

**Article Guide: Sections, Reviewing, Requirements, and Issues**

Dr. David J. Delene (Figure 1)



Figure 1: Image showing head-shot of Dr. David Delene.

**Table of Contents**

Document History.....2

Article Sections.....3

Typical Grading Method For Written Reports.....8

Graduate Student Master Thesis Writing and Review.....8

Document Reviewing and Revisions.....10

Preparation Software: Requirements and Recommendations.....10

Grammar: Common Issues and Comments.....14

Formatting Issues: Tex, Figures, Tables, and References.....17

Science Issues: Scientific Style and Focus.....19

## Document History

The Article Guide is a “living” document, which has been revised many times. The current version is available on the Web at <http://aerosol.atmos.und.edu/whitepapers.html>. While many papers do not get continually revised, the revisions listed below illustrated that writing is not a one step process and many revisions are necessary. Below is a list of major document revisions.

Revised by David Delene on 4/8/13, November 2023

Revised by David Delene on 21 July 2023

Revised by David Delene on 18 June 2023

Revised by David Delene on 10 February 2023

Revised by David Delene on 2 and 7 July 2022

Revised by David Delene on 13, 18, 26, and 30 June 2022

Revised by David Delene on 16 May 2022

Revised by David Delene on 19 September 2019

Revised by David Delene on 25 July 2018

Revised by David Delene on 26 July 2017

Revised by David Delene on 24 March 2016, 19/26 July 2016, and 16 August 2016

Revised by David Delene on 28 October 2015

Revised by David Delene on 25 September 25 2014

Revised by David Delene on 18 August 2012

Revised by David Delene on 22 August 2010

Revised by David Delene on 13 August 2008

Revised by David Delene on 28 September 2006

Originally Written by Paul Kucera

## Article Sections

### *Title*

The title is a brief statement of the topic addressed by the article, paper or report. The title should only include words that the intended audience knows; hence, acronyms should not be used. Title can be search to find articles of interest to the ready; therefore, it is good include keywords related to the topic discussed. Additionally, the title should be used to focus the topic discussed in the paper.

### *Authors*

The paper's authors are people that contribute to the article's production. Typically, the authors list is in order of who contributes the most to the work presented; however, author are sometime listed alphabetically. The first author typically writes the article while other authors contribute to some part of the article. Sometimes the last author is a "project manager" the has little scientific input to the article. Scientist that provide data used in the article are sometime included as authors, although they may not have input into writing the article. If the author list does not include people responsible for creating the data set analyzed or the software used in the analysis, then references need to be provided for data sets and software.

### *Table of Content, List of Figures, List of Tables*

Larger documents, such as Thesis and Dissertations, generally include lists to give an outline of the major parts of the document; however, smaller documents, such as an scientific paper, do not include such an outline. Such outline should be including using the Word Processor features to generate and update such information. Usage of the Word Processor features ensures the accuracy of such information that could be different if manually created and revised. Therefore, start by including necessary outline information automatically when first creating you documents. There are many resource available online on how to use the necessary Word Processor features.

### *Abstract*

An abstract summarizes the report. The abstract does not state what will be in the report but summarizes what is in the article, including the results, and conclusions. An abstract does not have to argue that the results or conclusions are correct or that the work was worth doing. An abstract should provide enough information for the reader to decide if they are interested enough in the subject to read the whole report. While the abstract is the first section in a report, it is best to write the abstract last! If not, you will probably rewrite the abstract at the end. Do not write a report in the same order that you read a report. Typically, it is best to start by creating figures, add figure captions, and end with the conclusions and abstract. An outline that includes the various sections and topics helps to get started. From an outline, it is possible to work on different sections at the same

time. Do not worry about completing one section before starting work on another section. In accordance with American Meteorological Societies, A Brief Guide for Authors, omit references from the abstract because they are not available to abstracting services.

### *Objective*

The purpose of writing this article is to provide the format for writing scientific articles, papers, and reports. Articles should clearly state the objectives of the work being reported. The Objective Section can come before, or after, the Theory Section depending on if the Theory Section is necessary to understand the Objective Section. The Objective Section should be short and to the point. One or two sentences are typically sufficient. Some science papers combine the Objective and Theory sections into an Introduction or Background Section; however, it is often best to include an explicit Objective Section.

