Things to consider/look for/answer when reading primary scientific literature

An essential skill to have and continually develop is meticulous methods for reading scientific papers. The actual content of papers varies and changes over time, but the strategies used to understand, remember, and apply the information you read are fairly consistent and learned skills. You need to constantly pursue and expand your knowledge base to be successful in science, and skills of acquiring information enable this goal. Many people have many different specific methods for extracting new information from papers; ask for input as you work to become better at reading papers, particularly from people whom you respect as scientists – chances are they got they way in part because they are excellent literature readers ☺

There is no one method to being a good reader; the important thing is that you need to figure out what works for you. Here are some suggestions from our experience, both general ideas and specific questions to think about and look for to help effectively and efficiency understand published scientific literature. In your reading, the goal is to be able to discuss these types of points with colleagues.

Introduction – In this initial section, you want to frame the study in your mind, understanding both the significance and application of further understanding in this area
*Why are they doing this study? What benefit is there from finding out more in this area?
*What is they hypothesis? That is, what are the authors seeking to test?
*What previous results provide the basis for the hypothesis? Is the hypothesis credible based on the existing literature?

Experimental Design – there is no formal "design" section; you need to piece together information from the intro, methods, and discussion to see how they set up experiments to test their hypothesis. The story in the paper is often told in retrospect; you need to piece together how they started out.
*What was the first step to the experiments? Why? What did they intend to learn from that experiment?
*How were subsequent experiments related to the initial experiment? What follow-up questions were they testing or pursuing?
*In experiments with multiple groups of samples/subjects, why did they test each condition/group? What conditions were controls? What were they controlling for?
*Why did they choose the particular techniques in the paper? Usually the choice of technique is based on the experimental questions and what needed to be demonstrated to answer the questions.
*How did the authors decide the experiment answered their question? If they used statistical significance, how did they determine this value?

Methods – the actual experiments of the paper; you need to understand what the techniques entail
*What are the strengths and limitations of the techniques used? Do the conclusions drawn from the results match the capacity of the techniques used?

Discussion – the explanation/interpretation/application of the experiments; this last section of the paper tells the story of the findings; you want to understand the continuity (or discontinuity) of the experiments and what the authors interpreted from their results
*What do the authors conclude from their studies? How do their conclusions address/match up with their hypothesis?
*How do the authors address conflicting or unexpected data? How reasonable are these explanations?
*What are the strengths of the paper and the findings? What are the weaknesses of the findings? What would you do differently? Why? If you were doing the experiments, what would you do to improve/expand on the given results?
*What are the next steps from these results? What are the next logical experiments that can now be pursued in light of the results?
*What are future potential steps based on these results? E.g. long-term goals of experiments, technologies using results, speculations of potential applications