Critical Thinking About Scientific Literature

Here is a list of questions you should ask about the different sections of a scientific paper. Because many papers in the literature are poorly written, you may not always come up with a good answer!

Introduction
♦ What hypothesis is being tested?
♦ Is it explicitly stated anywhere in the text?
♦ If not, can the questions the study addresses be recast as working hypotheses?
♦ Does the hypothesis describe a mechanism, or is it just a statement of pattern?
♦ Where did the hypothesis originate?
♦ Why is the question worth asking?
♦ Has the literature and background material on this topic been accurately summarized?
♦ Have opposing viewpoints or alternative ideas been discussed?

Materials and Methods
♦ What kinds of data have been collected to address the hypothesis?
♦ Do these data constitute a strong or a weak test of the hypothesis?
♦ Are the experiments and/or statistics appropriate?
♦ If not, how could they have been improved?

Results
♦ What are the results of the study, stripped of the author’s interpretations?
♦ What assumptions are necessary to relate these results to the original hypothesis?
♦ Does the description of the results in the text correspond to the data given in tables and figures?

Discussion
♦ Was the original hypothesis accepted or rejected?
♦ Were any results presented that contradicted the hypothesis?
♦ If so, how were they addressed?
♦ If not, what results would have contradicted the hypothesis?
♦ What other hypotheses might explain the author’s results?
♦ What additional data would be needed to distinguish among these competing alternatives?
♦ How might the original hypothesis be refined in light of this study?
♦ What sort of data would cause you (or the author) to discard this hypothesis entirely?
♦ Does the study stand on its own merits, or does the author rely on reference to authority, theory, or other published examples to bolster the conclusions?