### *Introduction, Background, Theory*

A well-written article should contain a number of specific items and should follow a uniform format. Papers should use modern word processing features such as “styles” and “cross-references”. The “styles” features ensures everything is formatted uniformly and using “cross-reference” for figure numbering enable automatic renumbering of all figure numbers when a new figure is inserted. Another characteristic of a good paper is that it should be written so a person familiar with the general topic but unfamiliar with the specific experiment could repeat the experiment using only the contents of the article and obtain similar data, be able to conduct similar results and produce similar figures. An article written to the point of enabling the work to be reproducible is a requirement of many Thesis committee members and typically a minimum requirement for publication of a scientific paper. Furthermore, articles need to describe any assumptions made in the analysis and provide a discussion of the accuracy of the assumptions. Disagreeing with an assumption made in scientific work is one reason for disagreeing with the article’s results and conclusions.

### *Instrumentation, Apparatus*

Most experiments use specific instruments or tools to perform a scientific investigation. Articles need to describe the major tools used during the experiment. The description should be in paragraph form and include how the instrument relates to the overall experiment. When discussing particular instruments, items such as acronym definition, manufacturer name, model number, and serial number need to be included. Provide a diagram of the experimental setup if the apparatus is not easily describable in words. Pictures with label overlays are also a good, simple method of describing an apparatus or experimental setup.

### *Methodology, Procedure*

Conforming to standard article procedures is important so readers can

understand the data, analysis, and results. The procedure for writing a good article is relatively simple and straightforward. First you think! Before writing any section, think about the contents that should be in the section and how to organize the material. Then, write clearly, concisely, and correctly. Say as much as is needed to cover the topic but no more. Say it grammatically and scientifically correct. Spelling, punctuation, and grammar are all important aspects of your article. The most important aspect, however, is the scientific content.

Regarding the overall article format, each section should have a header set off from the body of the text. The text should be typed using single spaced lines and with additional spacing between sections. Equations should be neatly typed using correct notation and an equation number provided at the far left. Each table and figure requires a caption and a number. Figures and Tables referred to in the text should start with a capital letter. Text should be written using 12-point font. Occasionally text within a table or figure may need to use smaller than 12-point font, but smaller fonts should be the exception, not the rule. It is best to use the same font and font size in captions as in the article text. All pages should be readable in the normal direction or by rotating the paper 90° clockwise (for figures and tables that are oriented parallel to the paper's long edge).

Note that all units have generally accepted abbreviations, almost none of which ever use a period. Capitalize units named after a person but not the unit if spelled out. For example, hertz - Hz, decibel - dB, joule - J, kelvin - K; note that both Celsius (C) and Fahrenheit (F) are capitalized for both the words and the units) but most other units are not capitalized (e.g. meter - m, gram - g, minute - min, hour - h, second - s, etc.). Capitalize prefixes used as decimal multiples or sub-multiples of a large unit, for example mega ( $10^6$ ). However, use small letters for small units like kilo ( $10^3$ ) and units that are less. Be careful not to confuse the measured parameter with its unit of measure.

### *Data, Data Set*

The Data Section should include the actual data collected during the experiment. Provide data in figure or table format. Figures should be prepared using a software tool such as a spreadsheet, plotting program, or programming language (i.e. Python). Each figure must have its axes labeled with the parameter being measured, units (in parentheses) if any, and a numerical scale. The numerical scale should be as simple as possible with enough tick marks or grid lines so that someone could read individual values off the figure. Utilize the space available by choosing the best axis scales. Manually adjust the interval between labeled values to be some convenient value. Software programs have the nasty habit of providing five or six labeled values that divide the range of values arbitrarily. For example, if the minimum is zero, the maximum is 40, and six intervals are used, then each interval represents 6.6666. Hence, it would be necessary to manually change the maximum to 42 so the interval would be seven or change the interval size to five. The point is that the axis labels should be

convenient for the human reader, not the computer. Do not blindly accept what the software program gives for axis scale values but adjust the values to make interpretation easy.

Figures should stand-alone; therefore, the caption should contain enough information so the figure is understandable without reference to the text. The caption needs to provide all information necessary to completely understand the information presented in the figure. Captions should not provide the interpretation or the meaning of the figure. Interpretation of figures should be included in the text; however, the text should not repeat the caption's description. Define acronyms in the caption even if the text defines the acronyms since the figure caption is independent of the text.

Tables should have a complete caption at the top describing the contents of the table. Explain abbreviations used as column headings in the caption along with unusual features of the data (such as the causes of missing data, etc.). The table should be understandable without reference to the text. Each column heading or row should contain both the parameter below or next to its contents along with the units of measure (again, in parentheses).

