Notes on writing assignments: Organization

The format of the writing assignment is to review a paper from the scientific literature related to brain computation. You are to try and evaluate the reported results in the paper with respect to their implication for brain computation.

There are two slants that we will use. In a *News & Views* format, you are writing to fellow scientists with the objective of pointing out the key results of the paper with respect to thinking about how the brain realizes computation. In a *Behavioral and Brain Sciences Commentary* format, your objective is to emphasize the flaws or weaknesses in the paper from the same perspective.

The best format to use us the *3Ts* format. The three *Ts* stand for:

1. "Tell them what you are going to tell them,"
2. "Tell them,"
3. "Tell them that you have told them."

Imagine that you scientific colleagues are very busy and have huge reading lists, so that you want to capture their attention with a succinct discourse. Another model is to imagine going back in time so that your paper is a review of the article for the editor of the journal that ultimately published the paper. They are also very busy and need a compact evaluation.

For the first T, your job is to orient the reader towards what is coming. In a short space you must describe:

- What is the setting for the problem? What is at issue? What is the previous state of knowledge?
- What is the main result of the paper? How does that advance scientific understanding of this venue?
- What is your opinion of the paper? What should be the disposition of the paper?
-What is the main reason for this evaluation?

For the second T, you need to come up with arguments that support your evaluation. These comprise the largest part of the paper and should persuade the reader to line up with your overall judgment. The key element is that, the arguments must be logical propositions, not feelings such as likes or dislikes or snap judgments. For example in reviewing Ray Kurzeil's *How to Create a Mind*, P. Z. Meyers claims that Kurzweil ignores essential gene-protein interactions:

> We **cannot** derive the brain from the protein sequences underlying it; the sequences are insufficient, as well, because the nature of their expression is dependent on the environment and the history of a few hundred billion cells, each plugging along interdependently. We haven't even solved the sequence-to-

> protein-folding problem, which is an essential first step to executing Kurzweil's clueless algorithm. And we have absolutely no way to calculate in principle all the possible interactions and functions of a single protein with the tens of thousands of other proteins in the cell!
> Let me give you a few specific examples of just how wrong Kurzweil's calculations are. Here are a few proteins that I plucked at random from the NIH database; all play a role in the human brain.
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> First up is RHEB (Ras Homolog Enriched in Brain). It's a small protein, only 184 amino acids, which Kurzweil pretends can be reduced to about 12 bytes of code in his simulation. Here's the short description.
> *MTOR (FRAP1; 601231) integrates protein translation with cellular nutrient status and growth signals through its participation in 2 biochemically and functionally distinct protein complexes, MTORC1 and MTORC2. MTORC1 is sensitive to rapamycin and signals downstream to activate protein translation, whereas MTORC2 is resistant to rapamycin and signals upstream to activate AKT (see 164730). The GTPase RHEB is a proximal activator of MTORC1 and translation initiation. It has the opposite effect on MTORC2, producing inhibition of the upstream AKT pathway (Mavrakis et al., 2008).*
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> Got that? You can't understand RHEB until you understand how it interacts with three other proteins, and how it fits into a complex regulatory pathway. Is that trivially deducible from the structure of the protein? No. It had to be worked out operationally, by doing experiments to modulate one protein and measure what happened to others.

The style here is more relaxed than that you should shoot for; Meyers is writing for a blog. Nonetheless the force of the argument comes through: to understand the brain, you have to understand how it's put together, and an essential part of that process is understanding the ways that the genes interact with proteins. If you leave this essential step out, you cannot understand how the brain works.

Your arguments do not have to be exhaustive. Think like a trial lawyer: you just have to show the jury that one or two of the opposition's arguments are false. The jury will then fill in that the rest might be suspect also.

After the arguments have been listed, you are ready for your third T. In the opening paragraph(s), your first T, you telegraphed the situation, but you could not be detailed, as you had not gotten to the arguments yet. In your summary, you revisit your opening theses, but at this point you can present a more integrated view of why your particular review of the material should carry the day.