membrane/cytoplasm interface. Such findings would be important, because they would likely inform the development of novel and much-needed approaches to therapy of disease Y."

When completed, the introductory paragraph should be 6-8 sentences and occupy no more than 1/4 to 1/3 of the page. The flow of logic must be clear and compelling – it must "hook" the reviewer's interest in the details that follow.

Research Design. Two of NIH's recent areas of emphasis are (1) rigorous experimental design that will produce robust and unbiased results and (2) consideration of relevant biological variables in such design. The genesis of these emphases stems from NIH's realization that not all of the results produced with its funding have been reproducible. A comprehensive overview of what NIH recommends to correct this problem can be found at https://grants.nih.gov/policy/reproducibility/index.htm.

Extra requirements with respect to experimental design and the consideration of biological variables may be imposed by individual Institutes and Centers, either on their website or in Funding Opportunity Announcements that they issue. Those specific requirements, if they exist, take precedence over the general instructions that follow.

Aids to understanding how you can enhance reproducibility of your own work are in video format. You can access them at the following links:

- Reproducibility of Data Collection and Analysis – Modern Technologies in Cell Biology: Potentials and Pitfalls (11-24-2014)
  https://videocast.nih.gov/summary.asp?Live=15277&bhcp=1
- Reproducibility of Data Collection and Analysis – Modern Technologies in Structural Biology: Potentials and Pitfalls (03-13-2015)
  https://videocast.nih.gov/summary.asp?Live=15910&bhcp=1
- Reproducibility of Data Collection and Analysis – Modern Technologies in Genome Technology: Potentials and Pitfalls (06-04-2015)
  https://videocast.nih.gov/summary.asp?Live=16381&bhcp=1
- NIH Workshop on Reproducibility in Cell Culture Studies
  09-28-2015 Day 1: https://videocast.nih.gov/summary.asp?Live=16876&bhcp=1
  09-29-2015 Day 2: https://videocast.nih.gov/Summary.asp?file=19196&bhcp=1
- Improving Openness and Reproducibility of Scientific Research (10-26-2015)
  https://videocast.nih.gov/summary.asp?live=17454&bhcp=1
- Clearinghouse for Training Modules to Enhance Data Reproducibility
  https://www.nigms.nih.gov/training/pages/clearinghouse-for-training-modules-to-enhance-data-reproducibility.aspx

<u>Rigorous Experimental Design for Robust and Unbiased Results</u>

One of the problems that NIH has identified is that some – many? – investigators have not received sufficient training in "strict application of the scientific method to ensure robust and unbiased experimental design, methodology, analysis, interpretation and reporting of results." As a consequence, as noted above, results of their research may not be replicable when the "same" experiments are repeated using appropriate experimental design. If you are one of those persons, it is relatively simple to catch up. For example, since changes in application requirements were announced in March of 2016, NIH has published aids that are designed to enhance rigor and reproducibility (e.g., https://grants.nih.gov/grants/Rigor-and-Reproducibility-Chart-