### *Results*

Presentation of the experimental results, the accuracy of assumptions, experimental errors that may exist, and anything else specifically relevant. The Results section usually always includes figures and tables. Never include a figure or table that is not explicitly discussed somewhere in the paper's text. Figures are not included in the Conclusion section but can be included in other sections.

### *Discussion*

Discuss experimental results in the context of other experiments. While the results section should focus on only results of the experiment, present information that, if understood, should be generally accepted by all readers. The Discussion is a little more open to interpretation and discusses the importance of the results and how the results related to other paper's results and to generally accepted or proposed theories.

### *Conclusions*

Conclusions should relate to your experiment. You can philosophize some, perhaps, but do not try to conclude things that your experiment did not show. On the other hand, a little scientific speculation might also be in order. For example, you might predict how the results of your experiment might relate to some other situation. But generally, stick to what you have learned; the conclusions section is usually one of the shortest of your paper, but, alas, is often one of the hardest to write.

Do not try to start with the big picture conclusion. Start with what exactly has been learned from the analysis. What do the observations indicate? List everything that can be concluded from the analysis of the observations using the

methods applied. Break down the list to what is important and new. The conclusions do not have to be new or unique. It is very important to state a conclusion to the objective defined.

### *Acknowledgments*

The Acknowledgment section should include funding sources and thanks to people that involved the paper by reviewing the report. Statements about people that contributed to the report but not at a level that would make them a co-author should be included in the acknowledgments. Use the acknowledgment section to state the exact contribution of different co-authors if you would like. For example, if a co-author provided data for the paper.

### *Availability, Data Availability*

The Availability section is a more recent addition to many scientific papers. The Availability section is similar to the Acknowledgment and References section in provide details, in this case, on the availability of data and software. However, even the availability of specialized instrumentation could be include. Such as manufactures information. A a minimum the Availability section should include how to openly obtain all the data used to create the plots presented in the paper.

### *References*

The reference section contains a list of material used to support statements made in the paper or the location of additional information. Give a reference to any source material used in the articles. Online tools, like Zotero, are useful when creating the reference section.

The text contains a citation to articles that present a conclusion that support that statement made. A long list of citations is not that useful to the reader since they do not know which reference to start with and it would take a long time to review many, many references. When a statement is backup by many, many, articles, such citation to references become unnecessary. Additionally, if the article discusses the reference later in the text, just include the reference when discussing the specific point and then a more general statement.

### *Appendix*

Appendix Sections are a good place to put additional material that is not necessary, or typically included in a scientific article. Having Appendix Sections is optional and many papers do not have any Appendix. Discussing calculation detail and software used is good to put into an Appendix.

## **Typical Grading Method For Written Reports**

Grades are on both the technical (spelling and grammar) and science aspect of a lab reports. When reviewing the report's technical aspect, points are lost for each mistake found. When reviewing the report's science aspect, points are lost for not doing the things outlined below. Individual lab reports may have different point values.

### *10 Points for the Abstract Section*

The report describes the lab content concisely, adequately, appropriately.

### *5 Points for the Objective Section*

Effectively presents the objectives and purpose of the lab.

### *5 points for the Theory Section*

Successfully establishes the scientific concept of the lab.

### *5 points for the Apparatus Section*

The report gives enough details to understand the equipment used for the experiment.

### *5 points for the Procedure Section*

The report provides enough details to enable other to repeat the procedure.

### *5 points for the Data Section*

Clear and accurate visuals are included in the report.

### *5 Points for the Discussion Section*

The report backs up statements with appropriate references.

Successfully integrates verbal and visual representation.

### *5 Points for the Conclusion Section*

The report convincingly describes what is learned.

## **Graduate Student Master Thesis Writing and Review**

Producing a major paper, such as a Master Thesis, is a lot of work. However, a Master Thesis is typically less work than a peer-reviewed scientific papers. Many times a Master Thesis is revised and submitted for peer-review. The major difference between a Master Thesis and a peer-review paper is that peer-reviewed paper is more concise and not as large as a Thesis. It may surprise inexperienced writers that presenting the same material in a reduced number of pages is more work. Some Master Thesis are written near the level of a peer-reviewed paper and after the Thesis Deference simply reformatted for submission to a peer-reviewed Journal. However, most Master Thesis take many months or even years of additional work before submission to a peer-reviewed Journal.

