

## Part II: Writing a Scientific Manuscript

### The Scientific Manuscript

This is a basic overview of a scientific manuscript. In the sections to follow, we will break down each section in detail.

#### Structure of an Article

The structure of a research article usually depends on the journal to which the article is being submitted. Many journals have page limits, figure limits, or specific article divisions to which authors must adhere. **Before you begin writing, check the journal you will submit to for formatting instructions.**

JYI has few restrictions; however, there are a set of basic guidelines which any JYI research article must follow. These are the basic structure guidelines that most journals have:

#### *Abstract*

Just about every journal out there requires an abstract. An abstract is a **single** paragraph of about 500 words or less. In the abstract, the author must summarize *why* the research was conducted, *how* it was conducted, and what the major results and conclusions were. References are typically not cited in the Abstract, since the reader expects a more full discussion in the body of the article.

#### *Introduction*

Every scientific report needs an introduction, though it is sometimes broken down into different components. The length of an introduction depends on the journal and the paper; however, the structure and content should be similar. In the introduction, the author must present the problem his or her research will address, why this problem is significant, and how it applies to the larger field of research. The author must clearly state his or her hypothesis, and quickly summarize the methods used to investigate that hypothesis. The author should address relevant studies by other researchers; however, a full history of the topic is not needed.

The introduction should contain all the background information a reader needs to understand the rest of the author's paper. This means that all important concepts should be explained and all important terms defined. The author needs to know who will be reading this paper, and make sure that all the concepts in the paper are accessible to them.

JYI caters to an audience of professionals *and* undergraduates. In a paper submitted to JYI, background information should be extensive enough for an undergraduate science major to understand, but not so detailed as to bog down a professional reader. For example, an author need not define an "electron"; however, a "Cooper paired electron" does require a definition.

### *Body of Article*

After the introduction, articles may vary in their structure. Some authors will find it best to progress directly into a "Methods and Materials" section; however, others may find a different breakdown more appropriate. At JYI, the structure of the body of the article is left to the author's discretion. However, you should always check with the particular journal you will be submitting to before writing the body of the article.

Whichever journal you're submitting to, several key points do need to be addressed in the body of the article. You should thoroughly describe the methods you used to investigate the problem, and should briefly describe why these methods were used. Any materials used should be documented, and any computer programs used should be discussed.

The body of the article should address the experiments, models, or theories devised. It should contain little to no background information, since this information should be placed in the introduction. Also, the body of the article should contain no results, conclusions, or interpretations.

### *Results*

Most journals – including JYI – require a results section. In this section, the author should thoroughly detail the results of the experiments, models, or theories developed in the body of the article. The results should be supplemented by figures and tables, and the figures and tables should be briefly explained. *No interpretations or conclusions should be drawn.* All interpretation and discussion of the results should be saved for the Discussion and Conclusions section.

### *Discussion and Conclusions*

Most journals – including JYI – require a discussion and/or conclusions section. In some cases, when the author has many points to discuss, he or she may split this into two sections; however, one section is usually sufficient.

In this section, the author should restate the problem he or she was attempting to address, and summarize how the results have addressed it. The author should discuss the significance of all the results, and interpret their meaning. Potential sources of error should be discussed, and anomalies analyzed. Finally, the author should tie his or her conclusions into the "big picture" by suggesting the impact and applications this research might have. This can be accomplished by discussing how the results of this paper will affect the author's field, what future experiments could be carried out based on this research, or what affect the conclusions could have on industry.

### *Acknowledgments*

An acknowledgements section is not usually required; however, most papers include a paragraph of acknowledgements and thanks for help received on the research or the paper. In journals where the reviewer's names are revealed, it is considered polite for the author to acknowledge the help of the reviewers.



### *References*

Every article must have references – usually many. References should come primarily from papers published in professional journals. A small number of abstracts or textbook-type references may be permitted; however, these should not make up the bulk of an author's references. Personal communication references are permitted, but, again should be kept to a minimum.

### *Figures and Tables*

Most articles include tables and figures. These should be of high image quality, with minimal pixelization. All figures and tables should be referenced within the text of the article, usually in the results section. The figures and tables should be thoroughly described within the text, and their meaning discussed within the discussion section.

### **Writing Style**

The basic rules of writing apply to any paper; however, they are especially important to a professional document being submitted for publication. Before submitting a paper to a journal, make sure that it:

- ♦ Contains no misspellings.
- ♦ Is grammatically correct.
- ♦ Meets the formatting guidelines of the journal
- ♦ Avoids the first person.
- ♦ Does not contain personal anecdotes or stories
- ♦ Is not trying to be clever—research manuscripts are no place for story telling, only reporting of facts

### **Audience**

Every journal addresses a specific audience, and an author must write his or her paper with that audience in mind. For example, JYI addresses an audience of professional scientists working in various fields, as well as undergraduate science majors. This means that every research article published by JYI must be accessible to both professionals and undergraduates. For example, a physics-related paper should be accessible to anyone working in the field of physics, whether an undergraduate, graduate student, or professional.

Before submitting a paper to a journal, the author should think about which concepts need to be defined and described for that particular audience.