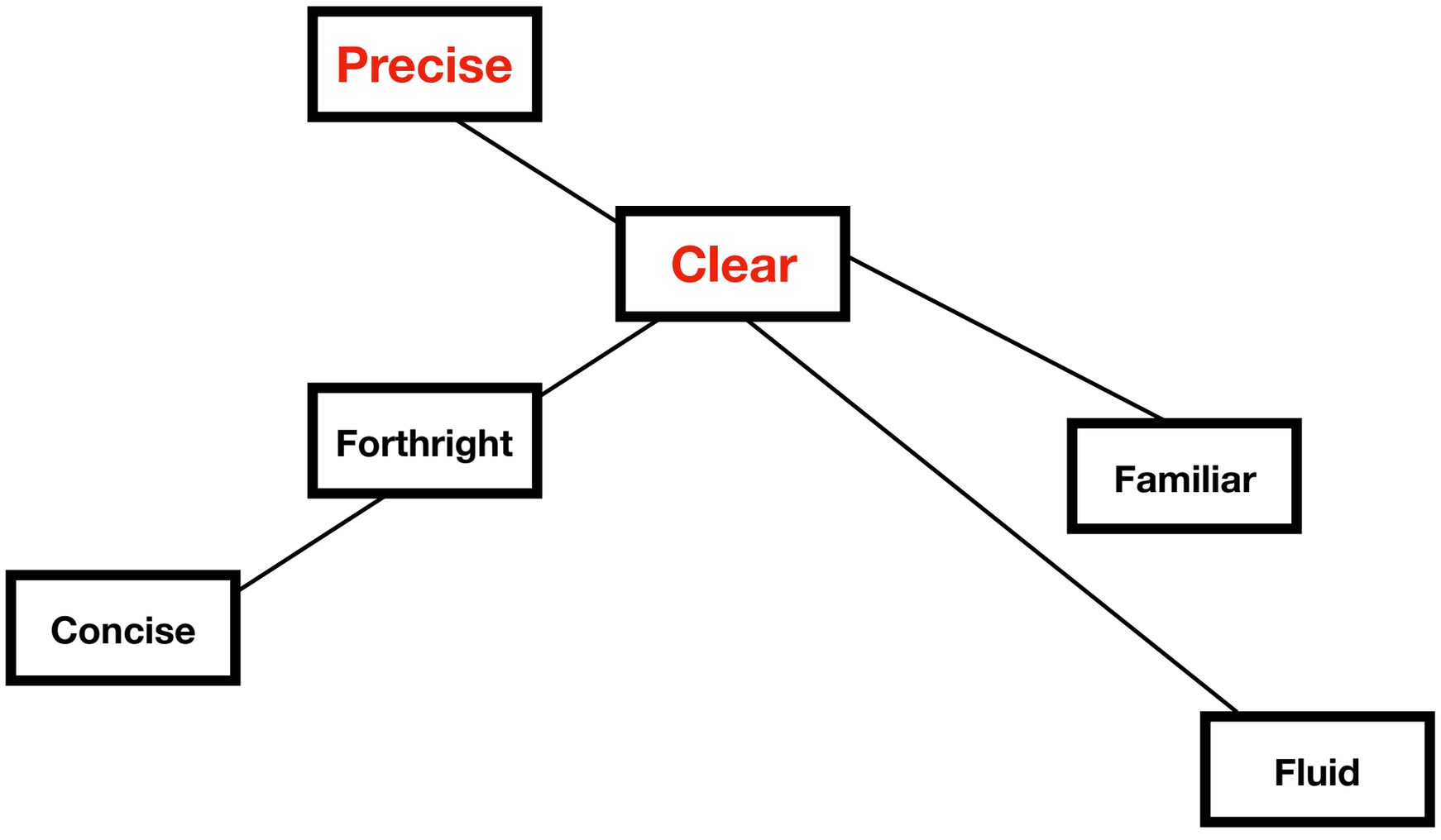

Figure 1-1 (Alley)

Stylistic Tools

Elements of Style

3. **Illustration**
   - Effective figures and tables in document
   - meshing of figures/tables with language
   - makes reading *and* writing more efficient

The Astronomical Literature

- <u>Prestigious Journals covering science broadly:</u>
  Science
  Nature
  Proceedings of the National Academy of Science
- <u>Astronomy Journals:</u>
  AAS Journals (*AJ*, *ApJ*, *ApJL*, *ApJS*)
  Astronomy & Astrophysics (A&A)
  Monthly Notices of the Royal Astronomical Society (MNRAS)
  Proceedings of the Astronomical Society of the Pacific (PASP)
  SPIE (instrumentation primarily)
  …
- <u>New Astronomy Journals:</u>
  Nature Astronomy
  Journal of Astronomical Telescopes, Instruments, and System (JATIS)
  …

The Astronomical Literature

How to find papers:

- Use NASA / ADS = Astronomical Data Service !! https://ui.adsabs.harvard.edu/
- Google Scholar — https://scholar.google.com/
- arXiv — https://arxiv.org/

How to use ADS:

- Find specific papers: search by author, first author, year, keywords, etc.
- Find papers on topic: search by keyword
- Sort by citations, read counts, date, etc.
- Cite articles using bibtex
- Use SIMBAD (next topic) to find articles about specific object

Astronomical Databases

Common Features:

- Properties or astronomical objects *or* observations
- Organized by object or observation
- Searchable

Purposes:

- Provide detailed information about specific objects or observations.
- Maintain a “complete” repository of objects of a particular type, for object discovery and statistical analysis

Astronomical Databases

General:

- Stars: SIMBAD (http://simbad.u-strasbg.fr/simbad/) (*)
- Galaxies: NED (http://ned.ipac.caltech.edu/) (*)
- Exoplanets: exoplanets.org & Exoplanet Archive
- NASA Missions: MAST (https://archive.stsci.edu/) (*)

Specialized:

- Keck Observatory Archive: KOA (https://www2.keck.hawaii.edu/koa/public/koa.php)
- Gaia Mission: (https://gea.esac.esa.int/archive/)

Structure of Scientific Papers

Break into small groups, skim Howard et al. (2011) and answer these questions:

- Identify (by highlighting or circling) the major parts of the paper: Title, abstract, introduction, results/discussion, conclusion
- Title: Does it convey meaning and importance?
- Abstract: Does it convey the motivation, main results, and importance?
- First paragraph: Does it draw your attention and motivate?
- Sections/sub-sections: Is the paper structure clear from the subsection headings?
- Figures/tables: Is the motivation and importance of these clear (based on 5 minutes of skimming)? Are they well designed?
- Conclusion: Does it elevate or merely summarize?