Master Thesis requires a lot of time to produce, especially for student without a lot of technical writing experience where detail review and revision was conducted. However, there is a lot of help available from the University's Writing Center, the major Thesis Advisor and the Thesis Committee. It is up to the student to utilize these resources in a timely manner to lessen the time required to produce



a quality product. One of the best things to do is get a lot of feed back. Ideally, starting with the Writing Center, moving on to the Thesis Advisor and finally the Thesis committee. Typically, the Writing Center provide ½ hour appointment, which is typically sufficient to review and revise one paragraph. Ideally, individual chapters are given to the Thesis Advisor for a minimum of one review; however, many reviews and revision may be necessary. Once approved by the Thesis Advisor, it is a good idea to ask individual Committee members to review Chapters and then revised before proceeding to the next Committee member. Providing comments on a Thesis chapter for a science based Thesis requires between two and size hours. Hence, it is important to have a minimum of one week for the Thesis advisor to review each chapter.

### *Example Timeline to Meet Expectations*

While expectation can vary, discussed herein is a typical example to set general expectation for completing a Master Thesis. The Thesis advisor should review the ten times before Advisor Approved Thesis draft is completed and the student is approved to schedule a Deference date. Typically the Advisor Approved Thesis draft is needed two week before the Deference data. Depending on how much the Thesis Committee members have seen draft chapters, members may required revisions before and after the Deference. Below is list of the ten Advisor Reviews.

#### *Revision 01*

A revision of the research topic proposal into Thesis Sections.

#### *Revision 02*

An outline for the Thesis with Chapter and subsections defined.

#### *Revision 03*

The outline formatted to include all sections required by Graduate School. List of Tables, List of Figures, etc setup.

#### *Revision 04*

The draft to some introduction material with references.

#### *Revision 05*

The draft to include at lease one figure and paragraph discussing the figure.

#### *Revision 06*

The draft to example of figures, tables, and equations.

#### *Revision 07*

The draft to include one completed chapter.

#### *Revision 08*

The draft to include two completed chapter.

#### *Revision 09*

The draft to include three completed chapter.

#### *Revision 10*

The draft to include all completed chapter.

## **Document Reviewing and Revisions**

Track changes word process features are typically used to provide detailed suggested changes to text and comments inserted where the reviewer has questions or is confused. The first step when revising a reviewed article is to read over all comments contained within the document. If a comment has been reviewed and document revised, the comment should be removed. Sometime, a reply is necessary, in which case, the comment is retained. Typically, the overall formatting is reviewed before reading the text in detailed, which includes reviewing figures and tables.

The first author is responsible for approving or rejecting all text change suggestion; hence, the first author revised version should accept, reject, or revise text based on suggestions. Therefore, the revised article should have no suggest text changes once the revision is completed. Each co-author on a paper should be given a chance to provide comments. Likewise, each commit member should be given a chance to provide comments. Ideally, co-authors revise the draft one at a time, while revision are made each time; typically, starting in order of the co-authors on the paper. Likewise, on a Thesis, start with the Thesis advisor and then move onto another committee member.

With Thesis, students are inexperienced with scientific writing and do not know what to expect; hence, it is a good idea to not wait until a complete draft is complete. It is best to work with the committee member chapter-by-chapter. Thesis should go through many revision. I am requiring the opportunity to comment on a Master Thesis 10 times, with 1 week each time to review the Thesis. Again, a complete draft is not required. The revision can start with an outline, build upon the research topic proposal. Next revision, could only include a paragraph. Get the formatting down first and then expanded.

### *Yellow Text Highlighting*

Yellow **highlighting** of texts indicates that a correction should be made to the text, which has been previously discussed in a comment.

## **Preparation Software: Requirements and Recommendations**

All students should use the University Writing Center for help on the technical points of good scientific writing. See the Writing Center website for hours and contact information. Additionally, all article should take advantage of some important features of word processor software. The below highlighted features are strongly suggest of all writers and are requirements for students working on Senior Projects and Graduate documents such as a Thesis.

### *Track Changes*

Suggested changes in the text are provided using the word processor feature of “Track Changes” and comments provided for suggested changes. All “Track Changes” need to be either accepted or rejected on the next version of the document. Additionally, comments need to be either addressed and deleted, or a

reply provided stating why the suggestion was not adopted.

