2 An Abstract Is Not an Introduction!

This section includes quoted excerpts from *A Short Guide to Writing About Science* by David Porusch.

What is an abstract? "An abstract is an accurate representation of the contents of a document in abbreviated form. ... At very least, the abstract should reveal the scope of the paper and the topics discussed. As one expert on abstracts has said, the task of the abstractor is "to convey what the author himself has done, why he has done it, and by what steps he has arrived at his conclusions, together with those conclusions. Any other points are irrelevant."[1] It should be self-contained; in other words, it should not refer to the paper itself for further clarification. And it must balance brevity with informativeness." Many students do not realize that the abstract should entirely "give away the punchline" by telling the reader the results up front.

Why do readers need abstracts? Because there are so many papers in the literature, and not enough time to read them all, scientists often make the judgement of whether or not they will read the paper simply by reading the abstract alone. "In many cases, the abstract is the only part of your article that someone will read. ... Since the reader will be interested in sorting through your abstract and thousands like it quickly, you ought to address him or her with *clarity* and *directness*. ... The abstract also serves a secondary function: by reiterating the contents in a more general way, a well-written abstract helps readers understand those contents when they read the article in full."

How long is the abstract? Abstracts are often limited to 200 words or less.

How do you write an abstract? "A good way to construct the abstract is to devote a sentence or two to the majors parts of the larger paper so that the abstract is a study in miniature of the paper." Every sentence should include a *crucial* piece of information; there's no room in only 200 words for fluff! The first few sentences will identify the problem/question and your hypothesis; this is the material that would appear in the Introduction of the paper. A sentence or two will then be devoted to each of the Methods, Results/Discussion, and Conclusions. "If space permits, it is often a good idea to include a sentence at the beginning describing the significance of the problem (contextualizing) and a sentence at the end describing the wider significance of the work or subsidiary but important conclusions."

When do you write the abstract? The abstract will often be the *last* part of a paper to be written. Discuss why you think that is.

[1] Perhaps this expert forgot that authors may identify with female pronouns. R. L. Collinson, *Abstracts and Abstracting Services* (Santa Barbara: ABC Clio, Inc., 1971)

2.1 Example Abstracts

Your task is to "dissect" each of these abstracts. Read the first one outloud. Then for each sentence, discuss as a group to identify which section of the paper it summarizes: Introduction (I), Methods (M), Results & Discussion (R), or Conclusions (C). Or, does the sentence add additional context (+)? Or, is the sentence completely extraneous and should be removed from the abstract (X)? A space before each sentence is set aside for your identifications. Finally, is the abstract *missing* anything? Repeat for the remaining abstracts.

1. "_____ Consider two separate tracks of equal horizontal displacements and equal initial and final heights. _____ One track remains at this initial height while the other angles down, levels out, and then angles back up in order to regain its original height. _____ Question: If two identical balls are set rolling with equal initial speeds, which ball completes the track in a shorter time interval? _____ In this manuscript, the dynamics of a ball on each track are analyzed using basic Newtonian mechanics. _____ We calculate the time necessary to complete each path in terms of the parameters of the track and the initial velocities of the balls. _____We derive an expression for the time difference between the two tracks and compare this to data taken on a set of high road/load road tracks, hence demonstrating the fact that the ball traversing the low road always wins the race."

2. " _____ Identifying how cognitive or mental operations match neutral activity in the brain is a fundamental problem in cognitive neuroscience. _____ A rhesus monkey learned the complex physical and cognitive task of moving its arm orthogonal and counterclockwise (CCW) to the direction of a target light. _____ As the light changed its position from trial to trial, the monkey continued to move at 90° and CCW from that direction. _____ We hypothesized that the monkey first imagined a mental image of a vector between the light and the direction of its arm motion, and then mentally rotated this vector. _____ We tested this hypothesis directly by recording the activity of neurons in the motor cortex that are sensitive to direction while the monkey performed its task. _____ We computed the pattern of action in these neurons in successive time intervals during the task. _____ The results created a neuronal population vector (npv). _____ This npv rotated gradually from the direction of the light to the direction of the arm movement. _____ These results provide direct evidence for the hypothesis that the monkey imagined and then rotated a line between the light and its mental image of the vector of motion. _____ It also proved that measuring neuronal population vectors is a useful tool for identifying how neuronal activity matches cognitive (imaginative) tasks in the brain of primates."

3. "_____ Can we use our knowledge of physics to design the best paper airplane? _____ Newton's First Law states that if an object experiences a net force, it will experience acceleration; this means that if our paper airplane experiences more air resistance, it will not fly as far._____ We varied the material and folding design of our paper airplanes and tested them to determine which was best. _____ These results could be applied to the design of real airplanes. _____ Our project was very difficult, but we had a lot of fun and thought it was interesting."