### *File Format*

The Open Document Text (.odt) format should be used to save all documents since it is an open standard that word processors conform to. The Open Document Text format allows your documents to be independent of the software used and provides long-term access to the file. Microsoft Word does not conform to the Office Open XML (\*.docx) format; therefore, it is difficult for other software to support it and you may not have long term access to your data. Libreoffice, Open Office and Microsoft Office (since 2013 version) can all read and write the Open Document Text format.

### *File Names*

File names should not include special characters, and a space is a special character. Best to use an underscore (\_) to divide major parts of file names and capital letter to divide different sub-parts of a file name. File names should always use the date at the end, with year, month, and day moving from left to right respectively. For example 20220516 for 16 May 2022. The date serves as the version of the document, which is much better than Draft3 or Final. Best to have format filenames using Who\_What\_Date. For Example, for a conference abstract use Delene\_AMS2022Abstract\_20220516.odt. Another version would be Delene\_AMS2022ScatteringAbstract\_20220601.odt and the presentation could be Delene\_AMS2022ScatteringPresentation\_20220601.odt. The different parts of What are in capital letters, AMS2022 conference, Scattering for short title, and Abstract/Presentation are what the file contains.

### *File Size*

While file shares like Dropbox or putting the file onto a shared server can be used to exchange large (> 20 MB) article documents, it can be much easier to simply email the file as an attachment. However, with a 10-25 MB limit, many files may be too large. Included images are the reason for the large files. Hence, the file size can be reduced by reducing the image resolution. Reduced resolution may be sufficient for viewing the document, but not for final publication. However, final publication typically requires submission of individual, high-Particle Measuring Systems resolution version of the files anyway; hence, there is not much reason for inclusion in documents sent out for comments or review. Table 1 illustrates the file size reduction for a ten figure document by adjusting the image size (e.g. [MS Word instructions](#)).

Table 1: Table showing an example of the files size reduction of a 10 figure, 33 page article when using image of different dots per inch (DPI) resolution.

<b>Resolution</b>	330 DPI	220 DPI	150 DPI	96 DPI
<b>File Size</b>	26.3 Mbytes	14.2 Mbytes	11.8 Mbytes	10.1Mbytes

### *Paragraph Styles*

Use the Word Processor feature of Paragraph Style for everything in the document. Do not use tabs to begin paragraphs but define the Paragraph Style to indent the first line. Blank lines should not be used to separate sections, Paragraph Styles should be used to control all line spacing.

Formatting is typically a large part of grading rubric and when documents are turn in for review without any attempt at applying paragraph styles formatting, what should be expected beside zero points for this evaluation. It seems students just won't apply formatting and hence get low grades. Formatting is important since it demonstrates the author cares about details in their work. Additionally, consistent formatting makes it easier for the reader to understand and follow the material presented.

### *Document Formatting*

Paragraph Styles are used to format the article to the greatest extent possible. Blank lines (empty) lines should be avoided since sometimes reviewers and journals required line numbers on the left of documents (a feature Word Processors provide), which should not including numbering blank lines. Articles should include page numbers. Do not change formatting manually, that is, outside of the style applied formatting.

### *Page Formatting (Page Break Usage)*

When the next item should start at the start of the next page, insert a "Page Break" instead of a lot of line feeds. The number of line feeds needed changes if the amount of text changes. In Microsoft Word, use "Insert" pull down ribbon and the select "Page Break" on the left.

### *Inserting Figures and Captions*

Use "Text Wrapping" Layout of "In line with Text" (as character) for all figures to enable figures move with additional text. Figures should be anchored "as character", not "to character" or "to paragraph" to enable them to flow with the other characters. Use one paragraph style for all figures that is center alignment with no indent on first character. Do not use special text boxes for figure caption but insert like normal text but define a caption style for the figure caption text.

### *Cross Referencing of Figure, Table and Equation Numbers*

Use the Word Processor feature of Cross Referencing to define Figure numbers in paragraph text.

### *Zotero*

Use the Zotero reference management tool. Best to create a public group for each article and share the group with all authors. Insert all references using Zotero Word Processor plugin and use Zotero to create Reference section that provides are article references used. See department Wiki for details on installing and using Zotero.

### *Original Source for Reference*

Use the original source, not a reference that references the source. It is not fair to the people that did the work to reference a summary/review article instead of the original source.

### *Usage of Line Numbers*

Many journals require the placing line numbers on the left side of papers to enable reviewers to refer to the line number when making comments. However, line numbers are only necessary when not using Track Changes feature of Word Processor. Additionally, the line number are very distracting when using text-to-speech software to read papers. Hence, only add line numbers when needed for commenting without the use of Track Changes feature.

## Grammar: Common Issues and Comments

“Comment Blocks” given below are used to indicate items to be revised or ask a question of the author. Word Processors allow highlighting of text in different colors, which is used, along with Character Styles, to color code text to point out issues. Below are comments which have highlighted text headers that correspond to colored highlight areas in your article where the issue occurs. Please correct the issue throughout the paper or provide a feed back comment on the issue noted.

### *Acronym Usage*

Avoid using an acronym for general scientific terms such as “aerosol-cloud interactions”. Such acronym usage make listening the audio produce from text-to-voice program of papers more difficult to follow. Additionally, such acronym usage is more difficult for beginners and people not familiar with the specific topic. Acronym are acceptable for variables used in equations and specific nouns, like instruments. Acronyms may be more useful when giving presentation where speech is much slower than the speed of listening; however, in papers this is not the case. Use of such acronym may give the impression that the writer is lazy and does not want to take the time to type out the full term.

### *Approximately Not About*

Use approximately instead of about when describing something that is “close” to a value but not exactly that value.

### *Avoid Short Cut Symbol uses in Sentences*

Avoid the use of symbols to replace words in science writing. The article is not like a “text” message or short note where you are limited on space or time. For example, instead of “... data displayed is bounded between latitude 28.0 °N; 29.0 °N ...”, remove “;” and use words, “... data displayed is bounded between 28.0 °N and 29.0 °N latitude”

### *Be Direct*

Do not use pronoun and indirect references. State exactly what you are referring to. Check for usage of sentences that start with “This” and “These”. For such sentences, replace the indirect reference with what is being directly referred to.

### *Comma before 'and'*

The comma before an and in a list of three items or more items is optional. The older style is to include the comma; while, more recently people do not use the comma. When 'and' is used to join two items, the comma is only included to join two complete sentences. However, sometime a comma is used before 'and' to avoided confusion, which can occur with two different lists.

### *Case Labels*

Analysis frequently have several different cases that are each discussed. There

is a necessary to label the different cases to define which case is being discussed. Typically, authors start with, or want to use, the simplest methods; for example, using labels like case1, case2, and case3. However, such labels are arbitrary and provide no meaning about what is different about each case. Ideally, it is best to use a label for each case with the most important difference; for example, the temperature such as +7 °C, +4 °C, -33 °C, -46 °C. However, there may be many, many cases and not a single parameter the differentiates the cases. In such cases, the best that could be done is use the case date or time, which provides some meaning.

### **First Person**

Students are often discouraged from using the first person, the pronouns I and we, in their writing. The most common reason given for this is that readers may regard such writing as being subjective, whereas science is all about objectivity. There is no universal rule against the use of the first person in scientific writing. Be careful to use first person only to make the writing more understandable and not to make things subjective. Hence, avoiding first person is generally more “scientific”.

### **Foreshadowing**

Discussing what “will” be talked about next is not necessary in a well organized paper. Adding foreshadowing of what “will” be talked about next or later just adds to the link of the paper and is not necessary if the paper is well organized. Do not use such foreshadowing. If such foreshadowing is felt to be necessary, then I would suggest that the paper should be better organized. Remember, scientific readers expect papers to be organized in a standard way and it is not necessary to state a standard organization.

### **Numbering Item**

Do not number items for no reason. Don’t use first, second, etc, when there is no reason that one item has to be first and another item has to be second. Avoid using the “construction” of “first”, “second”, etc; unless, there is a real reason that something has to be in a certain order. Such “Numbering Item” constructions are typically “indirect”, and it can be made more “direct” without numbering items.

### **Paragraph Length**

Two sentences does not make a paragraph. Review all paragraph to ensure they are at least four sentences, typically at a minimum 5 or 6 sentences. Typically, short paragraphs are the result of not being able to link things together for produce a complete argument or point. Review the sentences at the end and beginning of the paragraph which are short, see if the sentences can be revised so that the same idea can be ended with one and started with the other, which should enable the two paragraphs to be combined.

### **Percent Spell Out**

In formal scientific writing the percent symbol should only be used in tables and figures. In text of an article, use the word percent. For example, 1.0 percent supersaturation. Use of the word percent avoids the need to know how the symbol is written, 1.0% 1.0 % or 1.0-%. If degree symbol is used, include a space, such as 1.0 %.

### **Proper Nouns Usage**

Specific people, places and things are proper nouns and need to be capitalized. For example Cessna Citation, Cessna is a specific company and Citation is a specific type of aircraft. Furthermore, Citation Research Aircraft (N555DS) is a specific aircraft not just any Citation doing research. Hence, it is a proper name and each word should start with a capital. For example, “*North Dakota Citation Research Aircraft*”, not just “*North Dakota Citation research aircraft*”. Such usage is similar is similar to “*Washington Monument*”, instead of just “*Washington monument*”.

### **Repeating Same Word**

Typically, usage of the same major word, such as “precipitating”, more than once in a sentence indicates that there is a better way to phrase the sentence but only using the word one. All sentences that repeat a word within a sentence should be review and revised if possible.

### **Several Prepositional Phrases**

Several prepositional phrases in a row can create long and many times confusing sentences. When there are three or more prepositional phrases in a row, consider replacing prepositional phases with brief noun strings, adverbs, or possessives. For more details, see <https://www.aje.com/arc/editing-tip-avoiding-preposition-overuse/>. An example is “... which refers to the amount of liquid water within in a volume of air”, which is four prepositional phrases in a row. The sentence can be shorten to “... which refers to liquid water amount within an air volume.”. Hence, reducing four prepositional phrases to two. While when first writing out your thoughts, it is natural to use several prepositional phrases in a row, such sentences should be revised to be shorten when possible to be more concise and easier to understand.

### **Space Between Value and Unit**

Always put a space between the numerical value and the unit in a sentence. Such a space also include when using the degree symbol as in with a temperature of -10.1 °C or when given a latitude of 41.1 °N.

### **Specific Term Usage**

Always use specific terms that are as detailed as possible, instead of general terms. Typically, during the writing process, ideas and arguments starts out more general and as the process progresses, more specific terms and ideas evolve. Therefore, reviewing what has been written to determine if more specific



terminology can be applied is part of the writing process and helps in focusing ideas.

### *Temperature Descriptions*

Above or below are used when describing temperature values; however, warmer and colder are used when describing temperature of a substance such as air.

### *Tense Usage*

Past tense is for material that has been previously published. Present tense is for everything that is new and presented for the first time in the article. Use future tense only for work that has not been done by when the paper is written; for example, suggestions for future work.

### *Term Consistently Used*

Be consistent with term usage throughout an article and not change terms. For example, the terms particle and hydrometeor could be used to describe ice and water solid material within a cloud. Do not switch between the terms, pick one and use all the time. Particle is used so widely, it is probably better for reader understanding to use the term hydrometeor than particle.

## **Formatting Issues: Text, Figures, Tables, and References**

### **Text Formatting Issues**

#### *Space(s) After Period*

Should it be 2 or 1 space after a period. The correct answer is really in between, which is not possible; hence, have to choose one. Newer style is to use one space as paragraphs are typically justified which can add in additional space to get the “in-between”. The older style is to use two space. Whichever option, make sure all sentences are the same. If using one space after a period, use the word processor find features to search for a period and two space, and if found, remove one space.

#### *Chapters and Subsections*

Typically, a paper and thesis is broken into chapters and subsections. Each chapter and subsection has a title that would be included in the Table of Contents. One method to organize a paper is to write an outline for each chapter and subset. However, if the subset ends up being just one paragraph, the subset should be combined with another subsection or not have a subset title, as may be the case for an introduction paragraph to a chapter.

### **Figures Formatting Issues**

#### *Anchor*

Figures are best anchored ‘As Character’. Right click on a figure to adjust its

anchored, typically not correct by default. Use a paragraph style for the figure and then a different paragraph style for the figure caption. By defaults, seems that they want you to enter figure captions as another text box. Best to put outside the box, copy and paste if necessary to get from text box to normal text. Using normal text you don't have to worry about the Anchor of the text box.

### **Captions Acronym**

Figure captions in articles should always be independent of the text. Independent figure captions allows readers to just review figures without reading the complete article. To have figure captions independent of text, all acronyms need to be defined in captions, even if the acronyms is defined in the text.

### **Caption Sentences**

Figure captions are written using complete sentences. Make sure there is a noun and verb in each sentence. While many scientist use get away with sentence fragments, use of fragments are not necessary and demonstrate a lack of effort by the author.

### **Caption Text**

A full description should go in figure/table captions. The interpretation of the figure should go into the text of the paper. The paper's text should describe the figure and the caption should not provide interpretation.

### **Font Size**

All text within figures needs to have a font size that is approximately the same size as the text within the caption. Many software applications use font sizes that are too small. Sometimes it is easier to bring the figure within a Presentation Slide and overlay a white box with a larger sized, black fonts to cover over the existing text. However, this requires more work; hence, if possible best to adjust the font size in the software that originally generated the plot. Shorten up label titles/text if necessary to have fonts that are large enough and provide additional description of the label in the caption if necessary.

### **Reproducibility**

Reproducibility is a major principle underpinning the scientific method. Therefore, sufficient information need to be provide in plots and figure caption to enable the figure to be recreated. Hence, time information is critical to include.

### **Repeating Information**

Information in figures captions does not need repeating in the article text, in a Figure Title or in a figure legend. To keep articles short, do not repeat information presented in figures.

### **Scale**

Figure should have x and y axis intervals and scales adjusted so the plot is easy

to understand.

## **Tables: Formatting Issues**

### ***Table Significant Digits***

Numerical values in tables are presented with the number of significant digits of the measurement represented. The significant digits include calculated parameters that include parameter such as averages. Measurements do not receive additional digits by averaging. For example, if a temperature measurement has significant digits of -33.6 °C with the “0.6” being the digit that is uncertain, then and average would not have additional digits such as -33.6123 °C.

### ***Table Spacing***

Table captions go above the table with no spacing between the caption and start of the table. There should be space below the table. The best method in Microsoft Word for including space below the table is to have the table as wide as the text in the document, and insert, have text wrapping “Around” the table. Therefore, to add space, select/highlight the table, select “Properties”, under “Text wrapping” select around, use the “Positioning” button to set space below the table. Additionally, do not add additional spacing within text cells, which typically requires changing from the Microsoft default from 0.08 to 0.00 for the left and right cell spacing.

### ***Table Size***

Typically, have table span the full width of paper, which is typically 6.5 inch. Use left justification, expect where center justification may be better. Adjust the size of cells, to ensure that there is not additional space above or below test.

## **References: Formatting Issues**

Even if the document text is double space, the Reference Section can typically be single space using hanging formatting where the first line is to the left and additional lines are 0.24 inch indented.

## **Science Issues: Scientific Style and Focus**

### ***Believe this to be scientifically Incorrect***

Believe this statement is not scientifically correct. Please correct or explain why you believe this is correct.

### ***Be Specific (Avoid Sentences with only Adjective “Valuable” and “Important”)***

Do not only state that some noun, such as “observations”, are “valuable” or “important” but explain why it is valuable or important.

### ***Figure/Table Caption Acronym***

Figures and Table should be independent of the text of the paper; hence, all acronyms used in a figure or table should be defined in the caption. Independence

of figures and tables is not universally accepted; hence, some Journals only required one definition of an acronym between the text and figure caption.

### *Go Directly into Figure Interpretation in the Text*

There is little or no need to introduce a figure before providing a sentence with the figure interpretation. Just start talking about the interpretation of the figure, readers can review the caption

### *Parameter Comparison (Intensive and Extensive Properties)*

Plots that provide comparisons between parameters should always make such comparisons between either intensive or extensive properties, see <https://www.thoughtco.com/intensive-vs-extensive-properties-604133>. Do not compare an intensive to an extensive property.

### *Right and Wrong Comparison*

Avoid right or correct observations to wrong or incorrect observations. First, keep in mind that “Science” can never really prove something right, only things that are wrong. Many times there are more accurate observations; however, that does not these observations correct compared to other observations. State that is observed and uncertainties if possible.

### *Time Structure / Organizational Usage*

Do not structure / organize writing using time if what you are describing scientifically does not have or need a time relationship. The observations (data) may have a time structure; however, don’t include such a structure in writing if what you are discussing scientifically does not have such a time structure. From example, if you are discussing a storm’s melting layer characteristic and the observations have some time structure, do not use such a structure in describing the melting layer as you do not want to confuse the reader about a real time structure such as the evolution of the melting layer as the storm develops.

### *White Papers*

For White Papers and Science Proposal, the focus needs to be clear on the science first and the methodology second. This can be very hard to do as scientists devote a lot of time doing the methodology and thinking about how to develop the methodology. However, need to clearly state the problem to be solved first and then follow by the methodology, even when the work is all on development and application of a technique.